European Monitoring Centre
for Drugs and Drug Addiction

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POLYDRUG USE: PATTERNS AND RESPONSES

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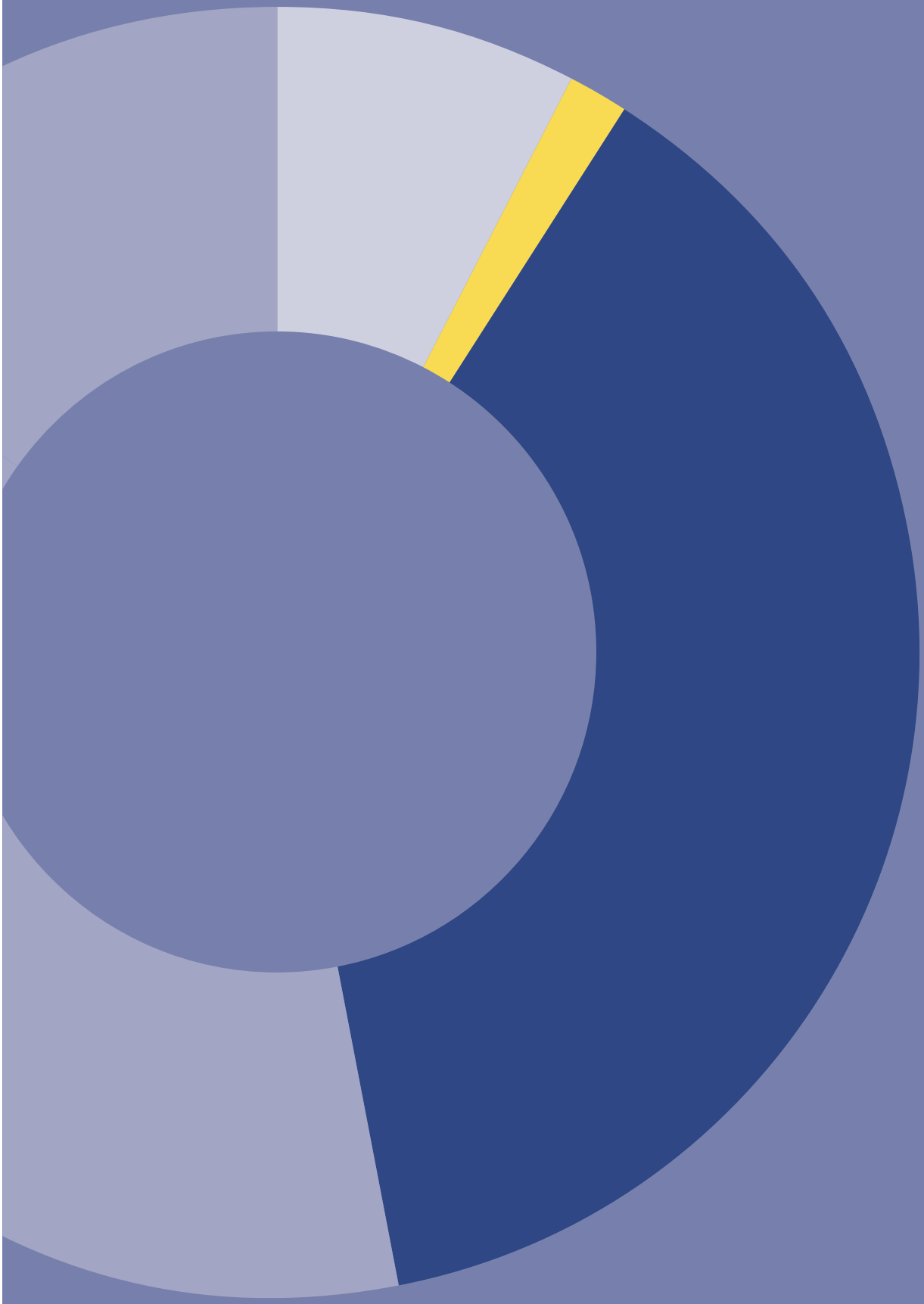

Introductory note and acknowledgements

Three in-depth reviews of topical interest are published as 'Selected issues' each year. These reports are based on information provided to the EMCDDA by the EU Member States and candidate countries and Norway (participating in the work of the EMCDDA since 2001) as part of the national reporting process. This report also includes data from the database produced within the European school survey project on alcohol and other drugs (ESPAD), a collaborative European project coordinated by the Swedish Council for Information on Alcohol and Other Drugs (CAN). It is written in line with the rules for the use of the ESPAD database. For a list of national institutions and supporting organisations for the other countries see www.espad.org.

The three issues selected for 2009 are:

- Drug offences: sentencing and other outcomes;
- Polydrug use: patterns and responses;
- Trends in injecting drug use.

All 'Selected issues' (in English) and summaries (in 23 languages) are available on the EMCDDA website: http://www.emcdda.europa.eu/publications/selected-issues.

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Reitox national focal points

Reitox is the European information network on drugs and drug addiction. The network is comprised of national focal points in the EU Member States, Norway, the candidate countries and at the European Commission. Under the responsibility of their governments, the focal points are the national authorities providing drug information to the EMCDDA.

The contact details of the national focal points may be found at:
http://www.emcdda.europa.eu/about/partners/reitox-network

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Polydrug use: patterns and responses

Introduction

A combination of population- and substance-specific approaches has framed the monitoring of illicit drugs use during the last decades. Our knowledge of the drug phenomenon is largely based on surveys conducted among the general population and specific groups, and on data from treatment centres. These data show, for example, that cannabis use mainly occurs during adolescence and young adulthood, that ecstasy can be associated with certain lifestyles and activities, and that heroin use frequently results in marginalisation and major health problems. These approaches have improved our understanding of the diversity of drug use patterns and of drug user profiles, and suggested better frameworks for planning and evaluating drug-related interventions targeting populations with sometimes very different problems and needs.

In contrast, the understanding of multiple substance use and the analysis of overlaps between different drug-using populations, such as cannabis users and binge alcohol drinkers or partygoers and dependent drug users, have been more limited. This has become particularly apparent in recent years, as increasing prevalence levels of drug use (e.g. alcohol, cannabis and cocaine) have translated into additional populations of drug users, and as an increasing range of available substances has resulted in additional drug combination possibilities. In such a context, the limitations of substance-specific approaches to understanding drug use patterns and trends have become increasingly apparent.

To fine-tune existing drug policies and drug-related interventions, it is necessary to explore the complexity of drug use patterns and consequences. Polydrug use — a pattern that has already been observed in many drug-using populations — is a priority for investigation. One simple rationale for this is that all pharmaceutical drug use follows the general rule that drug combinations tend to increase the risks of adverse health effects. Such effects can occur (generally as acute toxicity) shortly after the consumption of several substances, or within a short time. They can also occur following a long period of use, due to various mechanisms affecting body systems, including the liver and the central nervous, cardiovascular or respiratory systems (McCabe et al., 2006; Macleod et al., 2004; Stefanis and Kokkevi, 1986). Intensive alcohol use is often a major, but overlooked, component of polydrug use. For example, stimulant drugs such as cocaine may enable users to consume large quantities of alcohol over longer periods than would otherwise be possible.

While it is relatively easy to show that polydrug use can lead to multiple adverse health consequences, studying it remains a challenge, both at the conceptual and at the practical levels. Conceptually, polydrug use encompasses wide variations in user populations and patterns of use: from occasional alcohol and cannabis use to the daily use of combinations of heroin, cocaine, alcohol and benzodiazepines. As a result, it is not possible to arrive at a single definition of polydrug use, which would be necessary to develop standardised measures. Understanding polydrug use also requires a focus on the use of a range of drugs by the individual; but most drug monitoring information remains substance-specific and reported as aggregated national data. To overcome some of these difficulties, this 'Selected issue' looks at three different populations, for which patterns of polydrug use and their consequences are likely to differ: adolescents aged 15–16 years, young adults and problem drug users.

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Polydrug use among adolescents

Use of alcohol, cigarettes, cannabis and other psychoactive substances by young Europeans has increased since the 1990s, in a variety of drug-using repertoires (EMCDDA, 2008a). School population surveys invariably show that alcohol consumption and cigarette smoking are far more prevalent than the use of illicit drugs. They also confirm that cannabis is the most commonly used illicit drug, with prevalence estimates generally reaching much higher levels than those for other substances such as ecstasy, amphetamine, cocaine, heroin, LSD and hallucinogenic mushrooms.

Why do people use multiple drugs?

There are different rationales for mixing different drugs during one consumption episode. Drugs, which when taken together can have cumulative or complementary effects, may be mixed to increase the overall psychoactive experience. Offsetting the negative effects of a drug can be another reason to take an additional substance; for example, benzodiazepines to help the user sleep after taking stimulants.

The use of several substances by an individual over a longer period of time might reflect the replacement of one drug by another, due to changes in price, availability, legality or fashion (Boys et al., 1999). Examples are cocaine replacing ecstasy, methadone substituting heroin, or gamma-butyrolactone (GBL) replacing gamma-hydroxybutyric acid (GHB) after GHB came under drug law control. It could also reflect the use of separate drugs in different settings or contexts, or simply reflect regular multi-substance use associated with drug dependence.

Overall, the types of psychoactive substances that are used in combination depends not only on personal preferences, but also on other factors such as local availability and fashion, and for prescribed psychoactive medicines, on local prescribing practices (Gossop et al., 1998). Increases in the range of drugs available are usually accompanied by more polydrug use, as well as by increases in the social acceptability of combining various psychoactive substances (Ives and Ghelani, 2006).

Intensive patterns of drug use, with the possible exception of tobacco smoking, usually remain limited among adolescents. However, the use of any psychoactive substance in this age group is of concern as the brain and other organs are still developing during adolescence, and exposure to toxic substances may cause damage, though it might only appear later in life. In addition, early initiation during adolescence has been associated with higher probability of drug use later in life and greater difficulties in reducing or ceasing drug use (von Sydow et al., 2002). Polydrug use among adolescents, defined as the use of at least two different psychoactive substances at a young age, could be considered an indirect indicator for early initiation. Furthermore, the use of illicit substances that are uncommon at this age — depending on the local context these might be cannabis or other drugs such as cocaine — could also reflect higher levels of risk behaviours, social exclusion or deviance among adolescents.

In this report, individual data from the surveys carried out in 2003 by the European school survey project on alcohol and other drugs (ESPAD) are used to examine the characteristics of polydrug use among over 70 000 15- to 16-year-old students from 22 European countries ([1]). In order to attain sufficiently large samples for statistical analysis, while also allowing exploration of differences in polydrug use patterns in different contexts, the countries were divided into three distinct groups based on their prevalence levels of substance use during the last 30 days (last month use) ([2]). The countries assigned to the low-prevalence group were Greece, Cyprus, Malta, Romania, Finland, Sweden, Turkey and Norway. The medium-prevalence group was made up of Bulgaria, Latvia, Lithuania, Hungary, Slovakia, Slovenia and Croatia, and the high-prevalence group consisted of Belgium, the Czech Republic, Denmark, Germany, Estonia, the Netherlands and the United Kingdom.

Last month prevalence of drug use among school students in Europe (see Table 1) is dominated by the consumption of alcohol and cigarettes, with cannabis following in third place. The use of other illicit drugs during the last month seldom exceeds 1 % of the school student population. Research also indicates that adolescent drug use tends to occur during short periods, such as an evening out or over a weekend (Collins et al., 1998).

([1]) Details of the data analysis are published in Olszewski et al. (2009).
([2]) Hierarchical cluster analysis was performed using Ward's method. Drug use prevalence in each country for each of five drugs (cigarettes, cannabis, cocaine, ecstasy and amphetamines) and for alcohol binge drinking (drinking five or more drinks in a row), was scaled to lie between 0 and 1 by using the minimum and maximum for all participating countries (see Figure A1 in the online annex).

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Table 1: Range of last month prevalence of substance use among 15- to 16-year-old school students in 22 European countries and average prevalence by cluster

Substance	Prevalence range (%), all countries	Average prevalence (%)		
		Low-prevalence countries	Medium-prevalence countries	High-prevalence countries
Alcohol	20–81	50.8	65.3	73.1
Binge alcohol ([1])	15–60	34.6	38.4	51.8
Cigarettes	18–46	26.7	40.5	36.3
Cannabis	0–20	2.2	7.6	15.0
Ecstasy	0–3	0.5	0.8	1.3
Hallucinogenic mushrooms	0–2	0.3	0.3	0.8
LSD or other hallucinogens	0–1	0.3	0.3	0.6
Amphetamine	0–1	0.4	0.8	0.9
Cocaine	0–1	0.4	0.3	0.6
Heroin	0–1	0.3	0.2	0.3

([1]) Binge alcohol is defined as drinking five or more drinks in a row.
NB: Data for 19 EU Member States together with Norway, Croatia and Turkey (*n* = 76 541).
Source: ESPAD 2003.

Types of adolescent polydrug user

Around 30 % of the 15- to 16-year-old students of the 22 countries included in the analysis reported having consumed two or more substances in the month before taking part in the survey. The proportion of polydrug users was nearly 40 % in the high-prevalence country group, 36 % in the medium-prevalence country group and 22.5 % in the low-prevalence group. Some 91 different drug combinations were reported, possibly reflecting national differences in drug markets and lifestyles. However, more than 96 % of the students who reported having used two or more substances could be placed in one of three types of polydrug users:

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

Just over 20 % of the school students in the entire database reported the use of both alcohol and cigarettes (A type) during the previous month, 6 % reported the use of cannabis and alcohol and/or cigarettes (B type) and 1 % reported in addition the use of ecstasy, cocaine, amphetamines, LSD or heroin (C type).

Almost three-quarters (73 %) of all last month polydrug-using school students mentioned the use of both alcohol and cigarettes, but no use of an illicit drug (see Table 2). One-fifth reported the use of cannabis and alcohol and/or cigarettes, and 3.5 % reported, in addition, the use of ecstasy, cocaine, amphetamines, LSD or heroin. As expected, the proportion of those using illicit drugs (B and C types) among polydrug users is much larger in the country cluster of high prevalence of drug use (39.5 %) than in the medium (21.1 %) and low (9.4 %) prevalence clusters. Some gender differences can be detected in the patterns of polydrug use among school students. While among those reporting type A polydrug use girls slightly outnumber boys, boys are overrepresented among type C polydrug users.

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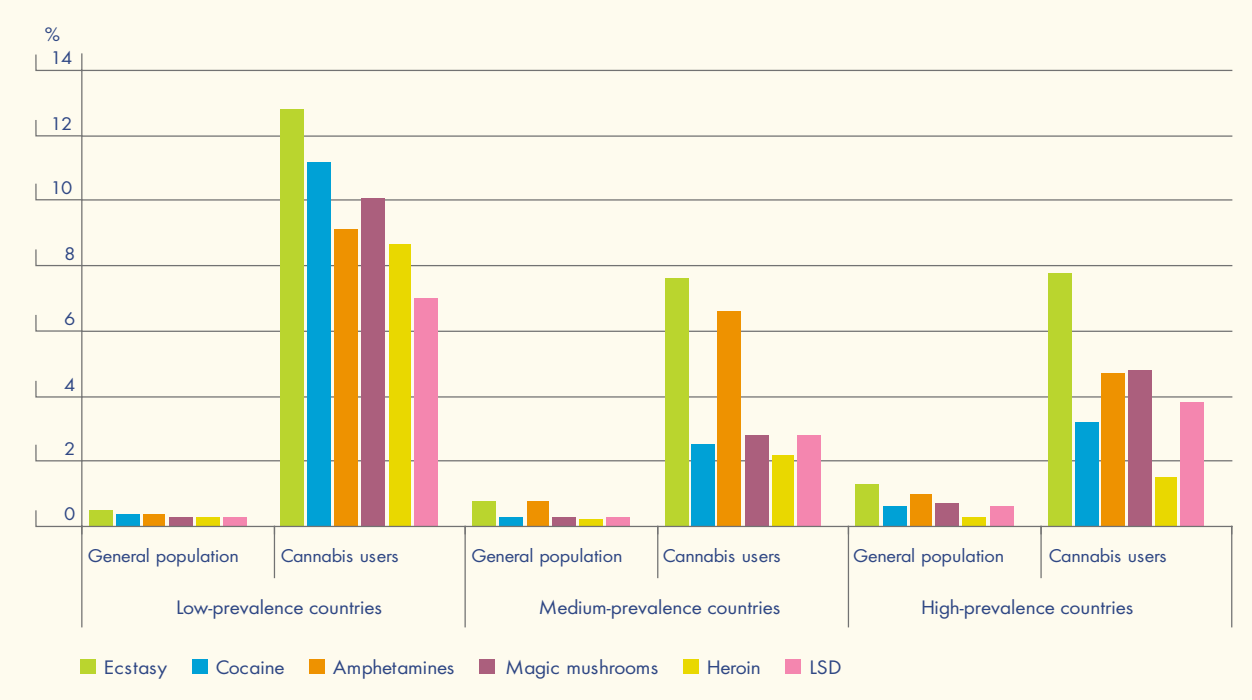
Table 2: Type of substance combinations among 15- to 16-year-old school students who reported last month polydrug use, in each of the clusters of low-, medium- and high-prevalence countries

Country group	Type A (%)	Type B (%)	Type C (%)	Other (%)	*n*
Low-prevalence	85.3	7.5	1.9	5.3	5 758
Medium-prevalence	76.3	17.9	3.2	2.6	8 496
High-prevalence	57.5	34.4	5.1	3.0	7 522
All countries	73.0	20.0	3.5	3.5	21 776

NB: Typology of polydrug use: type A, alcohol and cigarettes; type B, cannabis in addition to alcohol and/or cigarettes; type C, type B plus at least one of the following: ecstasy, cocaine, amphetamines, LSD or heroin.
Data for 19 EU Member States together with Norway, Croatia and Turkey (*n* = 76 541).
Source: ESPAD 2003.

School students who reported using cannabis in the last month rarely reported using other illicit substances during that time. This may be expected, as first use of illicit substances other than cannabis generally occurs at a later age. However, among those who reported using cocaine, use of other illicit drugs was much higher. This finding should be interpreted with caution given the low number of cocaine users in this age group, but it points to the existence of a small segment of the school population already engaged in high-risk behaviour. The prevalence of binge drinking among school students who have used cocaine reached 94 % in some countries, a figure that raises concern in view of the health risk to the individuals who combine cocaine use with binge drinking (Leccese et al., 2000).

Figure 1: Use of selected illicit drugs during the last month among cannabis users and among all 15- to 16-year-old school students in the clusters of low-, medium- and high-prevalence countries



NB: Data for 19 EU Member States together with Norway, Croatia and Turkey.
Source: ESPAD 2003.

The overall proportion of school students using at least two illicit drugs is low but, as expected, is greater in the high-prevalence countries compared to the others. However, pairwise associations between the use of two different illicit drugs show another important aspect of the phenomenon (Table 3) — cannabis and cocaine users in countries with low overall prevalence levels of drug use have a higher risk of taking other illicit drugs, in comparison with the general student population, than their counterparts in high-prevalence countries. This reflects the normalisation ([3]) of cannabis use in high-prevalence countries and the fact that the use of illicit substances, including cannabis, in low-prevalence countries is more frequently associated with deviant behaviours. In high-prevalence countries, cannabis users reported levels of use for other illicit drugs that were around five times those in the general school population of 15- to 16-year-olds, while in low-prevalence countries the ratio was about twenty times (Figure 1). In low-prevalence countries, cocaine users were more than 100 times more likely to use illicit drugs other than cannabis than were students in the school population as a whole.

An association between the use of licit and illicit substances is illustrated by the fact that students who used cannabis had prevalence estimates for cigarette smoking that were between two and three times higher than in the general school student population; and the pattern hardly varied between low, medium and high-prevalence countries. It is also worth noting that, in general, school students who reported binge drinking or smoking cigarettes were around twice as likely to smoke cannabis as students in the general school population.

Table 3: Last month use of other illicit drugs among cannabis and cocaine users, and comparison (rate ratios) with all 15- to 16-year-old school students in each of the clusters of low-, medium- and high-prevalence countries

Cannabis users	Average prevalence of use (all countries) (%)	Rate ratio ([1])		
		Low-prevalence countries (*n* = 562)	Medium-prevalence countries (*n* = 1 795)	High-prevalence countries (*n* = 2 982)
Ecstasy **	9.4	25.6	9.5	6.0
Cocaine **	5.6	28.0	8.3	5.3
Hallucinogenic mushrooms	5.9	33.6	9.3	6.9
Amphetamines **	6.8	22.8	8.3	4.7
Heroin *	4.1	29.0	11.0	5.0
LSD	4.2	23.3	9.3	6.3
Cocaine users	**Average prevalence of use (all countries) (%)**	**Low-prevalence countries (*n* = 103)**	**Medium-prevalence countries (*n* = 66)**	**High-prevalence countries (*n* = 109)**
Cannabis **	65.1	25.6	8.8	5.1
Ecstasy **	53.6	136.6	51.9	39.2
Hallucinogenic mushrooms **	35.3	195.7	70.7	37.0
Amphetamines **	35.6	139.8	37.9	20.7
Heroin *	40.7	220.0	177.0	69.0
LSD **	35.0	190.0	92.3	34.0

([1]) Rate ratio: relationship between prevalence in two population groups (cannabis or cocaine users compared to the general population as the reference category) expressed as the quotient of one divided by the other. A rate ratio of 25 means that a cannabis (or cocaine) user is 25 times more likely to have used a given substance than a member of the general school population in a given cluster.

NB: Data for 19 EU Member States together with Norway, Croatia and Turkey (*n* = 76 541).
Statistically significant differences in rate ratios between low-, medium- and high-prevalence countries are denoted by asterisks: * $P < 0.001$, ** $P < 0.0005$.

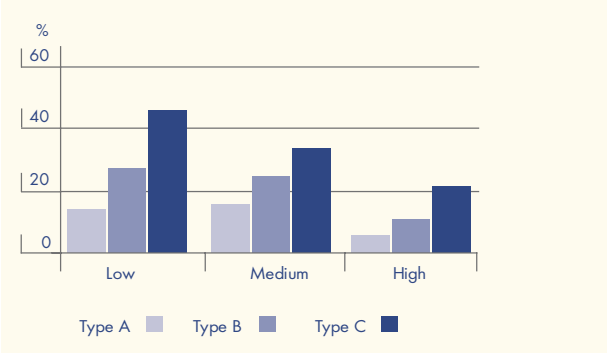
Source: ESPAD 2003.

([3]) A situation in which 'mainstream youth culture assimilated and legitimated recreational drug use' (Parker et al., 1998, p. 151).

Social factors associated with polydrug use

Three social factors (lack of parental control, truancy from school and perceived family affluence) were explored for their association with type C polydrug use (which includes the use of cannabis and at least one other illicit drug) and for differences between country clusters. Between 22 % and 32 % of type C polydrug users in all the countries reported that their parents usually did not know where they were in the evenings; but the strongest association was found in low-prevalence countries. The same could be observed with regard to school truancy (skipping school three or more times during the last month); almost half of the type C polydrug users in low-prevalence countries truanted from school, compared to only one-fifth in the high-prevalence countries (Figure 2). In terms of family affluence, type C polydrug users in high-prevalence countries are more similar to the general school population than are type C polydrug users in the other clusters, illustrating again that drug use has been normalised in high-prevalence countries.

Figure 2: Proportion of polydrug users truanting from school (three or more times in the last month) by type of substance combinations and clusters of low-, medium- and high-prevalence countries



NB: Typology of polydrug use: type A, alcohol and cigarettes; type B, cannabis in addition to alcohol and/or cigarettes; type C, type B plus at least one of the following: ecstasy, cocaine, amphetamines, LSD or heroin.

Source: ESPAD 2003.

Polydrug use among young adults

While polydrug use among adolescents can be an indicator of early initiation, risk behaviours or deviance, polydrug use among young adults can be symptomatic of more established patterns of multiple substance use, potentially carrying long-term health problems and acute risk during leisure time. Polydrug use among problem drug users — those showing frequent and often long-term use of the most harmful illicit substances — is specifically addressed elsewhere in this report.

Data on young adults (15–34 years) has been drawn from general population surveys conducted between 2005 and 2008 in nine EU Member States. Full access to individual data was not possible, therefore data analysis was based on conditional associations between the use of different substances. This allowed us to explore if the use of one substance by an individual increased the likelihood of using another one. The sample sizes of young adults in the surveys ranged from 1 753 to over 10 000 individuals, and because there was relatively little data for last month drug users the analysis was extended to those reporting having used drugs during the last year.

Alcohol use and cigarette smoking, followed by cannabis use, were the most prevalent forms of substance use consistently reported by young adults in all countries. However, there were wide variations among the nine reporting countries: the prevalence of cannabis use in the last year ranged from 3.6 % to 20.9 % and last year cocaine use ranged from 0.9 % to 5.1 % (Table 4).

Among young adults (aged 15 to 34), frequent or heavy alcohol users were, in general, between two and six times more likely to report the use of cannabis compared to the general population and between two and nine times more likely to use cocaine. The strongest associations between heavy alcohol and illicit drug use were found in the countries with the lowest prevalence of heavy alcohol use (Cyprus, France, Italy, Portugal), and the weakest associations in those countries where frequent or heavy alcohol use is more widespread, such as Ireland and the United Kingdom (England and Wales). In France, the prevalence of cocaine use among frequent or heavy alcohol drinkers was 8 %, compared with just over 1 % in the general population, and in Italy the corresponding figures were 27 % and 3 % (Figure 3).

Most cannabis users did not report the use of other illicit drugs, but they were nevertheless more likely to do so than the general population (Figure 4). The prevalence of last year use of other illicit drugs among cannabis users varied between 4 % (Italy) and 35 % (Cyprus) for ecstasy; between 1 % (France) and 17 % (Denmark) for amphetamines; and between 6 % (France) and more than 20 % (Cyprus, Ireland, Spain and the United Kingdom) for cocaine. Overall, cannabis users were between 4 and 25 times more likely to report the use of cocaine than were the general population. The strongest associations between the use of cannabis and cocaine were found in four countries with relatively low cannabis use prevalence (Cyprus, Germany, Ireland, Portugal).

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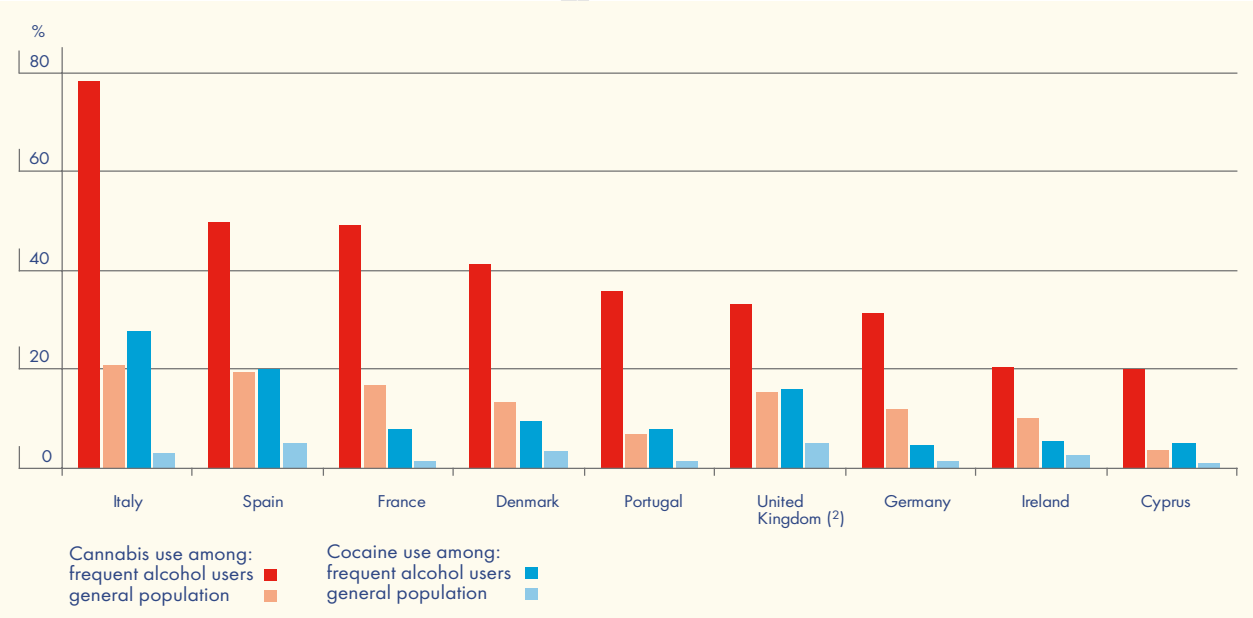
Table 4: Prevalence of frequent or heavy alcohol use and last year prevalence of cannabis and cocaine use among young adults (15–34)

Country	Survey date	Frequent or heavy alcohol (1) (%)	Cannabis (%)	Cocaine (%)	Sample size
Ireland	2006/07	30.3	10.4	2.9	1 989
Denmark	2008	18.6	13.3	3.4	1 744
United Kingdom (2)	2007/08	9.9	15.4	5	7 176
Germany	2006	9.2	12	1.5	3 306
Spain	2007/08	7.6	19.6	5.1	9 443
Cyprus	2006	5.9	3.6	0.9	1 753
France	2005	5.3	16.7	1.2	10 855
Portugal	2007	2	6.7	1.2	4 765
Italy	2007	1.8	20.9	3.1	4 243

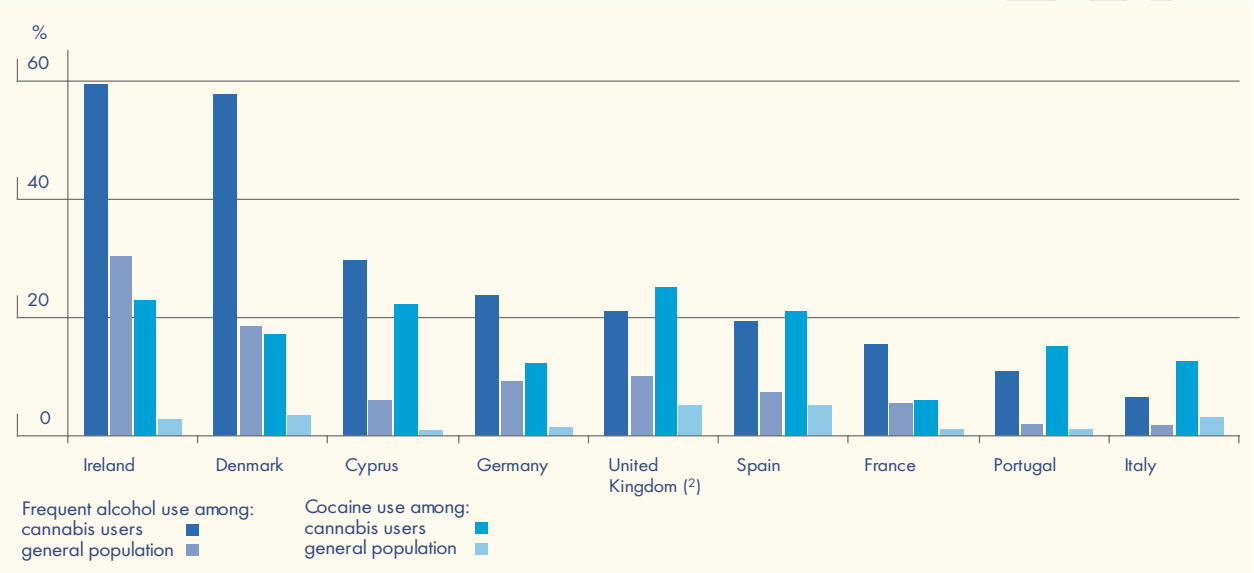
(1) Defined by the EMCDDA as drinking six glasses or more of an alcoholic drink on the same occasion at least once a week during the past 12 months. The United Kingdom and Spain use other definitions, and comparisons should therefore be made with caution.
(2) England and Wales, the age range is 16–30.
Source: National experts for general population surveys of participating countries.

Figure 3: Frequent or heavy alcohol users (1) — use of cannabis and cocaine during the last 12 months compared to the general population of 15- to 34-year-olds



(1) Defined by the EMCDDA as drinking six glasses or more of an alcoholic drink on the same occasion at least once a week during the past 12 months. The United Kingdom and Spain use other definitions, and comparisons should therefore be made with caution.
(2) England and Wales, the age range is 16–30.
Source: National experts for general population surveys of participating countries.

Figure 4: Cannabis users — frequent or heavy alcohol use ([1]) and cocaine use during the last year compared to the general population of 15- to 34-year-olds



([1]) Defined by the EMCDDA as drinking six glasses or more of an alcoholic drink on the same occasion at least once a week during the past 12 months. The United Kingdom and Spain use other definitions, and comparisons should therefore be made with caution.
([2]) England and Wales, the age range is 16–30.
Source: National experts for general population surveys of participating countries.

Many of the young adults who reported using cocaine in the last year also reported using other drugs during same period. The prevalence of use of other drugs was much higher among cocaine users than among cannabis users, although caution is required when interpreting data from countries with relatively small numbers of users. In all countries, the majority of cocaine users (67–89 %) have also used cannabis. Cocaine users also reported higher levels of use of other stimulants (amphetamines and ecstasy) compared to cannabis users, but with important country differences. For example, more than 60 % of young adults reporting last year cocaine use in Denmark and Germany also reported use of amphetamine; use of ecstasy was reported by more than 50 % of young cocaine users in Cyprus, Ireland and the United Kingdom (England and Wales); while not more than 31 % of young cocaine users in Italy and Portugal reported the use of either of these two substances ([4]). Cocaine users also reported high levels of frequent or heavy drinking (14–58 %). And, although the lowest levels of frequent or heavy drinking among cocaine users were reported for Italy and Portugal, these levels are particularly high when compared with the general population of these two countries, where only 2 % reported frequent or heavy drinking. In Ireland, the prevalence of this form of alcohol use among cocaine users was only twice that among the general population (30 %).

Polydrug use in recreational settings

Young people are exposed to a dynamic and expanding drugs market, with an increasing range of (licit and illicit) psychoactive substances or products being made easily and cheaply available. The expansion of the leisure and alcohol industry into areas of youth culture has also meant that, in many European countries, there is now a critical mass of potential polydrug users who regularly gather in large numbers at music clubs and other nightlife settings (Calafat et al., 2003; Bellis et al., 2002). New technologies have also facilitated communication about drugs, their effects, where and how to get them, within and between social networks.

Polydrug use often takes place in the context of recreational activities, with population surveys confirming that drug use is associated with visiting bars and nightclubs. Studies conducted in targeted nightlife settings during the past

([4]) See Table A1 in the online annex.

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decade in several Member States have found comparatively high levels of drug use.

Studies conducted in recreational settings in 2007 are available from five countries (Belgium, Czech Republic, Latvia, Lithuania, Austria). Lifetime prevalence estimates in these studies ranged from 15 % to 71 % for ecstasy use and from 17 % to 68 % for amphetamine use. The Czech Republic also reported recently a rise in the acceptability and attractiveness of cocaine and ecstasy use.

A study conducted in 2006 among a sample of 1 383 young people in nightlife settings in nine European cities (Athens, Berlin, Brno, Lisbon, Liverpool, Ljubljana, Palma, Venice, Vienna) found that the frequent use of individual drugs varies between cities and appears to reflect the prevalence levels among the general population and the availability of the substances. Tobacco (48 %), alcohol (11 %) and cannabis (9 %) were overall the substances most commonly used on a regular basis (five or more days a week); fewer than 1 % of respondents reported regular use of other substances. However, the study identified the existence of a very small group of drug users who consumed drugs in an extremely intensive manner. It also found that concomitant alcohol use was common, with 34 % of those interviewed reported having been drunk more than twice during the four weeks before the interview. Drunkenness is likely to increase the risk of making ill-considered decisions about drug taking, and was more commonly reported by males than females: 42 % and 27 % respectively (European Commission, 2007).

Two recently conducted studies in recreational settings were reported by Belgium. The first one, in the Flemish Community, surveyed over 2 000 people in three clubs during different events held in 2003, 2005 and 2007. The study found that almost half of those who reported the use of an illicit drug during the last year stated that they regularly combined alcohol and an illicit drug, and one in four drug users regularly combined different illicit drugs. Cannabis and cocaine were used both before and after going out. The second study, in the French Community, surveyed 2 444 individuals during music festivals in 2007 and found that 68 % of respondents used at least one psychoactive substance during such an event (tobacco not included). Some 38 % used only one substance, while 18 % used two substances and 12 % used three or more during the event. Among those who had used alcohol or drugs during the event (n = 1 649), the most common combination was alcohol and cannabis (19 %). Ecstasy users took an average of three other products (n = 165) and cocaine users an average of four other products (n = 86).

In the context of recreational drug taking, polydrug use can be time-limited and linked to a specific social situation or location. For example, one finding from a 2002 drugs survey conducted among 868 tourists at Ibiza airport is that those who were already using drugs in the United Kingdom had a significantly higher frequency of use during the holiday period. Some 6.7 % reported using ecstasy for five nights or more while in the United Kingdom, compared with 36.9 % while in Ibiza; on average consumers used at least two illicit drugs during the holiday (for example, 46 % of ecstasy users also used cocaine) as well as alcohol (Bellis et al., 2003). Furthermore, some individuals who had never used illicit drugs at home started using while on holiday in Ibiza. An EMCDDA 'Selected issue' on recreational drug use reported that Swedish research found that 23 % of the young people surveyed had tried illicit drugs for the first time while abroad, and in Spain recreational drug use was reported to be highest among concentrations of young people on the Mediterranean coast where there are many tourists (EMCDDA, 2006). Evidence suggests that during short holiday periods and weekends, young people are particularly liable to indulge in drug-related activities that put them at risk, which highlights the need for specifically targeted prevention and harm-reduction responses that take into account the context in which polydrug use occurs (Bellis et al., 2003).

Responses to polydrug use among adolescents and young adults

Data, both for adolescents and young adults, suggest that there is, in all countries, a limited group of people that consume multiple licit and illicit drugs, sometimes with a high frequency of use. Among adolescents, the use of several substances, including at least two illicit drugs, appears to be generally correlated with truancy and family risk factors. However, in countries where prevalence of drug use is highest, this correlation is weaker because non-vulnerable adolescents are also likely to use drugs such as cannabis. In these countries, a large number of non-vulnerable and lower-risk substance users may contribute to a greater share of health problems than the smaller number of vulnerable drug users who are individually at much greater risk. This is known as the 'prevention paradox' (Spurling and Vinson, 2005). In these countries, prevention strategies should address the norms and behaviours of non-vulnerable substance users, while also including selective measures targeting the most vulnerable and at-risk ones. In contrast, in countries where prevalence of alcohol and drug use is low, a larger proportion of health and social problems may occur among vulnerable or marginalised people consuming drugs, and these can be reached with selective and indicated prevention interventions.

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Responses to widespread use of alcohol, cigarettes and cannabis use among young Europeans: environmental approaches

There is evidence that alcohol and tobacco policies that target the market environment, such as pricing, taxation, regulating locations for sale and consumption of alcohol, including happy hour restrictions, have an impact on the use of these substances and the related health consequences (Toumbourou et al., 2007). Prevention strategies can also attempt to alter the cultural, social and physical environments in which people make their choices about drug use. The environmental approach acknowledges that individuals are influenced by a complex set of factors, such as social norms, regulations, mass media messages and accessibility of alcohol, tobacco or illicit drugs. Within this framework, tobacco and alcohol (and more recently cannabis) are viewed as industrial epidemics (Jahiel and Babor, 2007) that require modification of the social norms and market regulation.

Current developments in environmental strategies include the introduction of full smoking bans in all public places and workplaces (including restaurants and bars) by 12 EU Member States. Belgium, Spain, Denmark, Germany and Portugal have also introduced partial smoking bans. Other interventions include proposals for a code of conduct for alcohol advertising; integration of roadside drug screening alongside drink driving tests; and EU-wide indexation of existing minimum excise duties on alcohol. These strategies may have a knock-on effect on cannabis consumption and other illicit drug use. For example, studies have suggested that cannabis use may perpetuate cigarette smoking (Amos et al., 2003), and it is possible that tobacco policies and EU-wide tobacco advertising bans have influenced the prevalence of cannabis use as well as that of cigarette smoking. A study by Farrelly et al. (2001) also suggests that increases in cigarette taxation can reduce the intensity of cannabis use and may have a modest effect on the probability of use among males. Smoking bans and tax increases tend, however, to show direct effects on adults and indirect effects — possibly mediated through social norms — on adolescents (Aspect Consortium, 2004).

Structural national prevention measures targeting the availability of cannabis are rare. However, the Dutch government has now ruled that, in addition to other existing regulatory measures, coffee shops should not be located in the immediate vicinity of schools, and this could lead to a reduction in the overall number of retail outlets. Public smoking of cannabis has also become subject to a fine in the city of Amsterdam.

Perceptions of cannabis, particularly those of adolescents, are modulated more by personal experiences, observation of others and beliefs than by receiving objective information about the risks related to cannabis use (Springer et al., 1996). Normative beliefs are considered particularly important for young people who use cannabis, as they tend to view the prevalence of use among their immediate peers as being 'normal', and may thereby overestimate the overall prevalence of cannabis use in the population (Page and Roland, 2004). Some Member States have reported attempts to reverse the social perception of cannabis use as being a 'normal' behaviour, and to correct misconceptions that a majority of young people use drugs (EMCDDA, 2004). Cannabis use is also associated with specific youth subcultures, and some prevention programmes focus on deconstructing or neutralising certain 'market images' of cannabis, but these programmes still need to be evaluated for their effectiveness.

Environmental approaches in schools can take the form of structural and regulatory policies and practices — school rules. And, these measures may have an impact on preventing or delaying licit and illicit substance use (Hawks et al., 2002). The majority of Member States report that most of their schools have drug and alcohol polices that define procedures and rules about use and possession of licit and illicit substances in and around the school premises.

Prevention responses targeting vulnerable young people

Selective prevention usually targets vulnerable groups who share common socio-demographics and intervention needs, which are mostly related to social exclusion and increase the risk of developing problem drug use. Prevention strategies that specifically target polydrug use among the most socially vulnerable populations, especially those with social or academic problems, and young people who live in disadvantaged families or neighbourhoods where multiple risk factors are concentrated, are described in the 'Selected issue', *Drugs and vulnerable groups of young people* (EMCDDA, 2008b).

Indicated prevention focuses on diagnosed persons with an individually attributable vulnerability that increases their propensity to develop drug problems. Fast trajectories into problem drug use due to individual vulnerability factors, such as sensation seeking, impulsivity, aggressiveness and mental health problems, are extensively discussed, along with the corresponding prevention interventions, in a recent EMCDDA 'Thematic paper' on indicated prevention (EMCDDA, 2009b). As both selective and indicated prevention strategies target underlying vulnerability at social

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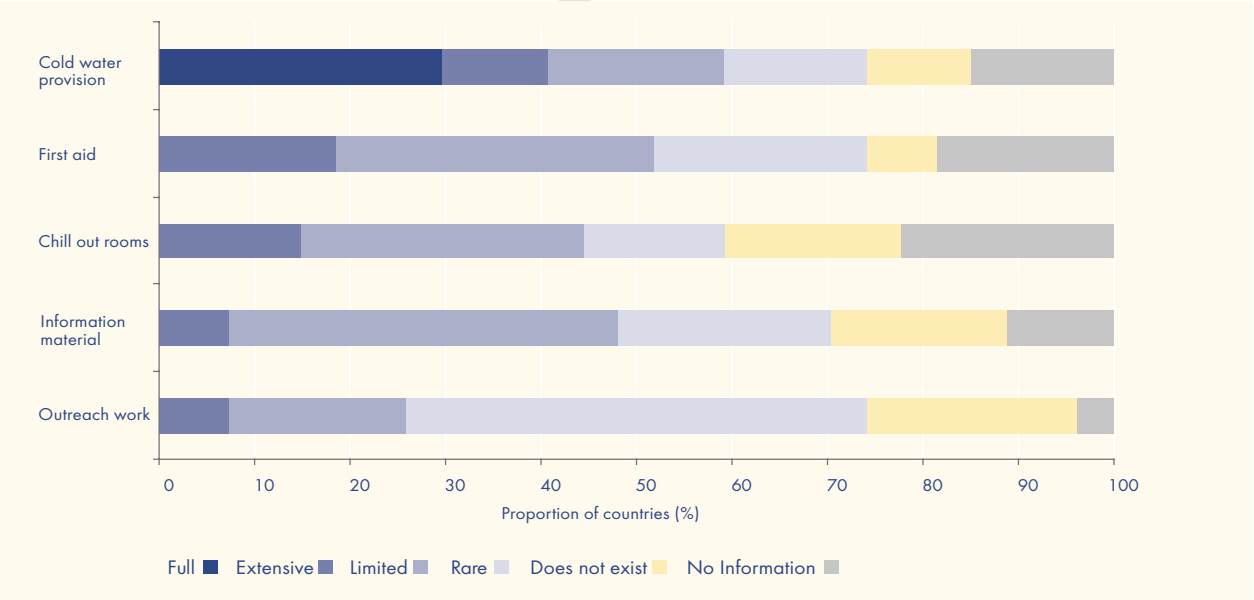
(selective prevention) or individual (indicated prevention) level, rather than the use of specific drugs, they are suitable for addressing polydrug use.

Responses targeted at drug users in recreational settings

The high prevalence of polydrug use found in certain recreational settings, such as clubs, festivals or raves, identifies them as important environments for implementing prevention and harm-reduction measures. The responses to drug use in these settings that are most frequently reported by EU Member States are targeted information campaigns, which often rely on the dissemination of information through flyers, booklets and the Internet. These materials are usually designed to reflect youth culture and are distributed through outreach mobile prevention teams. They aim to raise awareness of the potential health risks associated with commonly consumed substances, including alcohol, as well as the consequences of mixing substances. The Belgian Partywise website, for example, allows users to select two substances and read about the potential health consequences of using them in combination ([5]).

Guidelines for club owners about minimum health and safety standards in recreational settings, such as the 'Safer dancing' guidelines in the United Kingdom, are another intervention developed to prevent the acute health risks that are associated with the single or combined use of licit and illicit substances. While 12 countries now report that such guidelines have been developed for nightlife venues, only the Netherlands, Slovenia, Sweden and the United Kingdom report that they are monitored and enforced. The guidelines generally include measures such as overcrowding control, provision of free and accessible water, immediate availability of first aid by trained staff, chill-out rooms or provision of information material on the prevention and reduction of harm associated with drugs usually consumed in nightclubs. In a recent EMCDDA survey, national experts from most reporting EU Member States reported that these measures were available in fewer than half of the nightclubs with sufficiently large target populations for the intervention to be implemented (Figure 5). Worryingly, several national experts reported that free accessible water is rarely or not available in nightclubs. The purchase of alcoholic drinks might then be favoured over the purchase of water and this might increase the risk of negative health consequences.

Figure 5: Availability of measures to reduce substance-related health risks and improve the overall safety of partygoers in nightclubs



NB: Availability is defined by the provision of the specified measure in nightclubs with sufficiently large target populations for the intervention to be implemented: nearly all (full); the majority, but not nearly all (extensive); more than a few, but not the majority (limited); only a few (rare); not available. Information was collected by means of a structured questionnaire.

Sources: Reitox national focal points.

([5]) http://www.partywise.be/page2.htm

Other strategies attempt to alter the social, economic and physical environment associated with alcohol and drug consumption. The aims of these strategies include modifying consumption behaviours and norms, creating conditions less favourable to intoxication and injuries, and reducing the opportunities for substance-related problems to occur ([6]).

Measures reported by Member States that take place in or around nightlife settings include: training for bar and security staff, for example, to refuse entrance to intoxicated or aggressive customers; enforcement of existing drug and alcohol legislation; distribution of leaflets and posters to raise awareness of substance-related harms; provision of late-night transport services; provision of lighting and ventilation suitable for a safe nightlife environment. The implementation of such measures is often based upon dialogue and partnership between different stakeholders, such as the police, licensing authorities, club owners and healthcare providers.

Strategies that address the environment in which young people consume drugs and alcohol appear to have considerable potential for safeguarding public health and improving public safety, with benefits that can extend into the wider community (Bellis et al., 2002; World Health Organization, 1997). However, full implementation tends to be limited to particular, known problem areas and to a few Member States. In addition, acknowledgment that alcohol is a main contributor to substance-related harm in recreational settings is often limited and, in most Member States, responses to illicit drugs are addressed separately from alcohol. Non-governmental organisations working in prevention and harm reduction in recreational settings have little or no influence on environmental alcohol policies. For all these reasons, there is considerable potential for improving the responses to polydrug use in nightlife settings.

Polydrug use and its health consequences among problem drug users

Problem drug users ([7]), those practising the more intensive and damaging forms of drug use, often suffer from underlying health problems, which can increase their susceptibility to the harmful effects of combining drugs. Furthermore, some of the drug combinations commonly taken by problem drug users are associated with particularly elevated risks. These risks and health consequences are examined below, with particular attention to clients in opioid substitution treatment, among whom polydrug use levels are very high, and are connected with severe adverse health and psychosocial consequences.

Acute health problems and drug-induced deaths related to polydrug use

Interactions between different drugs consumed close together in time can lead to increased toxicity. This can occur due to additive or potentialising effects, pharmacokinetic factors (e.g. reduced metabolism leading to higher blood concentrations), or to other interactions, such as the production of a new metabolite derived from the drugs or their breakdown products. The effects of certain psychoactive substances can also lead to increased risk behaviour with another substance. For instance, alcohol intoxication can reduce the capacity to judge the amount of opioids consumed or reduce awareness of the loss of tolerance to opioids that is likely to occur after discharge from treatment or release from prison. The co-use of several substances can also increase the risk of negative outcomes, such as accidents or injuries. Research has also shown that the added effects of multiple substance use can increase considerably the risk of road accidents, even with relatively low levels of intoxication (EMCDDA, 2007).

Hospital emergency services report that polydrug intoxications, with alcohol playing a key role, represent a significant proportion of medical emergencies (Sopenã et al., 2008). Cardiologists also report that cocaine users typically consume other toxic substances (including tobacco), resulting in greater diagnostic difficulties. It is suggested that cocaine use be considered when young adults present with chest pain (Guiraudet et al., 2001).

The true numbers of drug-induced deaths ([8]) in Europe, as well as the extent to which these are caused by the consumption of more than one substance, is likely to be underestimated for a number of reasons. Therefore, a pilot study was carried out to explore the feasibility of collecting further information on the substances involved in the drug-induced deaths reported to the EMCDDA, drawing on general and special mortality registries. Nine countries ([9]) reported more than 6 900 deaths (two-thirds of which were in

([6]) http://www.emcdda.europa.eu/themes/prevention/environmental-strategies
([7]) The EMCDDA defines 'problem drug use' as 'injecting drug use or long-duration/regular use of opioids, cocaine and/or amphetamines'.
([8]) Also known as overdose deaths or poisonings. For more information on the EMCDDA drug-related deaths protocol and definitions see http://www.emcdda.europa.eu/themes/key-indicators/drd.
([9]) Czech Republic, Denmark, Germany, Latvia, Malta, Netherlands, Austria, Portugal, United Kingdom.

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the United Kingdom) that had occurred between 2002 and 2005. The reporting countries generally used the sources of information and case definitions recommended by the EMCDDA ([10]). The substances searched for and reported included opioids, cocaine, amphetamines, hallucinogens, cannabis, volatile substances, psychoactive medicines and alcohol. Some countries also reported that certain substances were less likely to be searched for or reported (e.g. cannabis).

The results of this feasibility study are in line with the data collected through the EMCDDA drug-related death indicator and show that the vast majority of reported drug-induced deaths are related to opioids. At least one opioid was found in the post mortem toxicology of three-quarter of all cases (77 %), followed by cocaine which was found in one-fifth of cases (21 %), and amphetamines (7 %).

The pilot study provided preliminary evidence of the high proportion of drug-induced deaths in which more than one psychoactive substance was detected. Overall, an opioid was detected as the sole substance in 18 % of the deaths, and together with alcohol in an additional 13 %. Cocaine was detected as the sole substance in 3 % of the deaths, and in combination with opioids in a further 8 %. Other combinations of drugs, most of which included opioids, were found in the remaining deaths.

Methadone was detected in about one-fifth (19 %) of the drug-induced deaths examined. Of these, it was mentioned as the sole drug in only 12 % of cases in combination with alcohol in a further 8 % and with another opioid in another 10 %. In the remaining cases, methadone was associated with other psychoactive substances.

Although these are preliminary results and there are some methodological limitations, the data from this feasibility study confirm that opioid use constitutes, by far, the most frequent background against which drug-induced deaths occur. These deaths are frequently related to combinations of substances, and only a minority of cases are related to one substance only. This might reflect the prevalence of polydrug use among drug users, as well as the increased risk of overdose and adverse effects when substances are combined.

As some substances may not have been identified or reported, the involvement of drug combinations in the deaths examined in the feasibility study may be underestimated. The presence of alcohol and psychoactive medicines could not be measured fully with the data collected, but figures are thought to be very high. The EMCDDA is developing the monitoring of polydrug use and particularly wants to improve measurement of the fraction of drug-induced deaths in which alcohol and psychoactive medicines, particularly benzodiazepines, played a role. Polydrug use, particularly its fatal consequences, should be explored further to inform public health interventions.

In addition to drug-induced deaths, non-fatal overdoses constitute a major public health problem, which can be aggravated by polydrug use. Studies suggest that among heroin users the most common cause of non-fatal overdose, besides taking a higher dose and taking heroin with increased purity levels, is using alcohol at the same time as heroin (Gossop et al., 1996).

Chronic risks and problems linked to ongoing polydrug use

Longitudinal cohort studies that follow problem drug users in Europe (e.g. opioid or cocaine users, or injectors) over long periods of time show a very high mortality rate, compared to the general population, due to causes such as overdoses, diseases and violence (Bargagli et al., 2005; Clausen et al., 2009). These studies include mainly opioid users, most of whom are polydrug users (including tobacco and alcohol) and present other social and personal risk factors. Overdose deaths will often be the result of, or occur against a background of, polydrug use, combined with the effects of chronic alcohol use (e.g. hepatic disease) or tobacco use (respiratory diseases). Other diseases leading to increased mortality can be influenced by chronic combined use of alcohol, tobacco, cocaine and other substances (Cruts et al., 2008). Overall, continued use of several substances can lead to longer-term toxicities in various organs or body systems (e.g. liver, cardiovascular, neurological).

Another dimension of chronic health damage, related to the use of different substances, is the aggravating effect of heavy alcohol use in the prognosis of liver disease due to chronic hepatitis C infection acquired through previous drug injection ([11]). Studies also report a very high prevalence of tobacco smoking among cases of cocaine-associated myocardial infarction, which could suggest that tobacco use constitutes a favourable background for these accidents (Baumann et al., 2000; Hollander et al., 1995).

([10]) See the 2009 statistical bulletin for the definitions of 'drug-related death' by which EU Member States report to the EMCDDA. In the Netherlands, deaths of known problem drug users are generally not forensically examined.
([11]) See 'Drug combinations: effects and consequences', p. 20.

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Drug combinations: effects and consequences

The specific risks associated with particular drug combinations can only be described in outline, as they are also influenced by characteristics of the user, such as the existence of tolerance, health status or genetic or phenotypic factors. Impaired liver functioning may, for instance, lead to higher blood concentrations, thereby causing increased toxic effects. The quantity and purity of the drugs used and the route of administration are other key variables that have an impact on the effects of drug combinations. Intravenous drug use will also lead to higher blood concentrations.

Despite these limitations, it is possible to list the better-documented effects and consequences of some of the common drug combinations, including those associated with high risks and severe health problems.

Alcohol: a cross-cutting issue in polydrug problems

Alcohol is present in most polydrug use combinations. Alcohol intoxication may lead to misjudgements regarding the use of other substances, including the amounts used. Concomitant alcohol use can also produce changes in the pharmacokinetics of other substances. Long-term, heavy use of alcohol is likely to cause severe liver damage, which often impairs the metabolism of other substances and can make it dangerous to consume amounts that would otherwise be tolerated.

Cocaine and alcohol

Alcohol can increase the levels of cocaine in the blood by about 30 %. It also enables the production of a psychoactive cocaine metabolite (cocaethylene) with a longer duration in the blood. The combination of these two substances also increases heart rate and blood pressure, which could lead to a higher risk of cardiovascular problems. In addition, cocaine use may facilitate increased alcohol consumption by decreasing the perception of alcohol intoxication effects. Violent behaviour and suicidal ideation have also been associated with the concomitant use of these two substances.

Opioids and cocaine

Opioids depress the central nervous system and cocaine stimulates it. The negative cardiovascular effects of cocaine are amplified when it is co-administered with opioids. Animal studies also indicate that cocaine, as well as opioids, can induce respiratory depression, which could increase overdose risk. In addition, cocaine can initially mask the sedative effects of opioids, thereby increasing the risk of a later overdose.

Opioids and benzodiazepines, with or without alcohol

Opioids, benzodiazepines and alcohol are all depressants of the central nervous system. Their concomitant use can lead to marked respiratory depression resulting in a high risk of fatal and non-fatal overdoses. Older drug users may also face delayed metabolism of benzodiazepines and there is an increased danger of respiratory depression when used with methadone.

Polydrug use among drug users entering drug treatment

Drug users entering treatment can be considered as indirect indicators of the profiles and trends in the wider population of problem drug users. However, it must be noted that the data presented here do not reflect the profile of all clients in treatment, but only of those starting drug treatment.

An ad hoc data collection and analysis was carried out in 14 European countries ([12]) with the objective of better understanding the prevalence and patterns of polydrug use among those entering drug treatment. The analysis was based on primary and secondary drugs, which were reported by clients only if they caused problems (according to the client or following a short diagnosis by a doctor) and had been used during the month before entering treatment. Alcohol was only recorded as a secondary substance in the framework of illicit drug treatment. Some methodological limitations, such as country differences in the methods of recording multiple drug use, must also be considered when interpreting the data.

The data covered 262 477 clients who entered treatment in 2006, with numbers in individual countries ranging from 483 clients in Cyprus to 100 267 in England. Approximately 50 % of all clients entered drug treatment for the first time in their life. The main primary drugs reported were heroin (47 %), cocaine (20 %), cannabis (19 %) and stimulants other than cocaine (4 %). The proportions are slightly different among the subgroup of those entering treatment for the first time, with heroin accounting for 36 % of new clients,

([12]) Czech Republic, Denmark, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Netherlands, Romania, Finland, Sweden, United Kingdom (England).

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cocaine for 28 %, cannabis for 26 % and stimulants other than cocaine for 5 %. There were also considerable differences between countries in the distribution of primary drugs ([13]) (EMCDDA, 2009a).

More than half of the clients (57 %) reported at least one problematic drug in addition to the primary substance for which they had entered treatment. These clients can be regarded as polydrug users. Overall, 33 % of all clients reported one secondary drug, 20 % reported two, and a much smaller proportion reported three or more secondary drugs. The proportion of treatment clients reporting polydrug use varied between countries, from 13 % in Romania to 86 % in Finland ([14]). Among new clients, the figures ranged from 40 % in France to 81 % in Finland ([15]).

The highest proportion of polydrug users was recorded among crack clients and among those entering treatment for the use of stimulants other than cocaine, but both of these groups were numerically small. The lowest proportion of polydrug users was found among primary cannabis clients. For all drugs with the exception of heroin, polydrug users composed a higher proportion of clients entering treatment for the first time than of all clients entering treatment. This might suggest a recent increase in multiple substance use among problem drug users.

Overall, around 60 % of clients reporting heroin, cocaine or other stimulants as their primary drug also reported a secondary drug. The proportion of polydrug users was smaller among cannabis users (43 %) and higher among crack users (69 %). These figures varied greatly between countries. In Romania, only 1.4 % of primary heroin users reported a secondary substance, while 92.2 % did so in Finland. For primary cannabis users, the prevalence of secondary drug use ranged between 23 % in Italy and 79 % in Finland. For primary cocaine users, polydrug use ranged from 44 % in Italy to 83 % in Ireland; among primary users of non-cocaine stimulants, it ranged from 30 % in Italy to 85 % in Finland ([16]).

The most frequently reported secondary drugs were cocaine (including crack, by 32 % of all clients reporting a secondary drug), alcohol (27 %), cannabis (27 %) and other stimulants (11 %). The frequent reporting of cocaine as a secondary substance might reflect increases in prevalence of use observed in several countries in recent years, as well as the use of cocaine among primary heroin users, who sometimes re-enter treatment for problems related to cocaine (SIVZ/IVZ, 2006) ([17]).

Countries differed in the secondary substances most frequently reported. In Ireland, cocaine hydrochloride was reported as a secondary substance by more than one-third of polydrug clients (35 %), and by more than half in Cyprus (54 %). In the United Kingdom, crack cocaine was reported as a secondary drug by 29 % of those clients who reported use of more than one substance. Alcohol was cited as a secondary substance by around 40 % of drug clients in Denmark, Ireland, Spain and Sweden, and cannabis by around half of all clients in the Czech Republic and Finland, and by even larger proportions of clients in Cyprus (59 %) and Greece (63 %). Finally, stimulants other than cocaine were reported as a secondary drug by about one-third to a half of drug clients in the Czech Republic, Denmark, Cyprus, Latvia, Finland and Sweden.

The most frequently reported drug combinations among clients who entered treatment in 2006 were: heroin and cocaine; cocaine and cannabis; cannabis and alcohol ([18]). Each combination was sometimes reported with other substances.

Patients co-using heroin and cocaine (including crack) represented a large group of the polydrug users in treatment. This group was comprised largely of heroin users who also use cocaine, and often use other drugs including alcohol. The proportion of heroin and cocaine co-users among all clients varied from 2 % in Denmark to 38 % in Cyprus. Heroin and cocaine ('speedballing') are sometimes injected together. Local studies suggest that this practice can be popular among injecting drug users and the mixture is sold on drug markets (De la Fuente et al., 2005). Injecting heroin with crack cocaine reinforces the effects of both drugs. Heroin and cocaine co-users were mainly found in large European cities, and most clients using heroin and crack were reported by the United Kingdom (Connolly et al., 2008; EMCDDA, 2009a).

The use of cannabis as a secondary drug was common among primary cocaine users, especially those new to treatment. Among polydrug-using clients, 13 % reported

([13]) See Tables A2 and A3 in the online annex.
([14]) See Figure A2 in the online annex.
([15]) See Tables A4 and A5 in the online annex.
([16]) See Table A7 in the online annex.
([17]) See Table A9 in the online annex.
([18]) See Tables A10 and A11 in the online annex.

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using cocaine and alcohol, with or without cannabis (23 % among new clients). The proportion of clients reporting co-use of cocaine and cannabis varied markedly between countries, with the highest levels in Spain and the Netherlands, where cocaine clients represented a large proportion of all clients. A prospective cohort study of 720 cocaine users in the metropolitan areas of Madrid, Barcelona and Seville showed that almost all of them also used cannabis (93.6 %) (Pulido, 2009).

Referral by the criminal justice system or pressure from social and family networks were among the main reasons for entry to treatment for many of the primary cocaine users who also reported co-use of alcohol or cannabis. They were mainly males and were reported to be socially integrated, with stable living conditions and regular employment. A Dutch analysis of treatment data reported that clients in treatment for use of powder cocaine, alone or in combination with alcohol or 'soft' drugs, usually have a regular job and income, and live in their own apartment or with their family (SIVZ/IVZ, 2006). However, studies in the USA show that a large majority of cocaine users in rehabilitation or treatment (up to 9 out of 10 patients) are also alcohol-dependent. In addition, patients who were once dependent upon both cocaine and alcohol, compared to those previously dependent upon cocaine alone, show higher risks of relapse into cocaine use triggered by alcohol use (Pennings, 2002).

Clients using cannabis in combination with alcohol, and sometimes other substances, form the last group, with patterns of use less risky than those of the other groups (EMCDDA, 2008a). Even though a large proportion of primary cannabis clients reported consuming only cannabis (57 % of all and 35 % of new cannabis clients), the number of those using other drugs, especially alcohol, is significant ([19]). In France, for example, where primary cannabis users make up a high proportion of the clients entering treatment, 24 % of new clients who reported using more than one substance were co-users of cannabis and alcohol. This group of clients often reported living with their family and, compared to the other groups in treatment, presented a younger and more socially integrated profile.

Polydrug use among problem drug users in opioid substitution treatment

Substitution has become the treatment of choice for heroin dependence in most European countries. It is now estimated that there are 650 000 opioid users in receipt of this treatment in Europe, and the number is probably still increasing. Methadone and buprenorphine are the substitution drugs most often prescribed, but other drugs such as slow-release morphine, codeine and heroin are also used. Polydrug use is particularly prevalent among this group, and its potential dangers are compounded by the difficult health and social conditions typically experienced by substitution clients.

Several studies have shown that the prevalence of polydrug use, often including heavy alcohol use, is relatively high among clients entering substitution treatment. In Barcelona, more than one-third of patients were found to be polydrug users when they began methadone maintenance treatment (Puigdollers et al., 2004). A Swedish study found that about one-third of patients entering methadone treatment had a history of hospital treatment due to alcohol-related problems (Stenbacka et al., 2007). An Irish study revealed that 56 % of methadone patients were also diagnosed as alcohol-dependent (MacManus and Fitzpatrick, 2007).

The use of benzodiazepines is common among substitution treatment clients, with studies showing between 11 % and 70 % of clients reporting current use. The proportion of non-medical use is, however, difficult to establish, and is further complicated by the fact that methadone clients

Interactions of substitution drugs with other substances

In addition to acute health problems and chronic risks, the use of drugs and alcohol by clients undergoing substitution treatment can pose specific problems due to drug interactions. As substitution clients constantly have a relatively high level of opioids in their blood, other drugs used may easily interact with the metabolism of the substitution substance, altering its bioavailability. This occurs because the same enzymes (cytochrome P450 group of enzymes) are shared by methadone, buprenorphine and many other substances, including medicines. Some substances increase the metabolism of methadone and buprenorphine, some reduce it, and thereby influence the effects of these opioids; possibly leading to withdrawal symptoms or overmedication. Generally, these interactions appear to have greater effects on the bioavailability of methadone than on buprenorphine (CSAT, 2004) (see Table 5).

([19]) See Tables A6 and A7 in the online annex.

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Table 5: Drug interactions with methadone

Substance group	Interactions
Opioid antagonists (including partial antagonists)	Contraindicated with methadone as they may precipitate opioid withdrawal.
Opioids	Share common metabolic pathway with methadone. The additive opioids effect can result in overdose. Heroin reduces methadone bioavailability.
Cannabis	Possible interaction due to common metabolic pathway.
Benzodiazepines	As they may cause additive central nervous system depression this combination is risky and can be fatal.
Cocaine	Generally reduces the effect of methadone.
Alcohol (chronic use)	Reduces the effect of methadone due to enzymatic induction.
Alcohol (acute use)	Increases methadone effect (again, can add to central nervous system depression and there is a risk of fatal outcome).

Source: Leavitt, 2006.

experience a high rate of co-morbid psychiatric conditions, including anxiety (Aeschbach Jachmann et al., 2008). Cocaine use is relatively common among methadone patients in those countries where its use among the general population is highest, such Spain, Italy (e.g. Maremmani et al., 2007), the Netherlands and the United Kingdom (Gossop et al., 2002; Seivewright, 2006). In the Netherlands, half of the methadone clients reported cocaine as their secondary drug (IVZ, 2004). Cocaine use can also increase alcohol use, and about 60 % of patients in a methadone maintenance programme who also used crack cocaine reported using alcohol to come down or to temper the discomfort associated with stopping crack cocaine use (Magura and Rosenblum, 2000).

Patients in substitution treatment might use drugs, including heroin, for a variety of reasons. Compensation for an insufficient dose of the substitution medication ('topping up') is one of them, and in such cases patients can be helped to reduce their use of other drugs, mainly opioids, by being offered higher doses of the substitute (e.g. Donny et al., 2005; Epstein at al., 2009). As best practice, it is recommended that methadone dose should be titrated according to individual need (e.g. Trafton et al., 2006). Individual tolerance and metabolism should be taken into account. Other reasons put forward for drug use in substitution treatment include pharmacological effects, such as reported higher cocaine effects under methadone substitution (Preston et al., 1996), the high abuse potential of flunitrazepam (Farré et al., 1998), pre-existing dependence and mental health problems.

Using other substances alongside the prescribed substitution medication can lead to severe acute health complications, including drug overdose. In addition, the use of alcohol and other drugs (possibly excluding cannabis — Epstein and Preston, 2003) during substitution treatment is associated with lower levels of psychosocial recovery. A substantial body of literature shows associations with higher levels of psychiatric co-morbidity, homelessness, unemployment, greater psychological distress, poorer social functioning, higher risk of relapse, lower retention rate in treatment, use of additional drugs, reduction in quality of life and higher levels of complications of existing medical problems (e.g. Backmund et al., 2005; Brands et al., 2008; Senbanjo et al., 2007).

Problem drug users in non-treatment settings

Studies in EU countries among street drug users, users of low-threshold services, emergency room visitors, offenders and prison inmates generally report high levels of polydrug use among problem drug users outside treatment. In all those countries where trends could be observed, polydrug use increased between the mid 1990s and the 2000s (Estonia, Ireland, Luxembourg, Netherlands, Poland, Finland). Among the reasons suggested for this increase were the low quality of street drugs (Luxembourg) or the fact that problem drug users already had a history of alcohol abuse (Finland). The most frequently reported combinations include heroin and cocaine (Belgium, Portugal, Italy), heroin and crack cocaine (United Kingdom), opioids (including heroin, fentanyl and poppy liquid) and amphetamines (Estonia) (Talu et al., 2009), amphetamines and heroin (Latvia), buprenorphine and amphetamine or methamphetamine (Finland), and alcohol and stimulants (Netherlands). It is unclear from the

available data whether different drugs were used simultaneously, successively or simply within the same time period (e.g. one month).

In Norway, a large study among clients of needle and syringe programmes showed that many problem opioid and amphetamine users had also used drugs such as psychoactive medicines (75 %), cannabis (85 %) and alcohol (50 %) during the month preceding the interview.

Responding to polydrug use among problem drug users

The range of services and interventions is generally the same for both polydrug and single drug use problems. The available interventions include harm-reduction approaches and psychosocial or pharmacologically assisted treatment. Professionals seeking information on how to manage polydrug-using patients have to rely on their own experience or that of their peers, or on case studies reported in the literature (Kenna et al., 2007).

Treatment

The treatment literature generally focuses on the management of one particular problem substance, with little information available on the management of problems related to the co-use of several substances (Rigter et al., 2004). However, findings from large national treatment outcome studies provide an indication of the prevalence of problem polydrug use among treatment clients. Most studies have observed positive changes, as indicated by substantial reductions in the proportion of clients using several substances.

Results from the United Kingdom National Treatment Outcome Research Study (NTORS) showed that clients, most of whom had a heroin problem and were in residential treatment programmes or on outpatient methadone maintenance treatment programmes, significantly reduced their use of several substances including heroin, crack cocaine, non-prescribed methadone and benzodiazepines (Gossop et al., 2002). Furthermore, a substantial number of clients remained abstinent from these substances for at least three months prior to the two-year follow-up: over a third of the clients from the residential programmes and about a quarter of those in methadone maintenance.

Similarly, results from VEdeTTE, a large Italian cohort study of 7 224 clients in continuous treatment for heroin dependence, showed a substantial reduction in polydrug use over time. The proportion of these clients who reported the use of cocaine as the only other drug fell from 28.1 % in the first month of treatment to 11.9 % after two years, while co-use of heroin and cocaine fell from 26.9 % to 8.4 % (Bargagli et al., 2006). The Australian treatment outcome study of clients with heroin dependence also observed significant reductions among all treatment modalities, one year after treatment intake, in the use of drugs alongside heroin (Teesson et al., 2006).

Although the study designs (e.g. a lack of randomisation of the clients) do not allow the observed changes to be directly attributed to treatment effects, the results indicate that treatment can bring about positive changes in polydrug use in severe and long-term problem drug users.

Reviews of randomised controlled studies have also demonstrated the beneficial impact of pharmacological and psychosocial interventions on polydrug use. Most of the randomised controlled studies of opioid substitution treatment for heroin dependence reviewed by Gowing et al. (2008) reported a significant reduction in cocaine use. Another review found that users were more likely to remain abstinent from cocaine use if given high rather than low doses of methadone (Faggiano et al., 2003). In addition, a review on pharmacotherapies for several patterns of polydrug use indicated that disulfiram and tiagabine showed positive results in the management of cocaine dependence among clients in substitution treatment (Kenna et al., 2007), although the efficacy of their use for the treatment of primary cocaine dependence is not conclusive.

Clinical trials have also shown that psychosocial interventions can in their own right contribute to reducing polydrug use among treatment clients, especially stimulant use among clients in substitution treatment. Thus, a meta-analysis of randomised controlled studies of psychosocial interventions conducted by NICE (2007) revealed that contingency management leads to significant reductions in illicit drug use (including both opioids and cocaine) among polydrug clients in methadone maintenance treatment programmes, both during treatment and at follow-up. In Europe, the United Kingdom has started introducing contingency management in its treatment services. The Netherlands is piloting this intervention and, according to the 2008 national report, first results of a randomised controlled study investigating the efficacy of contingency management among clients in methadone maintenance treatment with cocaine problems show significantly higher levels of abstinence from cocaine compared with the control group.

Despite these positive findings, the management of polydrug use remains a complex and challenging task for professionals. Among the factors that can render the treatment of clients with multiple drug use particularly

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difficult is the severity of polydrug use at treatment intake, which has been shown to negatively affect the reduction of multiple drug consumption over time (Teesson et al., 2006). Polydrug clients may also conceal occasional or regular use of illicit drugs in order to avoid repercussions, such as revocation of taking home doses of substitution medication. In turn, clinicians are sometimes reluctant to confront patients with their suspicions about ongoing drug use, fearing that the confrontation will compromise their relationship (Bruce and Altice, 2007).

Drug treatment services may focus primarily on the management of the most problematic drugs for the client, usually opioids, or may not be properly equipped to address other substance-related problems (Körkel and Waldvogel, 2008). This appears to be especially the case for alcohol, as indicated by the NTORS study, which showed that the prevalence of heavy alcohol use among clients in methadone treatment remained unchanged at two-year follow-up after treatment intake. In addition, the lack of evidence of effectiveness for treatments of particular drug problems, such as stimulant dependence, further contributes to the difficulty of effectively managing multiple drug problems simultaneously.

Harm reduction

Harm-reduction services for problematic drug users usually address the associated harms and risk behaviours, such as injecting, with a holistic approach that focuses on the nature and severity of the behaviours and problems experienced by the individual, rather than on a specific substance. Therefore, in response to the elevated health risks associated with problem drug use, including polydrug use, harm-reduction services are generally provided on a case-by-case basis and often according to professionals' own work experience. Furthermore, harm-reduction interventions usually operate within a broader local prevention strategy that combines other types of services such as outreach work and opioid substitution treatment, which contribute to the reduction of risks and health problems experienced by problem polydrug users. Evidence of the effectiveness of harm-reduction interventions has been reported in other EMCDDA publications (EMCDDA, 2008a) and will be reviewed in a forthcoming monograph on harm reduction.

Member States provide a wide range of harm-reduction services that aim to minimise the health consequences and risk behaviours of problem drug users, including problem polydrug users. These interventions include safer-use training, needle and syringe exchange, infectious diseases testing and counselling, hepatitis B vaccination and treatment of viral hepatitis and HIV infection. Client healthcare assessments, which identify individual harm-reduction needs, are also provided and appropriate information, advice and basic healthcare are subsequently offered. Among the most problematic and marginalised users, the primary focus will be on minimising the most acute health risks, which are usually injecting and overdose risks. Chronic health consequences associated with the concurrent use of tobacco, cannabis or alcohol may be of secondary importance, depending on the severity of the cases and on the level of acute risk-taking. Targeted information and education materials for specific polydrug consumption patterns have also recently been developed.

Conclusions

This overview of polydrug use among adolescents, young adults and problem drug users has shown that the use of multiple substances is a widespread pattern of drug use in Europe and carries particular health risks. Polydrug use reflects both the increasingly wide range of drugs available and the willingness of different groups of young people to experiment in the use of psychoactive substances. In addition, drug-taking repertoires have become both complex and dynamic, influenced by individual rituals, social controls, rationales and beliefs, the context in which drugs are used, the sought-after effects, and the extent to which individuals are dependent or experiencing problems. Risk-taking is associated with a complex picture of interrelated issues, including the frequency and quantity of the drugs taken. And, any attempt to describe, let alone quantify, it cannot be accomplished simply by listing the distinct risks of each substance or a particular drug combination. We must consider the many and various interconnections.

Polydrug use can have many different forms: among 15- to 16-year-old school children, about one in four had used both alcohol and tobacco in the last 30 days and a very small proportion had used two or more illicit drugs. Among young adults, the analysis of data for last year prevalence of substance use in nine countries showed associations between frequent and heavy alcohol use and cannabis or cocaine use. This is corroborated by studies in nightlife settings which observe similar associations. Finally, data from treatment settings and other sources point to the existence of three distinct populations of problem polydrug users. The first of these is composed of co-users of heroin and cocaine, who are often marginalised. The other groups, more recently identified, are made up of more socially integrated cocaine inhalers and alcohol users, and of younger co-users of cannabis and alcohol.

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The presence of alcohol in almost all of the polydrug-use repertoires and among all of the different populations addressed is one of the key findings of this 'Selected issue'. Alcohol is almost always the first drug with strong psychoactive and mind-altering effects used by young people, and its widespread availability makes it the ever-present drug in substance combinations among young adults, particularly in recreational settings. Alcohol is also a fundamental component of most polydrug use profiles among problem drug users; and this suggests that there is a need for additional interventions targeting alcohol, both at the market level and at the level of social norms. Tobacco smoking may also be a basic component of many polydrug use profiles, although it was not recorded in all the data sets. There is evidence that recent measures such as smoking and advertisement bans and tax increases have been effective in reducing overall cigarette consumption. While the acute, adverse effects of polydrug use may be limited to smaller populations of high-risk, vulnerable and problem drug users, some patterns of use may, like the widespread use of cigarettes in the past, carry long-term, adverse health consequences that go unacknowledged due to widespread social acceptance and vested economic interests.

This exploration of polydrug use also highlights the influence of social context on patterns of use. It was observed, both among adolescents and young adults, that in countries with low drug use prevalence, people who use cannabis, for example, tend to deviate much more from the general population, in terms of other drug use, than their counterparts in high-prevalence countries. It is important to identify and target interventions at the minority of vulnerable young potential 'problem' users who make ill-considered decisions about drug taking and are likely to go on to experience problems with their drug use. The early identification of these vulnerable people may not always be by their cannabis use, for example. Rather, they should be identified in the context of a wider understanding of drug use and social factors, so that targeted interventions take into account national characteristics in vulnerability, patterns of substance use and drug availability.

Polydrug use is very common among problem drug users, although its prevalence and specific pattern may differ between countries. Among this group, the use of multiple drugs generally aggravates an already difficult condition and leads to increased risk-taking. The most severe consequences of these patterns of use include fatal and non-fatal overdoses, hepatotoxicity — especially in combination with hepatitis C infection — and compromised outcomes of treatment efforts.

Information on current treatment practices in the Member States and on the management of polydrug use is limited. Generally, reports in the treatment literature focus on the management of problems related to individual substances, mostly opioids or stimulants, with little information on the management of those related to multiple substance use. While it is generally assumed that polydrug use is a hard-to-treat condition, results from large treatment outcome studies in Europe show significant reductions in multiple drug use among highly problematic users. Nevertheless, managing the care of problem polydrug users requires long-term treatment planning with attention to individual needs and multidisciplinary teams working together with flexible and sometimes innovative treatment options.

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