European Monitoring Centre
for Drugs and Drug Addiction

RAPID COMMUNICATION

Drug-related deaths and mortality in Europe

Update from the EMCDDA expert network
July 2019


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At a glance: a summary of key points

Overdose deaths: a very high burden of premature preventable deaths

Over 8 200 deaths involving one or more illicit drugs were reported in 2017 in the European Union. This estimate exceeds 9 400 deaths when Norway and Turkey are included. Males account for four-fifths of the drug-induced deaths. Most of the deaths were premature, affecting people in their thirties and forties.

Opioids: the main driver of fatal overdoses in Europe

- Opioids, often heroin, are involved in between eight and nine out of every 10 drug-induced deaths reported in Europe, although this is not true for all countries.
- Opioids used in substitution treatment are also commonly found in post-mortem analysis in some countries.
- Deaths related to medications, such as oxycodone and tramadol, are also reported.
- Deaths associated with fentanyl, its analogues are probably underestimated, and outbreaks of deaths related to these substances have been reported.

Stimulants and benzodiazepines involved in many deaths

- Post-mortem toxicology analyses of overdose cases suggest that in most cases, multiple drug toxicity is implicated.
- Overall, cocaine is reported in an increasing number of deaths. Increased cocaine injection is also reported in several countries.
- Synthetic cannabinoids were involved in the majority of drug-induced deaths reported in Turkey in 2017.
- Fake medicines, diverted medicines and new benzodiazepines are related to an increasing proportion of drug-related deaths in some countries. Benzodiazepines are causing particular concern in Scotland (UK), where they were implicated in more than half of the reported drug-related deaths in 2017, with recent increases driven mainly by deaths involving new benzodiazepines such as etizolam.

High overall mortality among drug users

Seven countries reported new data from mortality cohort studies among high-risk drug users:

- Findings suggest that high-risk drug users are three to seven times more likely to die than their peers of the same age and gender in the general population.
- The most frequently reported causes of death include overdose, HIV/AIDS, other infections, liver disease, cancer, respiratory disease and cardiovascular disease.
- The proportion of deaths due to overdose is likely to be underestimated.

Responding to drug-related deaths

- Coverage and diversity of responses to drug-related deaths vary between and within countries.
- Updates provided on drug consumption rooms and take-home naloxone programmes indicate the expansion of these responses in countries across Europe in 2018.
- While the evidence base for their effectiveness is growing, more research is needed on these and other responses.

Implications for public health and for monitoring

- There is an ongoing need to improve the epidemiology of drug-related deaths — from a toxicology perspective, in particular — in order to get more accurate and informative figures in Europe.
- Further implementation of cohort and linkage studies is needed and can be attained with relatively little investment.
- Additional sources of information offer timelier data — important for early identification of threats — and may be triangulated. These include open source information monitoring and data from acute intoxications presented at hospital emergency units.

Introduction and objective of this report

This publication provides an update on drug-related deaths in Europe. It is primarily based on presentations and discussions held at a two-day annual meeting of the EMCDDA expert network on drug-related deaths in Lisbon on 8 and 9 November 2018. The meeting gathered experts and representatives from more than 40 countries, and provided a platform for the presentation of new trends and analyses on drug-induced deaths and overall mortality among high-risk drug users in Europe and beyond.

Drug-related mortality is a complex phenomenon. The EMCDDA has defined a drug-related death and mortality (DRD) epidemiological indicator with two complementary components: (i) national, population-based statistics on deaths directly attributable to the use of drugs (drug-induced deaths, also known as poisonings or overdoses) and (ii) estimations of the overall and cause-specific mortality among high-risk drug users. These two components, based on common methodologies, can fulfil several public health objectives, notably as an indicator of the overall health impact of drug use. The indicator, when interpreted in conjunction with other drug indicators, plays an essential role in identifying changes and threats, informing policy decisions and measuring the impact of responses. Taking stock of the latest data on drug-related deaths in Europe, this report presents important highlights from the presentations and discussions that took place at the expert meeting. Some of the information outlined here is necessarily preliminary.

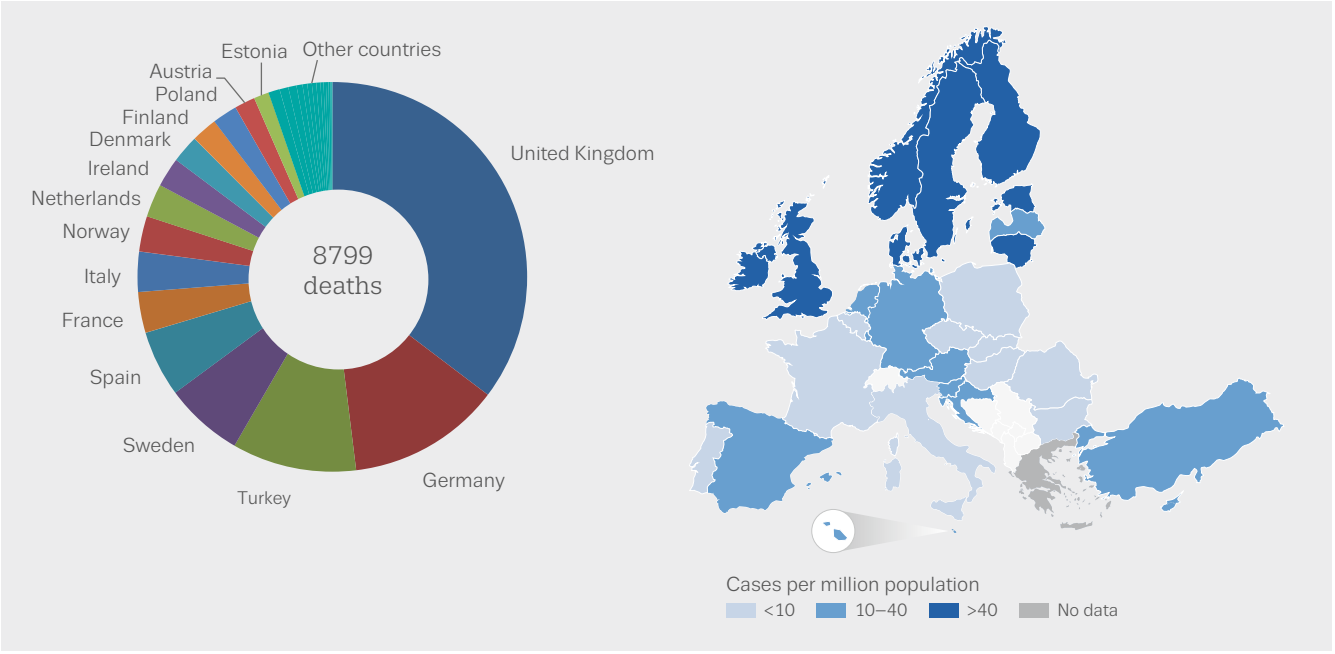
Overdose deaths in Europe: comparisons and causes

It is estimated that at least 8 238 overdose deaths occurred in the European Union in 2017. This rises to an estimated 9 461 deaths if Norway and Turkey are included, representing a stable figure (an increase of 0.7 %) compared with the revised 2016 figure of 9 397. These overall numbers must be understood as underestimations, as there are limitations to drug-induced deaths data, particularly to European cumulative totals (see the box 'Monitoring drug-induced deaths', page 6). As in previous years, the United Kingdom (34 %) and Germany (13 %) together account for around half of the EU total. This relates partly to the size of the at-risk populations in these countries, but also to the under-reporting in some other countries.

The mortality rate due to drug overdoses in Europe in 2017 is estimated at 22.6 deaths per million population aged 15-64 ([1]), but this varies across countries, with higher rates being observed in countries in the north of Europe (Figure 1). Nevertheless, drug overdose continues to be a major cause of premature death among people who use

FIGURE 1

Drug-induced deaths in the European Union, Norway and Turkey: total number and mortality rates among adults aged 15-64



Note: Data for 2017 or last year available. Only countries accounting for more than 1 % of the deaths are named in the chart.

([1]) This age range is selected for computation of mortality rate for reasons of comparability across indicators and datasets.

Monitoring drug-induced deaths

The EMCDDA defines drug-induced deaths as those 'happening shortly after consumption of one or more illicit psychoactive drug, and directly related to this consumption', and these often occur in the context of the co-use of other substances such as alcohol or psychoactive medicines (EMCDDA, 2010). Monitoring drug-induced deaths is one of two components of the DRD epidemiological indicator. It requires the existence of good-quality information sources, in particular general mortality registries and/or special mortality registries. The EMCDDA protocols define operative criteria for the extraction of relevant deaths from these registries. Extracting from both sources allows cross-validation of the data, but some countries have data available from only one source.

Although most countries are able to fully apply the operative criteria for the extraction of relevant deaths, there are important limitations to drug-induced deaths data, particularly to European cumulative totals. Of importance are differences between (and within) countries with regard to the identification, certification of the cause of death, coding and reporting of the number of drug-induced deaths (England, 2017a). This relates to the quality and frequency of post-mortem investigations, the availability of this information for the determination of the cause of death, the codification system used and the quality of codification, and the coverage and quality of the overall reporting system (EMCDDA, 2017b; England, 2017b,c). There are also different levels of forensic laboratory capacities, and different standard procedures for post-mortem toxicological investigation of suspected drug-induced deaths (EMCDDA, 2019; Leifman, 2017). These factors have an impact on the sensitivity of the analysis, and hence on the comparability of the data within and across countries. Caution is thus advised when interpreting and comparing drug-induced deaths data over time and between countries.

The quality of the DRD indicator information depends on the quality of its sources, and will increase with improvement of post-mortem investigations and the full use of this information for death certification and coding.

drugs in Europe, predominantly affecting males: 35.8 cases per million males aged 15-64 years, which is almost four times that among females (9.3 cases per million females aged 15-64 years). Furthermore, it was estimated that drug overdoses accounted for 4 % of all deaths among 15- to 39-year-olds in Europe (EMCDDA, 2011).

Overdose deaths in North America

The United States has experienced three cumulative waves of opioid crises over the past two decades: the first was mostly related to prescription painkillers, the second to heroin and the third to highly potent synthetic opioids (Figure 2).

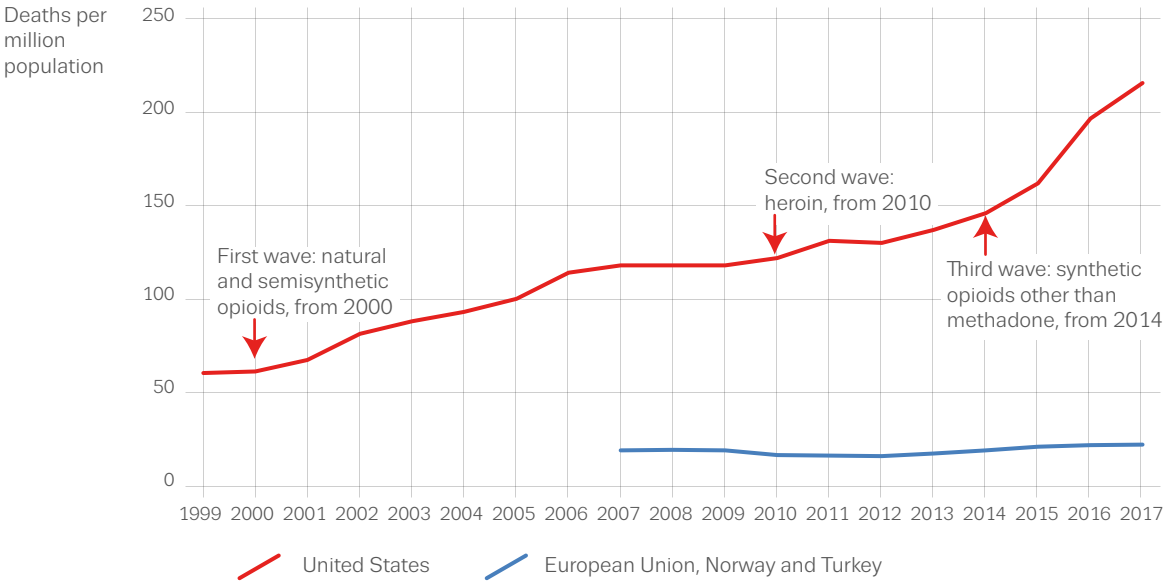
In 2017, there were 70 237 drug overdose deaths reported in the United States (Hedegaard et al., 2018). This translates into an age-adjusted rate of drug overdose deaths that year of 217 per million (about 10 times the EU rate), and represents an increase of 9.6 % on the previous year (198 per million). Whereas this continued increase was primarily fuelled by opioids, the age-adjusted rate of drug overdose deaths involving synthetic opioids other than methadone (drugs such as fentanyl, fentanyl analogues and tramadol) increased by 45 % between 2016 and 2017, from 62 to 90 overdose deaths per million (Hedegaard et al., 2018). According to the provisional data for the 12 months ending in August 2018, the number of deaths in the United States is estimated to have remained stable at 70 424 (Ahmad et al., 2019; Hedegaard et al., 2018).

Meanwhile an opioid crisis is developing in Canada, driven by both illicit and prescription opioid misuse, with fentanyl and its analogues compounding the epidemic. In 2017 there were 3 998 apparent opioid-related deaths, a death rate of 109 per million population — approximately five times the EU rate. Provisional data from January to June 2018 suggest a small increase to 112 deaths per million population (Special Advisory Committee on the Epidemic of Opioid Overdoses, 2018).

Demographic characteristics

Demographic analysis provides insight into where the current burden of deaths lies, and into implications for responses. Whereas an estimated 78 % of the reported deaths are of males, the proportion of women has recently increased, for example in Scotland (United Kingdom).

FIGURE 2
Drivers of the upward trend in drug-related deaths in the United States, 1999-2017



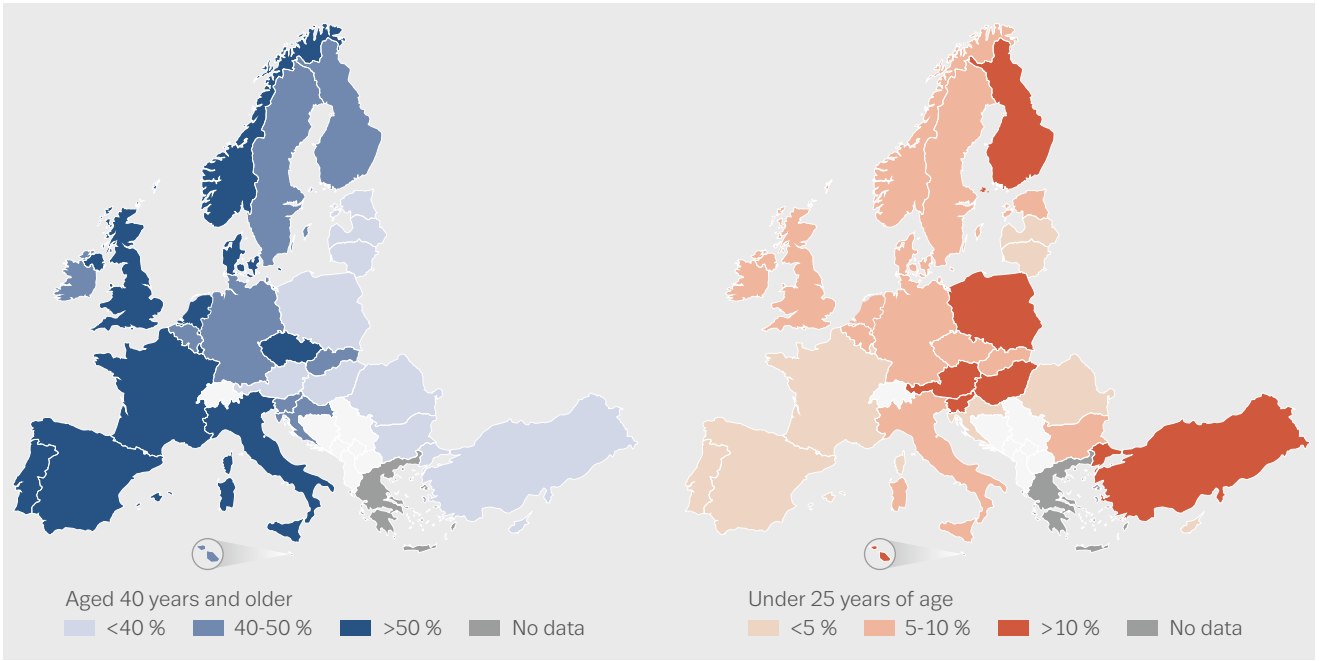
Note: Age-adjusted overdose death rates. The European trend for all drug-induced deaths rates per million population aged 15-64 is presented for comparison.
Sources: National Center for Health Statistics, National Vital Statistics System, Mortality; EMCDDA. Both adapted by the EMCDDA.

Males accounted for 70 % of the drug-induced deaths there in 2017 and, comparing the annual average for 2013-17 with that for 2003-07, the percentage increase in the number of drug-induced deaths was greater for females (203 %) than for males (68 %) (National Records Scotland, 2018).

There is an ongoing increase in the reported number of overdose deaths among older age groups. Older people represent a large proportion of all drug-induced deaths in west European countries (Figure 3). That reflects the ageing nature of Europe's opioid-using population in most countries, and suggests that older high-risk drug users may be at greatest risk of drug overdose death (Pierce et al., 2018).

In 2017, the overall mean age at death due to overdose was 39 years, compared with 36 in 2012, and the highest

FIGURE 3
Proportion of drug-induced deaths in people aged 40 years or more (left) and aged less than 25 years (right), 2017 or last data available



mortality rates were found among those aged 35 to 39 years, with 57 deaths reported per million males and 13 per million females in this age group. Some countries fall outside this general characterisation. Turkey, for instance, has a younger drug-using population (possibly reflecting its overall younger general population), which is mostly characterised by non-opioid drug use (see 'Synthetic cannabinoids', page 12). The highest drug-induced mortality rates in Turkey occur among males aged 25 to 29 and females aged 20 to 24. Overall in Europe, 247 drug-induced deaths among people aged less than 21 years have been reported in the most recent year for which data are available (2017 for 20 countries, 2016 for six, 2015 for two and 2014 for one).

In England, as part of a drug-induced deaths inquiry, a 'deep dive' study on a sample of drug misuse deaths was commissioned. The most commonly observed characteristics included, although not necessarily in combination, being white, single or divorced, unemployed, male, and living alone. In Italy, an open source information-monitoring system has observed that an overwhelming majority of the deaths occurred after the person had used drugs alone. This has important implications for public health responses. The 'deep dive' study in England resulted in recommendations for clinical practice and responses to specific risk factors, such as harm reduction messages on using drugs while alone or consuming drugs alongside alcohol (ONS, 2018).

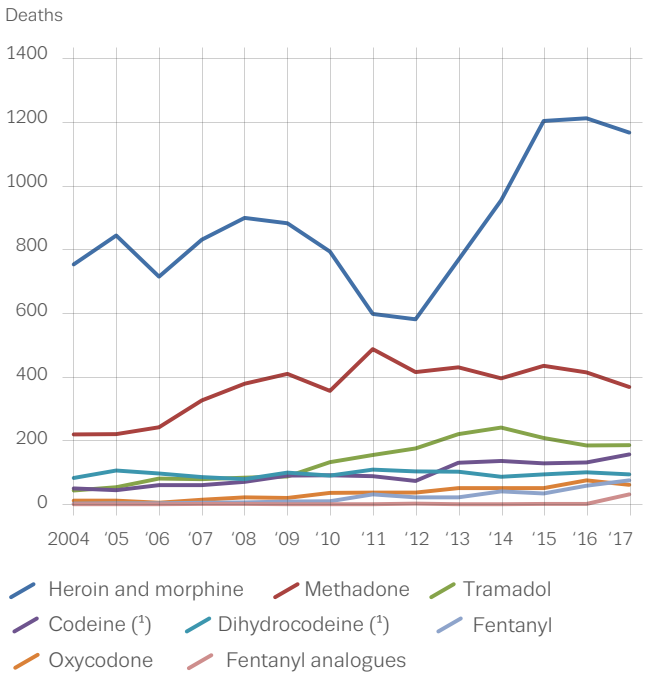
Opioids

Heroin

It is important to bear in mind that most drug-induced deaths are attributed to multiple drug toxicity. Opioids, mostly heroin, are involved in most of the drug-induced deaths reported in Europe. Heroin, in particular, claims a high toll of deaths in a number of countries. In England and Wales (UK), heroin/morphine is mentioned in 1 164 deaths, or 47 % of the cases, registered in 2017 (ONS, 2018). In France, it is mentioned in 131 deaths recorded in the special mortality register, or 40 % of the cases with information available. In Germany, heroin is recorded in 409 deaths reported by the police, or 32 % of cases, and in Norway it is mentioned in 49 deaths reported in the general mortality register in 2017, or 20 % of the cases.

In England and Wales (UK), the most recent data on opioid deaths show that heroin continues to be the most commonly mentioned opioid (Figure 4). Detailed data about opioid deaths occurring in 2016 show that heroin

FIGURE 4
Overall trend in registrations of opioid deaths where selected substances were mentioned, England and Wales (UK), 2004-17



(1) Not from compound formulation.

Source: ONS data presented by Martin White at the DRD expert meeting.

was implicated in 69 % of the deaths among males (compared with 55 % among females). The mean age at the time of death from heroin overdose was 42 years (44 years for opioid-related deaths as a whole). Around nine in 10 heroin deaths were recorded as accidental, and one tenth as with a suicidal intent. In Scotland, heroin was implicated in, or potentially contributed to, half of all drug-induced deaths in 2017 (470 deaths, 50 %).

In England, Public Health England's inquiry into increases in drug-induced deaths highlighted changes in heroin purity and an ageing of the drug-using population with multiple co-morbidities as the principal factors behind the increases in the number of heroin-related deaths over the previous years. Mortality cohort studies in England and in Scotland have also highlighted higher methadone-specific death rates in older methadone clients (Gao et al., 2016; Pierce et al., 2018), and a narrowing of risk between men and women with age (Pierce et al., 2015).

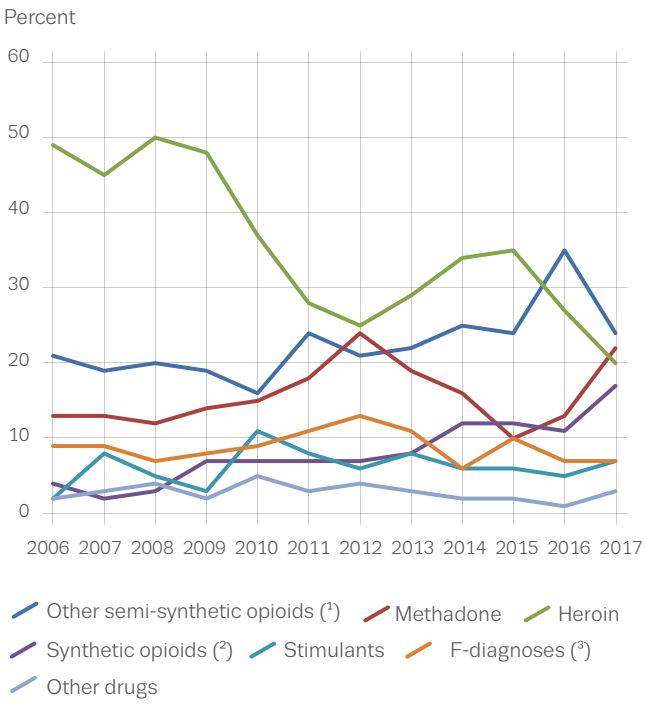
Non-heroin opioids

Some countries now report that opioids other than heroin are associated with a high number and sometimes an increasing share of drug-induced deaths.

In France, according to the latest available data (2016) from the special mortality register, opioids were present in 80 % of all drug-induced deaths. Methadone was associated with four out of 10 opioid-related cases, a slightly higher proportion than heroin. This continues a pattern observed for several years.

In Norway, a shift has been observed in the relative importance of different opioids, with heroin now identified as the main intoxicant involved in a fifth (20 %) of the overdose deaths in 2017, compared with around half of the deaths (49 %) in 2006 (Figure 5). Methadone (22 %) and the category 'synthetic opioids including fentanyl and buprenorphine' (17 %) are commonly identified as a main intoxicant in post-mortem examinations. These changes are concurrent with significant shifts in the dispensing of prescribed opioids in Norway over the last decade (Muller et al., 2019). There has been a scaling-up of buprenorphine prescription for the management of opioid dependence, and an increasing trend in the prescription of other opioids (namely tramadol and oxycodone) in the general population over the last 10 years. For example, oxycodone was prescribed to 5 200 males in 2006, compared with 19 700 in 2016 (a 279 % increase), and tramadol was prescribed to 29 600 males in 2006, compared with 94 200 in 2016 (a 218 % increase).

FIGURE 5
Overdose deaths by main intoxicant, Norway, 2006-17



(1) Including morphine, codeine and oxycodone.
(2) Including fentanyl and buprenorphine.
(3) According to the EMCDDA definition.

Note: F-diagnosis refers to mental and behavioural disorders due to psychoactive substance use, without more specific information about the drugs involved.
Source: Data from Norwegian Institute of Public Health 2019, presented by Thomas Clausen at the DRD expert meeting.

Tramadol is an opioid associated with a significant number of deaths in Europe. At least 300 drug-induced deaths were reported in 2017 in which tramadol was either present or implicated: most notably 185 in England and Wales (10 % of all opioid-related deaths where the opioid was known), 40 in Spain, 37 in France and 20 in Finland. In Sweden, concerns have been raised regarding its use among young people.

Tramadol is often used in combination with other drugs, and it is therefore difficult to assess its contribution to deaths where it is recorded. In addition, the presence of tramadol (and other substances) might be underestimated, as it might not be systematically looked for, or not reported when found. Several countries, including France, the United Kingdom and Norway, report an increase in the prescription of this and of other opioids.

Fentanyl analogues

More than 30 fentanyl analogues have been detected and reported to the EMCDDA since 2012. Available from the surface web, from the darknet and at street level, they are used to make fake medicines or sold as 'legal' replacements to illicit opioids (Figure 6). They are also found in, or sold as, heroin, other illicit opioids and cocaine. Novel dosage forms such as nasal sprays and e-liquids have emerged in recent years. Fentanyl and its analogues can cause rapid onset of life-threatening respiratory depression, and their appearance on the drug market has been associated with increases in poisonings. Cyclopropylfentanyl, carfentanil and acryloylfentanyl, in particular, have been associated with large numbers of deaths: 78, 61 and 47 deaths, respectively, at the time of their risk assessments (EMCDDA, 2017a, 2018a,b). While illicit fentanyl and its analogues have been associated with deaths in Europe, there is some evidence of diversion of medicinal fentanyl (e.g. patches) to illicit markets, and this might also be associated with deaths but to a much lesser extent.

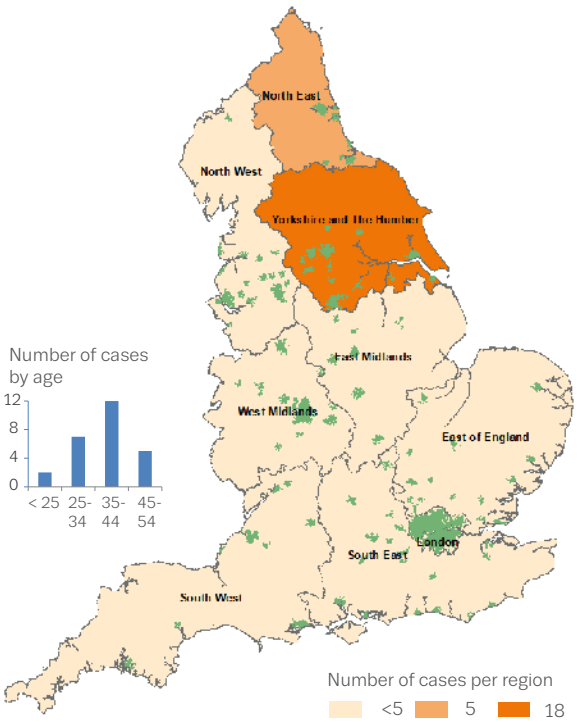
In England, in the spring of 2017, intelligence from post-mortem results and drug seizures suggested that fentanyl and its analogues had been introduced into the heroin supply in the north of the country. Public Health England issued an alert at the end of April 2017 advising (i) on the availability of, and harms from, heroin that had been mixed with fentanyl or carfentanil, (ii) that warnings be cascaded and (iii) of the naloxone dosing regime in the event of an

FIGURE 6
Fentanyl analogues: fake medicines (Xanax), nasal sprays and powder containing fentanyl analogues, detected in Europe

Note: Fake Xanax tablets containing cyclopropylfentanyl (copyright Swedish Police). Unlabelled nasal sprays containing acryloylfentanyl (copyright Anders Helander, Karolinska Institutet, Stockholm). A ziplock bag found inside a foil packet, containing carfentanil as a white powder (copyright Norwegian National Criminal Investigation Service).

overdose. Around the same time, police and the National Crime Agency disrupted a laboratory that could have been the site for processing and mixing fentanyl and other analogues, and they sought to raise awareness. Official data from the Office for National Statistics, analysed by Public Health England, indicate that around 26 deaths registered in 2017 appeared to fit the pattern of the incident (Figure 7). Most of the deaths were concentrated in urban areas of Yorkshire and the Humber (around where the lab was based), with 18 deaths recorded (a rate of 6.8 per million population aged 15-64, and 6.5 % of all drug misuse deaths in the region). There were five cases in the North East (a rate of 3.0 per million population aged 15-64, and 2.4 % of all drug misuse deaths). In the other regions put together, three cases were recorded. The 26 deaths are only those on which the inquests have currently concluded; there will be more that are yet to be registered and will appear in the data for 2018 when these are released by the Office for National Statistics (even though all the deaths occurred in 2017).

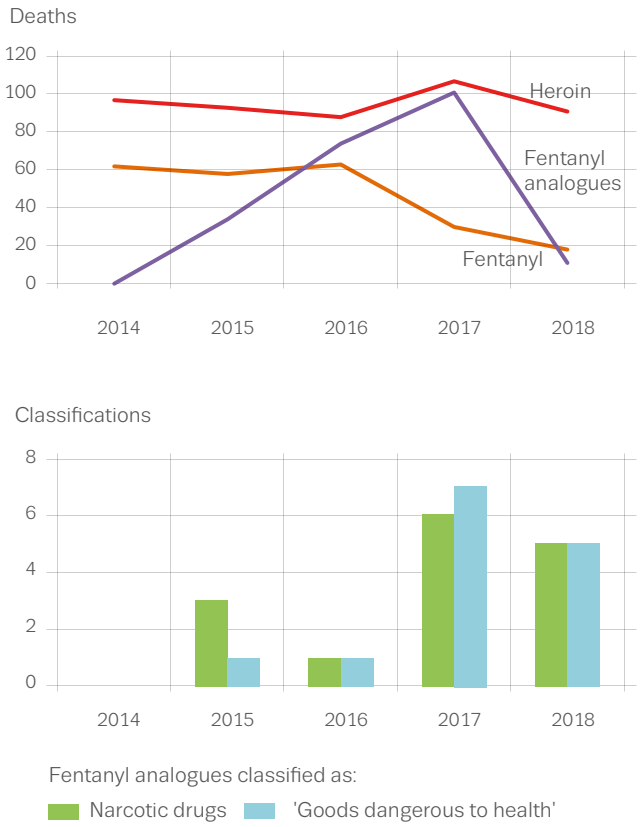
FIGURE 7
Fentanyl-related incidents in England (UK) in 2017: locations of the deaths



Source: Martin White, DRD expert meeting
Note: Large urban centres are shown in green.

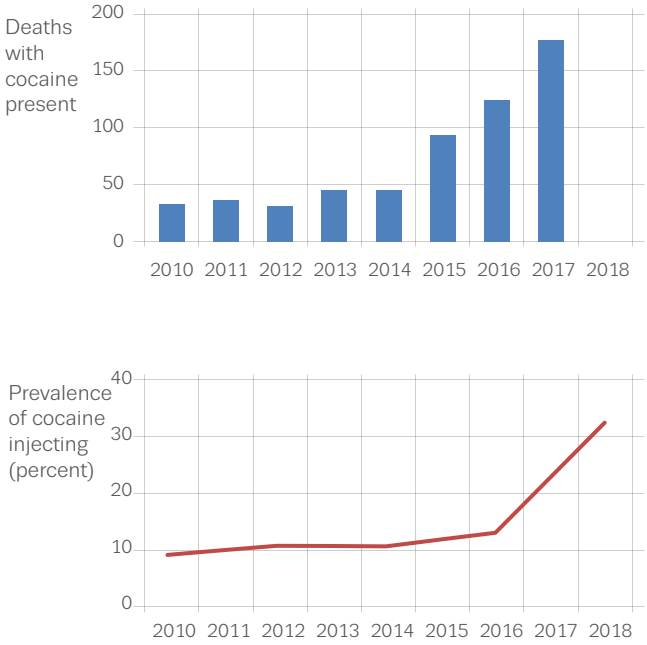
In Sweden, data from forensic analyses show that there has been a major decrease in the reported number of deaths related to fentanyl analogues, with 11 reported in 2018 compared with 101 in the previous year. In 2017, there were 30 cases related to fentanyl and 107 related to heroin. The drop in 2018 may be related to the number of fentanyl analogues that were classified as narcotic drugs or 'goods dangerous to health' over the previous year (Figure 8). That classification resulted in new possibilities of prosecuting those who sell not-yet-classified new psychoactive substances (NPS), which influenced supply. Recent evidence suggests that the classified fentanyl analogues disappeared from the open web shops in Sweden.

FIGURE 8
Deaths related to fentanyl, fentanyl analogues and heroin in Sweden (top) and number of classifications of fentanyl analogues (bottom), 2014-18



Source: National Board of Forensic Medicine (2019), data from forensic analyses presented by Mimmi Eriksson Tinghog at the DRD expert meeting, adapted by the EMCDDA.

FIGURE 9
Deaths with cocaine present in Scotland (UK) and prevalence of cocaine injecting among needle and syringe exchange clients, 2010-18



Sources: National Records of Scotland (NRS); Needle Exchange Surveillance Initiative (NESI). Reported by Andrew McAuley and Roy Robertson. Presented by Roy Robertson at DRD expert meeting and adapted by the EMCDDA.

Stimulants

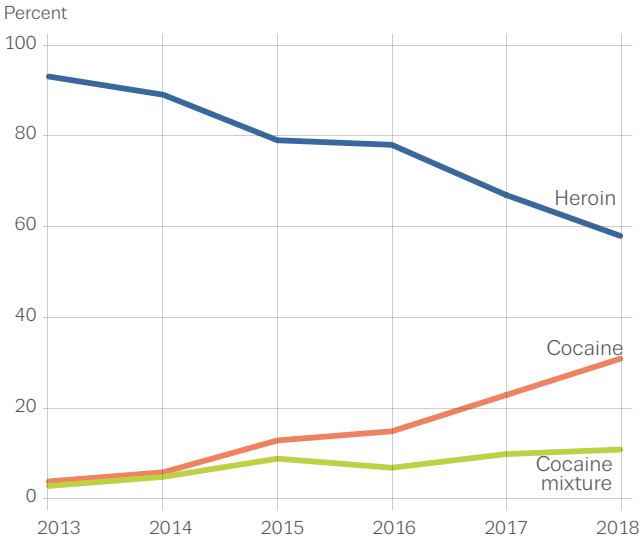
Cocaine

Cocaine use has important health implications, particularly when the drug is consumed with other substances or when injected, alone or in combination with heroin (EMCDDA, 2018d). Cocaine use is also associated with increased risk of blood-borne and sexually transmitted infection, through increased frequency of injecting (when sharing and re-using injection equipment), crack pipe sharing and increased libido.

In recent years, the European drug market has been experiencing an increase in both availability and purity of cocaine. A rise in powder cocaine injection and in the use and injection of crack-cocaine has also been noted in some countries. These developments have resulted in significant public health impacts, with more cocaine-related hospital emergencies and deaths as well as HIV outbreaks linked with cocaine use reported in Europe over the past few years (EMCDDA, 2018d). In Scotland, for instance, there has been a marked increase in recent years in the number of deaths with cocaine present across the country, and in the prevalence of cocaine injecting as reported by clients of the needle and syringe exchange services (Figure 9).

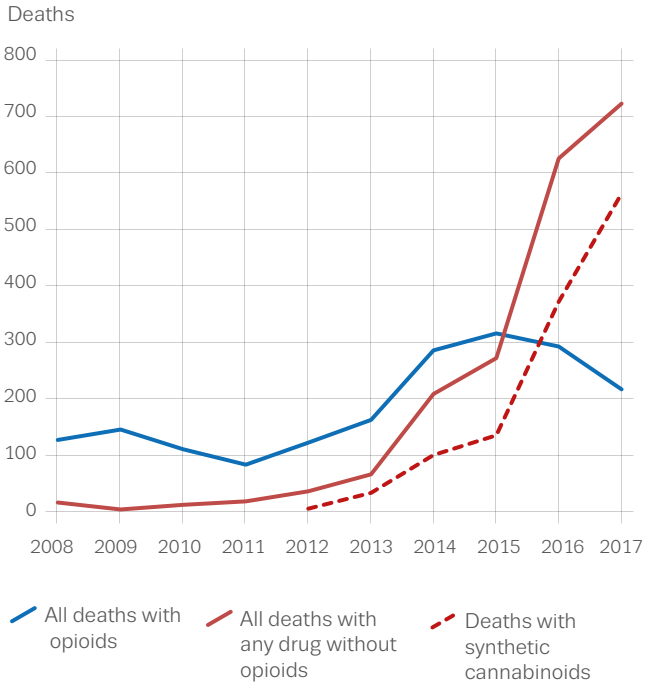
In Luxembourg, the prevalence of cocaine consumption among high-risk drug users has been increasing over time, as evidenced in data from drug consumption rooms in the country: 28 % of the clients consumed cocaine in 2018, compared with 4 % in 2013 (Figure 10). There was a similar increase for 'cocaine mixture' (typically cocaine mixed with heroin): 12 % of the drug consumption room clients reported its use in 2018, compared with 3 % in 2013. In 2018, those who consumed cocaine in drug consumption rooms did so mostly by snorting (51 %) or injecting (46 %).

FIGURE 10
Drugs used in supervised drug consumption rooms in Luxembourg, 2013-18



Source: Michel Yegles, DRD expert meeting.

FIGURE 11
Opioid-related, non-opioid-related and synthetic cannabinoid-related deaths in Turkey, 2008-17



Source: Bulent Sam, DRD expert meeting.

Synthetic cannabinoids

Synthetic cannabinoids are being used in Europe among young people and vulnerable groups, including prisoners, homeless people and opioid injectors. The effects of synthetic cannabinoids often appear more pronounced and severe than those of cannabis, and can include symptoms such as tachycardia, delirium, seizures, psychosis and anxiety. Worldwide, an increase in severe poisonings and deaths associated with these substances has been observed with, at times, large outbreaks of mass poisonings overwhelming emergency responders and emergency rooms.

In Turkey, more than 550 deaths related to synthetic cannabinoids were reported in 2017, four times the number reported in 2015. Synthetic cannabinoids are associated with the majority of drug-induced deaths in Turkey (Figure 11), in contrast with the other countries in Europe.

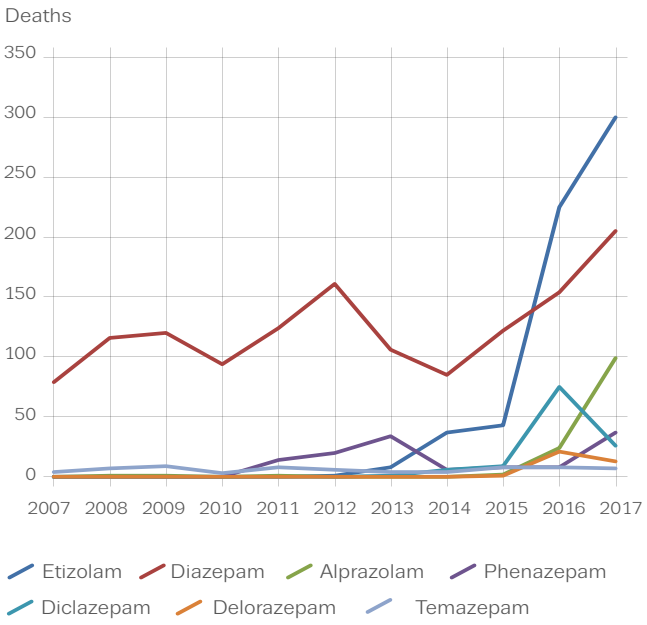
Deaths related to synthetic cannabinoids have also been reported by other countries, though to a far lesser extent. For instance, 29 deaths associated with MDMB-CHMICA were reported by five EU Member States and Norway by the time this substance was risk-assessed (EMCDDA, 2016). Particular care should be taken when comparing NPS-related deaths between countries and over time, as there may be considerable under-ascertainment and under-reporting of these cases.

Benzodiazepines

Benzodiazepines are a family of psychoactive medicines prescribed commonly for anxiety disorders, insomnia, muscle spasms and seizures. They are a risk factor for fatal drug overdose because of their depressant effect on the central nervous system, which can potentiate the respiratory depression effect of heroin and other opioids. Whereas deaths related to benzodiazepines alone do not fall within the EMCDDA definition of overdose death, benzodiazepines are often identified in post-mortem toxicology examinations of deaths related to illicit drugs.

In addition to prescription benzodiazepines, new psychoactive substances belonging to the benzodiazepine class, which are not controlled under international drug control laws, are available on the drug market in Europe. Some of these 'new benzodiazepines' are sold as fake versions of commonly prescribed anti-anxiety medicines such as alprazolam (Xanax) and diazepam (Valium), making use of existing distribution networks in the illicit drug market. Others are sold online, sometimes under their own names or marketed as 'legal' versions of authorised medicines.

FIGURE 12
Deaths where benzodiazepines were implicated in Scotland (UK), by substance, 2008-17



Source: National Records of Scotland (NRS) — reported by Andrew McAuley and Roy Robertson. Presented by Roy Robertson at the DRD expert meeting.

In Scotland, the prevalence of benzodiazepine-related deaths has increased in recent years; in 2017, benzodiazepines were implicated in more than half of the 934 drug-induced deaths recorded. A number of benzodiazepines are sold as 'street Valium' and, while they may have a similar appearance to Valium tablets, some were found to contain diclazepam, other new benzodiazepines, a mixture of etizolam and the synthetic opioid U-47,700, or U-47,700 on its own — increasing the risk of accidental overdose. Etizolam is related to the benzodiazepines and has similar effects. It is readily available online, and is associated with an increasing number of deaths (Figure 12).

Overall mortality: insights from cohort studies

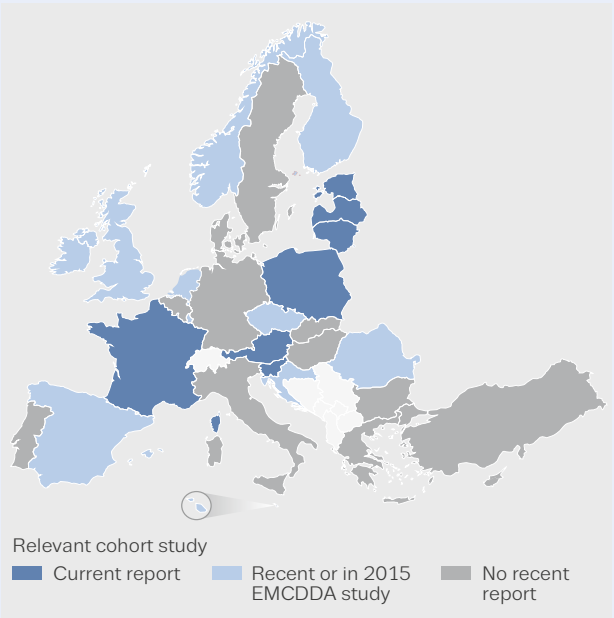
The World Health Organization (WHO) estimates that 450 000 deaths occurred in 2015 as a result of drug use (WHO, 2018). Of those, 167 000 were directly attributed to the use of drugs, that is, drug-induced deaths or

Monitoring overall mortality

Monitoring overall mortality among high-risk drug users is the second component of the EMCDDA DRD epidemiological indicator. The overall or 'all-cause' mortality among high-risk drug users is investigated by means of cohort studies, which link records from death registers with records of individuals — typically from treatment registers — who are or have been using drugs. In this way, it is possible to check the vital status of the individuals who enrolled in treatment at some point. Follow-up cohort studies also allow measurements of behaviour over time, for example the duration of treatment and interruptions, if any. 'Linkage studies' connect records of drug users and mortality registers but do not collect information on subsequent drug use or treatment history after enrolment.

Although their results might not be readily generalisable to other populations of high-risk drug users, mortality cohort studies are an important contribution to a better understanding of drug-related deaths. They determine overall mortality rates among high-risk drug users, estimate their excess mortality risk compared with the general population, and give information about cause-specific mortality such as from hepatitis, liver disease, cancer and violence. They can also serve to measure the impact on mortality of interventions, such as opioid substitution treatment, and they give information about changes in the risks of death, such as those related to ageing. Many countries affiliated to the EMCDDA report insights from such studies (EMCDDA, 2011, 2015), but their use could be expanded to include the remaining countries.

Availability of cohorts and reports of information from cohort studies listed in the present paper and in the 2015 EMCDDA study



overdoses. Reducing these deaths therefore remains a major challenge for public health policy worldwide and in Europe, as highlighted by the recent European data on drug-induced deaths presented above.

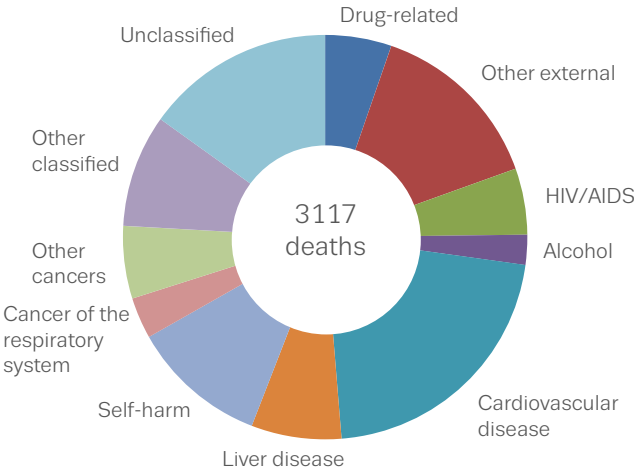
In addition, deaths from a number of other causes, such as those related to HIV or hepatitis C acquired through unsafe injection practices, are indirectly attributed to drug use. Taken all together, mortality directly or indirectly attributed to the use of illicit drugs is a considerable contributor to avoidable and premature deaths among adults worldwide. In many European countries, it accounts for a considerable number of years of life lost.

Crude drug-related mortality rates, excess mortality of high-risk drug users compared with the general population of the same age and sex, survival, and the most frequent causes of death among high-risk drug users are detailed below. The discussion is informed by new analyses of cohort studies presented by experts from Poland, Latvia, Austria and Estonia, in combination with findings from cohort studies that have been conducted in Europe over the past decade and discussed in previous publications (see figure in the box 'Monitoring overall mortality', page 13, and the Appendix).

Crude mortality rates

The majority of cohort studies reviewed show a crude mortality rate among enrolled high-risk drug users in the range of 10 to almost 30 deaths per 1 000 person-years (EMCDDA, 2011, 2015; Giraudon et al., 2012). Findings from Poland were presented, based on a cohort study that followed up 42 700 persons (346 735 person-years) between 2000 and 2016 (Appendix). A total of 5 489 deaths (13 %) were reported over the study period, corresponding to a crude mortality rate of 15.8 per 1 000 person-years.

FIGURE 13
Distribution of death causes, Polish cohort study



Source: Janusz Sierosławski, DRD meeting.

Overdoses typically account for between one third and half of the deaths among high-risk drug users (EMCDDA, 2015). An important limitation of some cohort studies is the fact that causes of death are sometimes unavailable, or non-specifically coded. This may result in an underestimation of the true proportion of deaths caused by overdose. In recent results from the Polish cohort study, 5 % of the deaths are classified as drug-related, but many others are classified in ways that may suggest a mislabelling of overdoses; for example, some of those coded as related to 'cardiovascular disease', but also some that are recorded as 'unclassified', 'other classified' or 'self-harm' (Figure 13).

Definitions used in mortality cohort studies

Crude mortality rate: a measure of the number of deaths in a population, scaled to the size of that population, per unit time. It is typically expressed as deaths per 100 or per 1 000 individuals per year.

High-risk drug use: injecting drug use or long-duration/regular use of opioids, cocaine and/or amphetamines.

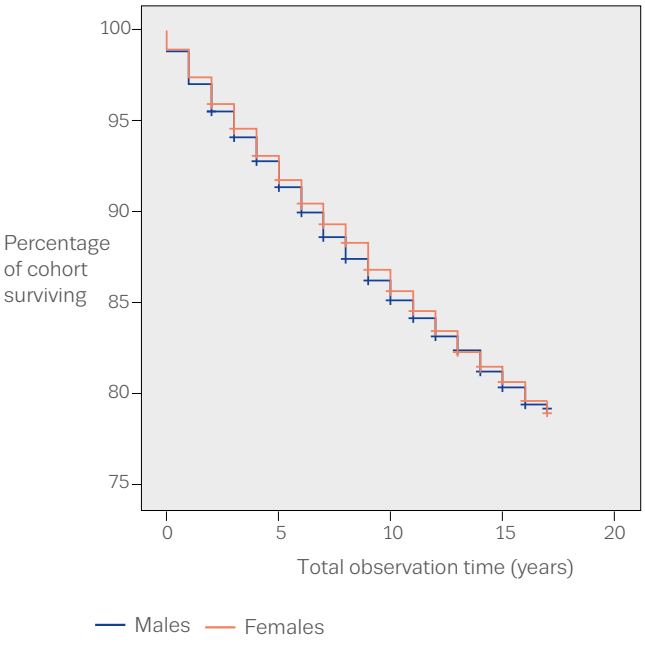
Person-years: an estimate of the actual time at risk, in years, that all study participants contributed to the study.

Standardised mortality rate: a crude mortality rate that is adjusted for differences in age and sex composition between the study population (e.g. high-risk drug users) and a standard population.

Standardised mortality ratio: a measure of the excess risk of mortality of a specific group compared with their peers of the same age and gender in the general population.

Survival analysis: a form of time-to-event analysis in which the event considered is the death of participants, and time is measured from the participants' enrolment in the study.

FIGURE 14
Survival functions for males and females in psychiatric residential treatment facilities, in Poland, from 2000 to 2016



Note: 346 735 person-years of follow-up.
Source: Janusz Sieroslawski, DRD meeting.

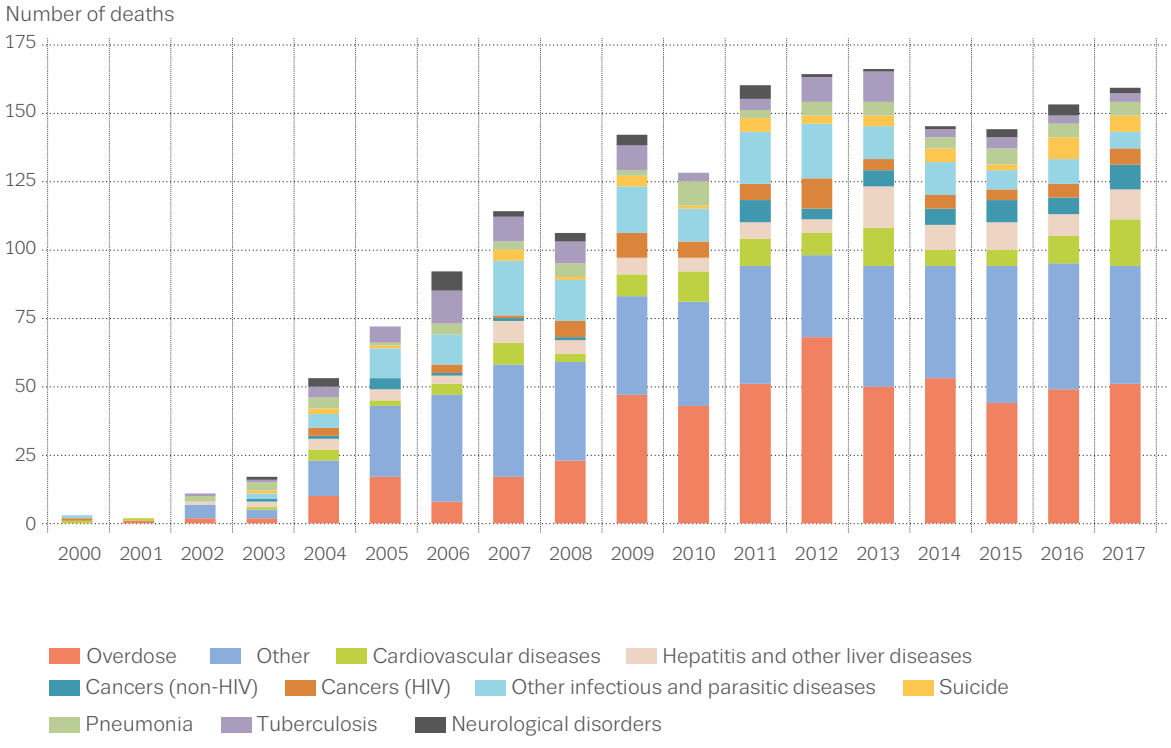
Excess mortality and premature deaths

Data suggest that high-risk drug users have a three to 20 times higher mortality risk than their peers of the same age and gender in the general population (three to seven times higher overall in the studies reported in 2018; Appendix). The excess risk of overdose mortality in particular is much higher (see Latvian study below).

Survival analysis provides an insight into how the risk of death accumulates over time and how the lives of the participants enrolled in a study are lost prematurely. In the Polish cohort study, almost one tenth of the participants died within the first 5 to 8 years of follow-up, and one fifth died within 13 to 15 years (Figure 14). In this study, the mortality risk was relatively constant over time, following the enrolment of participants.

In Austria, a large cohort study enrolled more than 25 000 patients receiving opioid substitution treatment, from January 2002 to December 2016. Most participants were enrolled in their early twenties. Over 1 500 deaths were recorded, more than a third of which were coded in the special mortality register as directly related to drug use. The crude mortality rate of participants was 7.7/1 000 person-years and the standard mortality ratio was 4.5. This means that the mortality risk of those who have started

FIGURE 15
Deaths among a retrospective cohort of people living with HIV in Estonia, by cause, 2000-17



Source: Liis Lemsalu, presented by Gleb Denissov, adapted by the EMCDDA.

Opioid multi-indicator analysis: estimating the expected numbers of opioid overdose deaths

Mortality cohort studies can be used to cross-validate national statistics on overdose. To get an accurate and valid measure of the real burden of drug overdose, an assessment of its possible underestimation is important. This can be done, for example, through capture-recapture techniques (Janssen, 2011). The EMCDDA developed a model for opioid multi-indicator analysis to explore possible opioid overdose underestimations. The model is based on the assumption that the number of fatal opioid overdoses is proportional to the size of the population at risk.

To implement the multi-indicator triangulation, several indicators are combined, separately for each country: high-risk opioid users prevalence, number of clients in opioid substitution treatment (OST) proportion of injectors and reported number of fatal opioid overdoses. Some other indicators are not included in the current model (e.g. age, polydrug use, market indicators and other protective interventions in addition to OST, such as take-home naloxone or safe consumption facilities).

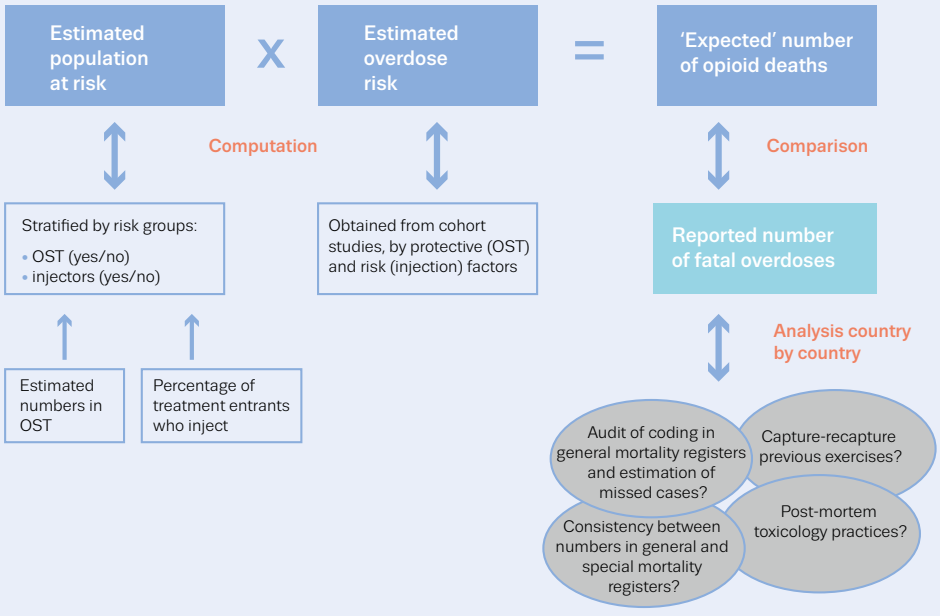
Three subgroups of high-risk opioid users are defined based on their level of risk of overdose death; those in OST (low risk), those not in OST and not injecting drugs (medium risk), and those injecting drugs and not in OST (high risk). The OST group is further divided into treatment 'predominantly based on methadone' and 'predominantly based on buprenorphine'. The expected mortality rates for each group are derived from scientific literature, and where possible from national cohort studies. The expected number of opioid-induced deaths is computed for each subgroup and added up to determine the expected number of fatal opioid overdoses.

The methodology was piloted in two countries: Latvia and Bulgaria.

In Latvia, preliminary estimates of opioid-induced deaths were obtained with different methods and sources. These estimates varied substantially, but in all cases strongly suggested an underestimation. Possible reasons for it include difficulty in identifying novel synthetic opioids; limited number of full post-mortem investigations; unspecific and ill-defined causes of deaths; and lack of liaison between forensic sources and the general mortality register.

In Bulgaria, findings strongly suggested an underestimation. Possible reasons include limited analytical capacity, limited number of toxicologists, limited use of information from police and forensic laboratory sources in death certification, and possible overestimation of the number of high-risk opioid users (inflating the estimated number of opioid deaths).

Preliminary recommendations included enhancing the descriptive epidemiology of overdoses in terms of time, place and persons; considering a capture-recapture study; refining high-risk opioid use estimates; mapping the responses in place; and cross-validating fatal overdose data with drug-related emergencies, treatment and market data.



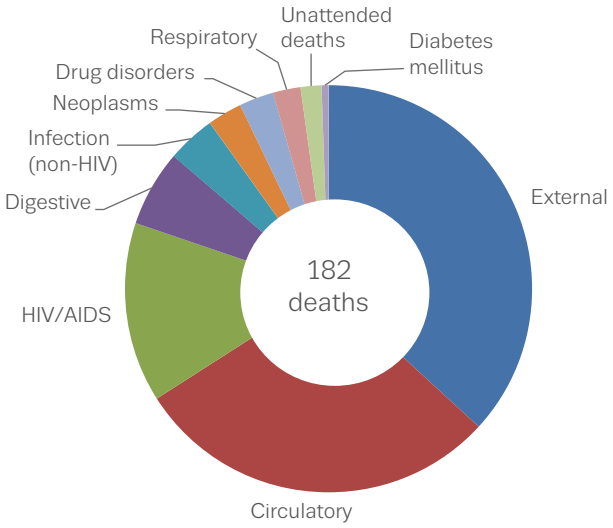
opioid substitution treatment was 4.5 times that of the general population with the same age and gender distribution. It also suggests that the mortality of people receiving opioid substitution treatment in Austria is lower than in other countries (see Appendix).

In Estonia, HIV infection and drug use are strongly interlinked. A retrospective register-based cohort study that enrolled almost 7 900 patients living with HIV, and linked healthcare data from national databases with the Estonian Causes of Death Registry, provides interesting insights into drug-related deaths. It must be borne in mind that as the enrolment criteria in this study (patients living with HIV) differ from those in many other studies (patients enrolled in drug treatment), the results are not readily comparable.

By the end of 2017, the study showed that drug overdose was the most frequent cause of death (29 %; Figure 15). The overall median age at death was 33 years, but younger for those who died of overdose (31 years) and suicide (31 years), and higher for those who died of cardiovascular disease (45 years) or non-HIV-related cancer (51 years). The mortality rates observed in this study were very high (31 deaths per 1 000 person-years; Appendix). In Estonia, almost half (47 %) of the fatal overdoses reported in 2017 occurred in people who lived with HIV, underlining how overdose risk, injecting drug use and HIV are closely interlinked. These findings are important to inform the provision of responses appropriate to the needs and risks of this population (Lemsalu et al., 2018).

In Latvia, the pilot study mentioned in the box on multi-indicator analysis (page 16) was in part informed by the recent longitudinal cohort study conducted from January 2013 to December 2017, which enrolled 2 315 high-risk drug users (primarily opioid/stimulant and synthetic cannabinoid users) aged 15- to 49-years-old. The mean age at enrolment was 29 years, and eight out of 10 participants were male. There were 182 deaths reported, more than a third (37 %) of which were attributed to external causes, and almost a third (29 %) to disease of the circulatory system (Figure 16). The analysis of cause of death reported in death certificates revealed that only 15 (8 %) of the 182 deaths were coded as overdose in the general mortality register. This small number suggests that some of the 67 deaths attributed to external causes may have been unrecognised and miscoded overdoses. There could be other unrecognised overdoses, for example among those reported as due to 'disease of the circulatory system' (53 fatalities). Therefore, the 15 recorded overdoses can be taken as a minimum figure, as it is likely that only some of the overdoses are flagged and retrievable in national mortality statistics.

FIGURE 16
Causes of deaths among high-risk drug users enrolled in the Latvian cohort study between 2013 and 2017



Source: Diāna Vanaga, presented by Linda Veisberga, adapted by the EMCDDA.

Responding to drug-related deaths

Reducing overdose morbidity and mortality is a major public health challenge in Europe. A broader public health response in this area aims to reduce vulnerability among high-risk drug users, especially by removing barriers and making services accessible, and by empowering them to take fewer risks (EMCDDA, 2017c, 2018c). In recent years, some European countries (e.g. Norway and Sweden) have developed national overdose prevention strategies, and specific enquiries into drug overdose have been conducted in the United Kingdom (ONS, 2018).

This section concerns only drug consumption rooms and take-home naloxone programmes, for which national updates were presented and discussed at the expert meeting, including challenges in measuring their impact. An overview of other responses to drug-related deaths, including retention in opioid substitution treatment, which has a strong protective effect, is available in the European guide *Health and Social Responses to Drug Problems* (EMCDDA, 2017c) and at the EMCDDA's online Best Practice Portal.

Drug consumption rooms

Drug consumption rooms are professionally supervised healthcare facilities where people can use drugs in safer and more hygienic conditions (Hedrich et al., 2010). Drug consumption rooms seek to attract hard-to-reach populations of people who use drugs, especially

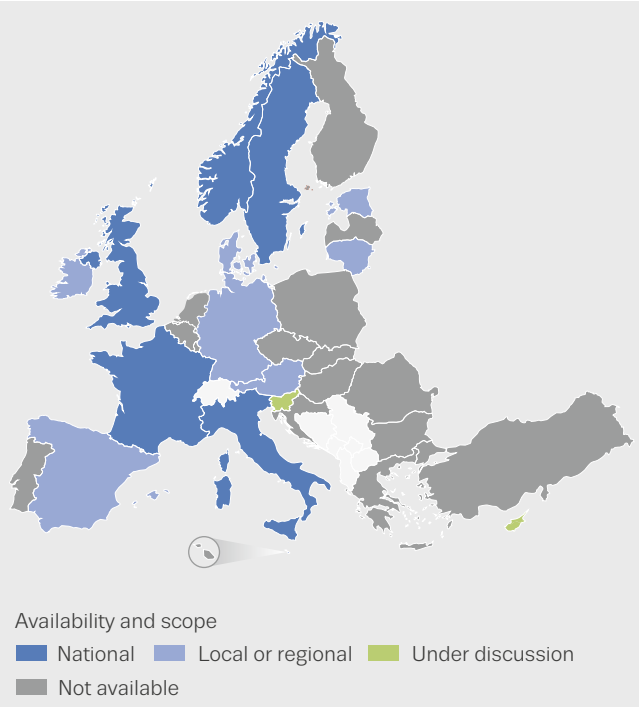
marginalised groups and those who use drugs on the streets or in other risky settings. They aim to reduce morbidity and mortality by providing a safe environment, training clients in safer drug use, and promoting access to social, health and drug treatment facilities (Hedrich et al., 2015). Drug consumption rooms also seek to reduce drug use in public places and improve public amenity in areas surrounding urban drug markets. Six EU countries (Belgium, Denmark, France, Luxembourg, Netherlands, Spain) and Norway, as well as Switzerland, Canada and Australia, have established drug consumption rooms as part of an integrated response to specific local problems.

Studies on the effectiveness and impact of safer injecting facilities suggest that drug consumption rooms reach the most marginalised injecting drug users, facilitate access to healthcare services, are effective in reducing self-reported high-risk behaviour, promote safer use practices and may therefore have a protective effect regarding overdose-related morbidity and mortality. They have not been shown to increase drug use or frequency of injecting among their clients, and do not result in higher rates of local drug-related crime, but are likely to be effective only when integrated into a wider public policy framework and based on consensus, support and active cooperation among local key actors (healthcare providers, police, local authorities and consumers themselves). For an overview on the research on drug consumption rooms, see Belackova and Salmon (2017), Belackova et al. (2019), Hedrich and Hartnoll (2015) and Kennedy et al. (2017). At the meeting, experts from three countries provided updates on the introduction or expansion of drug consumption rooms in their jurisdictions. In France, during the first 12 months of a pilot project in Paris and Strasbourg, more than 1 000 clients used the drug consumption rooms, and more than 200 consumptions were supervised each day. In Finland, in 2018 the Helsinki city council agreed to establish a drug consumption room. In Canada, 20 such facilities, operating in 11 cities, were recently established in response to the opioid deaths epidemic in the country.

Take-home naloxone programmes

Naloxone is an opioid antagonist medication used worldwide in emergency medicine to reverse respiratory depression caused by opioid overdose. Take-home naloxone (THN) programmes aim to prevent opioid overdose deaths by providing the medication to potential bystanders (e.g. opioid users, their peers and families) and training them to recognise an overdose and intervene using naloxone. The medication is available as an injectable solution in ampoules or pre-filled syringes and, more recently, as an intranasal spray'.

FIGURE 17
Availability and scope of take-home naloxone programmes in Europe, 2018



In Europe, THN programmes of local, regional or national scope are currently running in 11 countries. In Italy, where the medication is available without prescription, service providers can distribute it to potential bystanders (EMCDDA, 2018c; Figure 17).

In Norway, the implementation of the national THN programme is expanding; the medication and related training is now available in more than 30 municipalities, and a newly approved nasal naloxone spray is in use since June 2018. The programme is supported by government funding, involves user groups and other key stakeholders, and is carried out in collaboration with the public health infrastructure, which allows a broad reach and rapid expansion. More than 1 200 trainers have been trained, and more than 6 000 naloxone kits were distributed between 2014 and 2017 (including more than 2 500 in 2017 alone), as well as a provisional number of around 4 000 for 2018, adding up to more than 10 000 kits distributed from 2014 to 2018 in Norway. An e-health training programme and video are also available.

The Estonian THN programme started in 2013 and is implemented by six service providers in the counties of Harju and East Viru. By the end of 2017, more than 2 000 people had been trained and 2 600 naloxone kits had been

distributed. The programme was extended to prison medical departments in 2015: around 140 prisoners were trained in the use of naloxone and given pre-filled naloxone syringes upon release, in order to reduce the risk of opioid overdose death.

In 2017, the Swedish government ordered the National Board of Health and Welfare and the Swedish Medicinal Products Agency to increase the availability of naloxone in pre-hospital settings. This resulted in national guidelines for naloxone programmes, which allow nurses to prescribe and hand out naloxone to patients at risk of an opioid overdose. A national information package on overdose risks and overdose treatment has also been developed. There are two versions, one directed at those using opioids, and their relatives, and one directed at professionals.

With increasing implementation of THN programmes, the evidence base for their effectiveness is growing (Bird et al., 2016; Espelt et al., 2017; Langham et al., 2018). While studies confirm that naloxone saves lives, they also caution against taking THN programmes as a panacea. The extent of impact of THN is likely to vary from country to country. Mortality impact studies will be critical to ensuring the future sustainability and development of THN programmes.

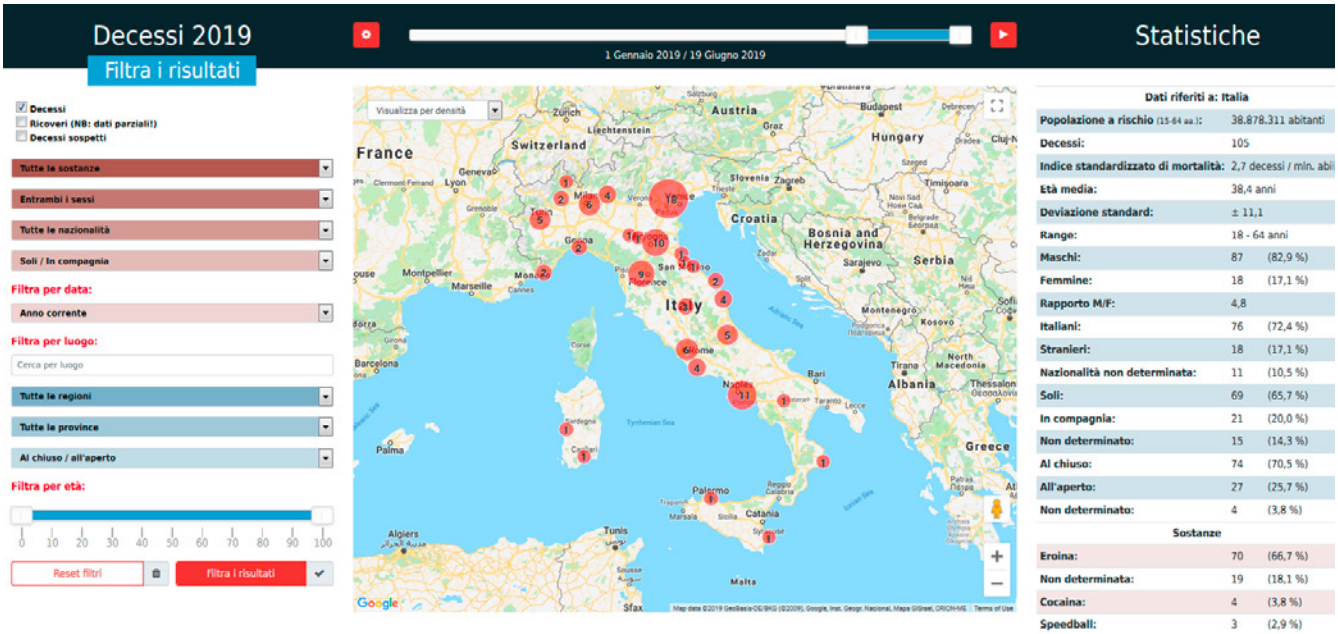
The way forward: exploring complementary sources

In addition to taking stock of the epidemiological situation and current responses to drug overdose in Europe, the annual expert meeting also facilitated the sharing of monitoring experiences with additional sources of information: open source information and hospital emergency settings. These sources provide data that can be triangulated with other sources in order to detect changing patterns and the emergence of new substances. They also provide data in a more timely manner, potentially contributing to earlier identification of problems.

Open source information monitoring

GeOverdose.it, a private initiative, is an Italian database linked to a geographical information system, interfaced with a website, that provides a visual mapping of fatal and non-fatal drug overdoses in Italy. The database is fed by search engines scanning online national and local newspapers, and is continuously updated by professionals working in public treatment services (Figure 18). This project is linked to 'NeverDose', an experimental programme aiming to prevent drug overdose. Both programmes form a concrete attempt to use new technologies and the internet for the prevention and reduction of drug-related harms. An important benefit of GeOverdose.it, in addition to providing an early warning of

FIGURE 18
Screenshot of the GeOverdose website, Italy



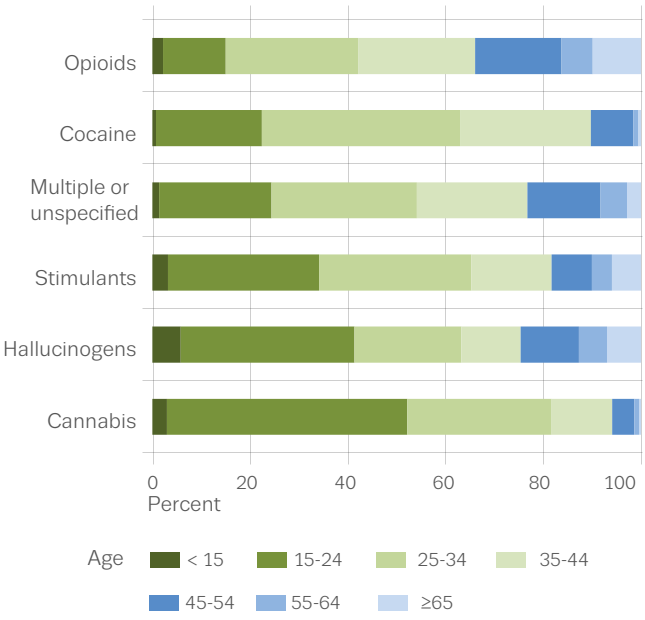
Source: https://www.geoverdose.it/

clusters of overdose, is that the information can be triangulated with other sources, such as drug seizures, wastewater analysis, hospital data and drug treatment data, to detect signals of changing health threats. GeOverdose.it monitoring shows that the overwhelming majority of overdosed drug users were alone at the time of consumption. This initiative aims to raise awareness among local communities for prompt integrated interventions.

Hospital emergencies: monitoring acute intoxications

In France, a national system of surveillance based on emergency departments was set up to identify situations requiring a rapid public health response. Data collection is based on direct extraction from patients' electronic medical records compiled during their visit to the emergency room. Data include main and associated diagnoses coded with the International Classification of Diseases 10th Revision (ICD-10), and destination of the patient after the emergency visit. Similarly to other countries in Europe, the surveillance system shows that drug-related hospital emergency visits concern mainly a young adult male population. The most common substances involved in acute toxicity presentations vary by location and year, and there are marked differences in the demographics of the patients, depending on the substances used: a third of the acute intoxications related to opioids occur among patients aged 45 years and more, and over half of the intoxications related to cannabis occur in patients aged less than 25 years (Figure 19). This information source has the added advantage of timeliness and capacity to contribute to early warnings, compared with the less timely data from national mortality statistics.

FIGURE 19
Distribution of drug-related hospital emergency visits in France, by age group and substances in 2015



Source: OSCOUR network (Santé Publique France), processed by the French Observatory for Drugs and Drug Addiction (OFDT), presented by Anne-Claire Brisacier at the DRD expert meeting.

Conclusions

This publication provides an update on drug-related deaths in the EU Member States, Norway and Turkey, and of the state of play of the monitoring of this public health issue by the Reitox national focal points and national experts. The European monitoring of drug-related deaths is based on two pillars: the monitoring of drug-induced deaths or overdoses, and the monitoring of the overall mortality risk among people using drugs, particularly those who are high-risk drug users. From both perspectives, according to the most recent data presented here, there are reasons for concern.

Thousands of drug-induced deaths are reported in Europe every year. These deaths are preventable and premature. Opioids, mainly heroin, continue to take the highest toll, but there are worrying trends highlighted by forensic toxicology evidence in some parts of Europe. These are related to changes in the drug market and the availability of new opioids (including fentanyl analogues), prescription opioids, other medicines such as new benzodiazepines, and cocaine in both powder and crack form. There are also challenges arising from the changing populations at risk, in particular the continued ageing of opioid users in west European countries.

The updates presented in this report shed light on important public health challenges faced by European policymakers and stakeholders, with regard to prevention, risk assessment, harm reduction and drug treatment. Overdose is a multifaceted problem (EMCDDA, 2017b) requiring a combination of responses tailored to the particular circumstances of at-risk populations. Beyond overdose, other causes of morbidity and mortality disproportionally affect people using drugs. Reducing drug-related mortality associated with somatic causes, such as HIV/AIDS, hepatitis and liver failure, and also alcohol-related problems, suicide and violence, will demand additional responses. Cohort studies contribute to a better understanding of drug-related mortality in Europe, including the impact of particular responses. The implementation of cohort and linkage studies in EU Member States that have not yet done so requires

relatively little investment and may be as simple as linking treatment data with mortality registers.

There is a need to improve the epidemiology of drug-related deaths in order to get more accurate and informative figures. Doing so includes strengthening the completeness and comparability of information available from forensic toxicology sources, if the exact drivers and triggers of deaths and outbreaks are to be understood and tackled. Investing in enhanced monitoring, preparedness and responses in Europe is crucial, particularly against the backdrop of the drug overdose crises currently experienced by the United States and Canada.

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References

Ahmad, F. B., Rossen, L. M., Spencer, M. R., Warner, M. and Sutton, P. (2019), *Provisional drug overdose death counts*, CDC National Center for Health Statistics.

Belackova, V., Salmon, A. M., Day, C. A., Ritter, A., Shanahan, M., Hedrich, D., Kerr, T. and Jauncey, M. (2019), 'Drug consumption rooms: a systematic review of evaluation methodologies', *Drug and Alcohol Review*, doi:10.1111/dar.12919.

Belackova, V. and Salmon, A. M. (2017), *Overview of international literature: supervised injecting facilities & drug consumption rooms — Issue 1,* Uniting Medically Supervised Injecting Rooms, Sydney Medically Supervised Injecting Centre, Sydney.

Bird, S. M., McAuley, A., Perry, S. and Hunter, C. (2016), 'Effectiveness of Scotland's national naloxone programme: response to letter to editor', *Addiction* 111(7), pp. 1304-1306.

EMCDDA (2010), *Drug-related deaths (DRD) standard protocol, version 3.2*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.

EMCDDA (2011), *Mortality related to drug use in Europe: public health implications*, Selected Issues, Publications Office of the European Union, Luxembourg.

EMCDDA (2015), *Mortality among drug users in Europe: new and old challenges for public health*, EMCDDA Papers, Publications Office of the European Union, Luxembourg.

EMCDDA (2016), *Report on the risk assessment of methyl 2-[[1-(cyclohexylmethyl)-1H-indole-3-carbonyl]amino]-3,3-dimethylbutanoate (MDMB-CHMICA) in the framework of the Council Decision on new psychoactive substances,* Risk Assessments 19, Publications Office of the European Union, Luxembourg.

EMCDDA (2017a), *Acryloylfentanyl: report on the risk assessment of N-(1-phenethylpiperidin-4-yl)-N-phenylacrylamide (acryloylfentanyl) in the framework of the Council Decision on new psychoactive substances*, Risk Assessments 20, Publications Office of the European Union, Luxembourg.

EMCDDA (2017b), 'EMCDDA assessment of drug-induced death data and contextual information in selected countries', Technical Reports, European Monitoring Centre for Drugs and Drug Addiction, Lisbon (available at http://www.emcdda.europa.eu/publications).

EMCDDA (2017c), *Health and social responses to drug problems: a European guide*, Publications Office of the European Union, Luxembourg.

EMCDDA (2018a), *Carfentanil: report on the risk assessment of methyl 1-(2-phenylethyl)-4-[phenyl(propanoyl)amino]piperidine-4-carboxylate in the framework of the Council Decision on new psychoactive substances*, Risk Assessments 28, Publications Office of the European Union, Luxembourg.

EMCDDA (2018b), *Cyclopropylfentanyl: report on the risk assessment of N-phenyl-N-[1-(2-phenylethyl)piperidin-4-yl] cyclopropanecarboxamide in the framework of the Council Decision on new psychoactive substances*, Risk Assessments 29, Publications Office of the European Union, Luxembourg.

EMCDDA (2018c), *Preventing overdose deaths in Europe,* Perspectives on Drugs, European Monitoring Centre for Drugs and Drug Addiction, Lisbon, updated 3 October 2018 (http://www.emcdda.europa.eu/topics/pods/preventing-overdose-deaths).

- EMCDDA (2018d), *Recent changes in Europe's cocaine market: results from an EMCDDA trendspotter study*, Rapid Communications, Publications Office of the European Union, Luxembourg.
- EMCDDA (2019), *Analysis of practices of post mortem toxicology of drug-related deaths cases in Europe*, Technical Reports, Publications Office of the European Union, Luxembourg.
- England, K. (2017a), *Drug-related deaths monitoring — Part I: codification practices of drug related deaths following the WHO revision of ICD coding guidelines related to DRDs*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon (available at http://www.emcdda.europa.eu/document-library).
- England, K. (2017b), *Drug-related deaths monitoring — Part II: codification practices in some countries following the WHO revision of ICD coding guidelines related to DRDs*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon (available at http://www.emcdda.europa.eu/document-library).
- England, K. (2017c), *Drug-related deaths monitoring — Part III: a review of the inventory of the national special mortality registries in Europe with a focus on information flow to the general mortality registries*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon (available at http://www.emcdda.europa.eu/document-library).
- Espelt, A., Bosque-Prous, M., Folch, C., Sarasa-Renedo, A., Majo, X., Casabona, J., Brugal, M. T. and Redan Group (2017), 'Is systematic training in opioid overdose prevention effective?', *PLoS One* 12(10), e0186833.
- Gao, L., Dimitropoulou, P., Robertson, J. R., McTaggart, S., Bennie, M. and Bird, S. M. (2016), 'Risk-factors for methadone-specific deaths in Scotland's methadone-prescription clients between 2009 and 2013', *Drug and Alcohol Dependence* 167, pp. 214-223.
- Giraudon, I., Vicente, J., Matias, J., Mounteney, J. and Griffiths, P. (2012), 'Reducing drug related mortality in Europe: a seemingly intractable public health issue', Adicciones 24(1), pp. 3-7.
- Hedegaard, H., Minino, A. M. and Warner, M. (2018), *Drug overdose deaths in the United States, 1999-2017*, NCHS Data Brief 329, National Center for Health Statistics, Hyattsville, MD.
- Hedrich, D. and Hartnoll, R. (2015), 'Harm reductions interventions', in el Guebaly, N., Carrà, G. and Galanter, M. (eds.), *Textbook of addiction treatment: international perspectives,* Springer, Milano, pp. 1291-1313.
- Hedrich, D., Kerr, T. and Dubois-Arber, F. (2010), 'Drug consumption facilities in Europe and beyond', in *Harm reduction: evidence, impact and challenges*, EMCDDA Monograph, Publications Office of the European Union, Luxembourg, pp. 305-331.
- Janssen, E. (2011), 'Drug-related deaths in France in 2007: estimates and implications', *Substance Use & Misuse* 46(12), pp. 1495-1501.
- Kennedy, M. C., Karamouzian, M. and Kerr, T. (2017), 'Public health and public order outcomes associated with supervised drug consumption facilities: a systematic review', *Current HIV/AIDS Reports* 14(5), pp. 161-183.
- Langham, S., Wright, A., Kenworthy, J., Grieve, R. and Dunlop, W. C. N. (2018), 'Cost-effectiveness of take-home naloxone for the prevention of overdose fatalities among heroin users in the United Kingdom', *Value in Health* 21(4), pp. 407-415.
- Leifman, H. (2017), 'Drug-related deaths in Sweden: estimations of trends, effects of changes in recording practices and studies of drug patterns', EMCDDA Commissioned paper (available at http://www.emcdda.europa.eu/document-library).
- Lemsalu, L., Uusküla, A., Rice, B., Raag, M. and Rüütel, K. (2018), 'Drug overdose is the most common cause of death among HIV infected people in Estonia', poster presented at AIDS 2018, July 23-27, Amsterdam.
- Muller, A. E., Clausen, T., Sjogren, P., Odsbu, I. and Skurtveit, S. (2019), 'Prescribed opioid analgesic use developments in three Nordic countries, 2006-2017', *Scandinavian Journal of Pain* 19(2), pp. 345-353.
- National Board of Forensic Medicine (2019), *Statistik – Rättsmedicinalverket*, https://www.rmv.se/om-oss/forskning/aktuell-statistik/ (accessed on 6 June 2019).
- National Records of Scotland, (2018), *Drug-related deaths in Scotland in 2017. Statistics of drug-related deaths in 2017 and earlier years, broken down by cause of death, selected drugs reported, age and sex* (available at https://www.nrscotland.gov.uk/).
- ONS (Office for National Statistics) (2018), *Drug-related deaths 'deep dive' into coroners' records: an experimental 'deep dive' study investigating deaths related to drug misuse in 2014 and 2015 using available coroners' records*, https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/articles/drugrelateddeathsdeepdiveintocoronersrecords/2018-08-06, accessed on 5 June 2019.
- Pierce, M., Bird, S. M., Hickman, M. and Millar, T. (2015), 'National record linkage study of mortality for a large cohort of opioid users ascertained by drug treatment or criminal justice sources in England, 2005-2009', *Drug and Alcohol Dependence* 146, pp. 17-23.
- Pierce, M., Millar, T., Robertson, J. R. and Bird, S. M. (2018), 'Ageing opioid users' increased risk of methadone-specific death in the UK', *International Journal of Drug Policy* 55, pp. 121-127.
- Special Advisory Committee on the Epidemic of Opioid Overdoses (2018), *National report: apparent opioid-related deaths in Canada (January 2016 to June 2018)*, Public Health Agency of Canada, Ottawa.
- WHO (2018), *Information sheet on opioid overdose*, https://www.who.int/substance_abuse/information-sheet/en/, accessed on 5 June 2019.

Appendix

Results of the EMCDDA review of cohorts presented or reported in 2018

Country	Enrolment period	End of follow-up	Mean age at enrolment (years)	% male	Inclusion criteria and setting	Person-years followed up (participants)	Mean observation time (years)	Number of deaths	Crude mortality rate per 1 000 person-years (95 % confidence interval)	Standardised mortality ratio (95 % confidence interval)
Austria	1.1.2002	31.12.2016	28.9	75	All persons starting OST	197 739		1 526	7.7	4.5 (4.3-4.7)
Estonia	1.1.2000 to 31.12.2017	31.12.2017	29.7	63.5	People who had a national ID-code-based-HIV related (ICD-10 B20-24, Z21, Fo2.4) national healthcare bill (out-/inpatient care, prisons) or had been registered as a new HIV case.	57 994 (*n* = 7 770)	7.5	All causes: 1 831 DRD: 559	All causes: 31.3 (29.9 to 32.8) DRD all: 9.6 (8.8-10.4) DRD male: 13.4 (12.2-14.7) DRD female: 4.0 (3.2-4.8)	DRD all: 35.0 (31.9-38.3) DRD male: 31.9 (28.8-35.2) DRD female: 65.3 (52.1-80.6)
France	September 2009 to December 2011	31.12.2015	35.4	77	Last-month use of illicit substances (other than cannabis), OST, whether prescribed by a physician or not, or benzodiazepines not including therapeutic use. Setting: addiction treatment centres for drug users, and harm reduction centres	5 120 (*n* = 955)	5.4	73	14.3 (6.8-21.8)	7.0 (5.5-8.8)
Latvia	1.1.2013 to 31.12.2017	31.12.2017	29.2	81	Opioid/stimulant/synthetic cannabinoid recent users (last 30 days)	6 327 (*n* = 2 315)	2.7	182	28.8 (24.9-33.2)	5.3 (4.6-6.1)
Lithuania	1.1.2016 to 31.12.2017	31.12.2017			Retrospective linkage study. Six months after release from prison			64 in 2016 and 58 in 2017, of which respectively 17 and 8 overdoses		
Poland	2000 to 2014	2016	32.1	69	Residential treatment psychiatric facilities. All of Poland. Patients diagnosed with ICD-10 codes F11-F16, F18, F19	346 735 (*n* = 140 604) [Vital status identified 42 771]	8.1	5 489	15.8 (15.4-16.3)	3.4 (3.3-3.5) Male 4.6 (4.5-4.7) Female: 2.1 (2.0-2.2)
Slovenia	1.1.2009 to 31.12.2012	31.12.2015	30.7	78.9	18 outpatient treatment centres, 1 hospital unit, 3 prisons	28 376 (*n* = 5 012)	5.6	135	26.9 (22.5-31.4)	3.9 (3.2-4.6)

Abbreviations: DRD, drug-related deaths; ICD-10, International Classification of Diseases (10th revision); OST, opioid substitution treatment.

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Rapid Communications bring you the latest findings and discussions in key areas in the drugs field. This publication provides an update on drug-related deaths in Europe, presenting and analysing the latest data and trends in drug-induced deaths and overall mortality among high-risk drug users in the European Union and beyond. It draws on contributions from specialists representing more than 40 countries at the latest meeting of the EMCDDA expert network on drug-related deaths in November 2018 as well as information provided by European countries in the annual reporting exercise.

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The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) is the central source and confirmed authority on drug-related issues in Europe. For over 20 years, it has been collecting, analysing and disseminating scientifically sound information on drugs and drug addiction and their consequences, providing its audiences with an evidence-based picture of the drug phenomenon at European level.

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