Cohort studies among people who are using drugs: Update of the European overview of mortality cohort studies

Technical report

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Gesundheit Österreich GmbH

European Monitoring Centre for Drugs and Drug Addiction

Cohort studies among people who are using drugs: Update of the European overview of mortality cohort studies

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Authors:

Tanja Schwarz
Martin Busch

Supported by:

Isabelle Giraudon (EMCDDA)
Julian Vicente (EMCDDA)

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This document is part of a package of documents that accompany the mapping and support of cohort studies among people who are using drugs (2021) and using cohort studies to answer key policy questions (2022).

Owner: Gesundheit Österreich GmbH,
Stubenring 6, 1010 Wien, Tel. +43 1 515 61, Website: www.goeg.at

Summary

This document (deliverable 3) is part of a package of documents produced in the course of a consultant study on cohort studies among people who are using drugs in the EU27, Norway and Turkey commissioned by the EMCDDA (contract no.: CT.20.HEA.0113.1.0 and CT.21.HEA.0129.1.0).

The objective was to prepare an updated list of studies from the European overview produced between 2020 and 2021. The study authors, researchers and National Focal Points were contacted and asked to report studies, if any, published since then. This mapping exercise was not aimed to be a systematic literature review and therefore other relevant cohort studies, including grey literature, might have been missed. Mortality cohort studies are a quickly moving topic that requires regular updating of information and data on a European basis.

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1 Evidence

20 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 (EMCDDA 2019). 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.

The studies were selected primarily to cover as many countries as possible, and according to the size of the population followed up. Recent long-term follow-up studies conducted at national level and enrolling between 3 000 and 5 000 participants were available for Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, France, Germany, Ireland, Latvia, Lithuania, Luxembourg, Poland, Slovenia, Sweden, and Norway. While many of these studies have been published, some countries provided cohort data that are yet unpublished. The participants in the cohort studies analysed were predominantly high-risk drug users, most of whom were engaged in opioid substitution treatment or some other form of treatment for addiction disorder at the time of their enrolment. Studies conducted in other settings, such as prisons or low-threshold services, are available for some countries.

1.1 Evidence tables

1.1.1 Austria

Table 1.1:
Austria

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Austria, national	Busch et al. (2019)	1.1.2002 to 31.12.2016	31.12.2016	OST-Statistic register	All patients starting OST	28.9	197 739 (n=24 892)	1 526	7.7 (7.3-8.0)	4.5 (4.3-4.7)	Yes, ICD-10

1.1.2 Belgium

Table 1.2:
Belgium

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Belgium, national	Van Baelen et al. (2019)	1.1.2011 to 31.12.2014	31.12.2015	SUD treatment register	All patients starting SUD treatment	37.1	84 857.4 (n=30 905)	1 323	15.59 (14.77-16.45)	n.a.	n.a.

1.1.3 Bulgaria

Table 1.3:
Bulgaria

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Bulgaria, national	ST18 of Bulgaria (2020)	1.1.2005-31.12.2009	31.12.2019	n.a.	Drug users admitted to inpatient and outpatient treatment centres	25.9	23 3320.2 (n=2 460)	255	10.9 (n.a.)	8.76 (7.74-9.92)	Yes, ICD-10

1.1.4 Croatia

Table 1.4:
Croatia

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Croatia, Zagreb	EMCDDA (2015)	1.1.2000 to 31.12.2006	1.1.2008	Psychoactive Drug Abuse register	Opiate users in treatment	27.04	24 508 (n=3 059)	230	9.4 (8.3-10.7)	8.5 (7.4-9.6)	Yes, ICD-10
Croatia, Zagreb, Split and Rijeka	Handanagic et al. (2019)	1.11.2014 to 28.2.2015	28.2.2015	Recruitment using RDS	PWID	36 (median)	n.a. (n=830)	n.a.	n.a.	n.a.	Yes, ICD-10
Croatia, Split-Dalmatia	Sutlovic et al. (2018)	1.1.2001 to 31.12.2015	31.12.2015	Drug treatment register	OST patients	35.1 (in 2015)	n.a. (n=3 189)	154	n.a.	n.a.	n.a.
Croatia, Zagreb, Split and Rijeka	Erceg (2021)	1.1.2010 to 31.12.2019	31.12.2019	Registry of persons treated for psychoactive drug abuse, causes of death registry, psychoses registry, committed suicides registry, hospitalisations database	Opiate users in treatment	33.0 (min=15; max=49)	46 861 (n=8,615)	Total 628 (7.3%), Male 537 (7.6%), Female 91 (5.7%)	13.40 (12.39-14.49)	10.19 (10.1-10.28)	Yes, ICD-10

1.1.5 Czech Republic

Table 1.5:
Czech Republic

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Czech Republic, Prague	Zabransky et al. (2011)	1.1.1995 to 31.12.2010	31.12.2010	Survey-based database	Young PWID	17.6	1 660 (n=151)	8	4.8 (n.a.)	14.38 (7.19-28.75)	Yes, ICD-10

1.1.6 Denmark

Table 1.6:
Denmark

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Denmark, national	Arendt et al. (2011)	1.1.1996 to 31.12.2006	31.12.2006	Danish Substance Abuse Treatment Register	All patients in specialized institutions for illicit SUD	29	111 445 (n=20 581)	1 441	12.9 (12.3-13.6)	7.8 (7.4-8.2)	n.a.
Denmark, national	Hesse et al. (2020)	1.1.2000 to 31.12.2010	31.12.2010	Danish Substance Abuse Treatment Register	Persons enrolled in a publicly funded outpatient treatment facility for SUD	33.5	n.a. (n=27 942)	3 070 (163 due to suicide)	n.a.	7.1 (5.8-8.4) for suicide	Yes, ICD-10
Denmark, national	Omland et al. (2010)	1.1.1995 to 31.12.2006	31.12.2006	Danish HIV Cohort Study	Patients infected with HIV through injection drug use	40 (median)	1 286 (n=392)	157	122 per 1 000 PY (104-143)	n.a.	Yes, ICD-10
Denmark, national	Thylstrup et al. (2020)	1.1.2000 to 31.12.2010	31.12.2010	Danish Substance Abuse Treatment Register	Patients enrolled in a publicly funded treatment facility for SUDs	34	n.a. (n=11 199)	572	n.a.	n.a.	Yes, ICD-10

1.1.7 Finland

Table 1.7:
Finland

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Finland, Helsinki	Onyeka et al. (2014); Onyeka et al. (2015)	1997 to 2008	2008	Helsinki Deaconess Institute (HDI) treatment data	Patients treated for drug use at HDI	24.5	41 567.5 (n=4 817)	496	1 193.2 (1 090.5–1 303.0) per 100 000 PY	8.9 (8.1–9.7)	Yes, ICD-10
Finland, Helsinki	Uosukainen et al. (2013)	1.1.1998 to 31.8.2008	31.12.2010	Helsinki Deaconess Institute (HDI) treatment data	Patients treated for buprenorphine abuse at HDI	25.7	5 371.8 (n=780)	61	3.0 (2.3–3.8)	27.9 (12.6–49.0)	Yes, ICD-10
Finland, Helsinki and Järvenpää	Pitkänen et al. (2020)	1990 to 2009	31.12.2017	Inpatient treatment data	Patients treated for SUD in three clinics	n.a.	n.a. (n=10 888)	3 938	n.a.	n.a.	n.a.
Finland	Koivisto et al. (2022)	1.7.1985 to 30.6.1986	n.a.	Northern Finland Birth Cohort 1986 (NFBC86)	Population born between 1 July 1985 and 30 June 1986, from the two northernmost provinces in Finland	n.a.	n.a. (n=7 714)	183	n.a.	n.a.	Yes, ICD-10

1.1.8 France

Table 1.8:
France

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
France	Brisacier/Cadet-Taïrou (2014); Brisacier (2015)	1.9.2009 to 31.12.2011	01.07.2013	Survey-based database	Persons seen in harm reduction facilities and national treatment and prevention centres for addiction	35.3	2 949 (n=1 134)	37	12.6 (n.a.)	6.7 (4.7-9.3)	Yes
France	Dupouy et al. (2017)	1.1.2007 to 31.12.2011	31.12.2013	Representative sample of the population protected by French health insurance (Echantillon Généraliste des Bénéficiaires)	Patients starting OST	32.9	3 219.4 (n=713)	29	0.63 per 100 PY	n.a.	Yes, ICD-10

1.1.9 Germany

Table 1.9:
Germany

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Germany	Soyka et al. (2011); Soyka et al. (2017)	–	6 years follow-up	Prospective longitudinal naturalistic study	Patients in OST treated in specialized substitution centres and at office-based doctors	34.8	N=2 284	131	1.2 per 100 PY	n.a.	Yes, ICD-10

1.1.10 Greece

Table 1.10:
Greece

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Greece	Rousssos et al. (2022)	1.4.2018 to 12.6.2022	12.06.2022	National HCV treatment registry	PWID in community-based seek-test-treat programs for HCV and HIV	40.1	6 649 (n=2 433)	243	3.50 (3.08-3.97) per 100 PY	17.17 (15.14-19.47) per 100 PY	n.a.

1.1.11 Ireland

Table 1.11:
Ireland

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Ireland	Cousins et al. (2016)	1.8.2004 to 31.12.2010	31.12.2010	National methadone treatment register	Patients prescribed and dispensed methadone	n.a.	28 895 (n=6 983)	213	0.51 and 1.57 per 100 PY on and off treatment respectively	Adjusted mortality rate ratio 3.64 (2.11-6.30)	n.a.
Ireland	O'Kelly/O'Kelly (2012)	1985	2010	Descriptive study of a community-based cohort of IDUs	Persons who inject heroin identified through local sources	n.a.	n.a. (n=82)	51	n.a.	n.a.	Yes
Ireland	Durand et al. (2020)	1.1.2010 to 31.12.2015	31.12.2015	Retrospective cohort study using addiction services and primary care dispensing records and National Methadone Register	Patients receiving methadone in specialist addiction services	33.9 (median)	13 300 (n=2 899)	154	1.14 per 100 PY (0.96-1.32)	n.a.	Yes, ICD-10

1.1.12 Italy

Table 1.12:
Italy

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Italy	Pavarin et al. (2022)	1.1.2009 to 31.12.2019	31.12.2020	Retrospective treatment data	Patients with SUD presenting to a public treatment centre for addiction	44.4	4 850 (n=5 699)	53	10.9 (8.3-14.3)	5.35 (4.09-7.0)	Yes, ICD-10
Italy	Pavarin et al. (2021)	1.1.1975 to 31.12.2016	31.12.2016	Retrospective treatment data	Patients presenting to a public treatment centre for addiction	35.4	188 569 (n=15 940)	121 suicide deaths	0.64 (0.54-0.77)	4.93 (4.12-5.89)	Yes, ICD-10
Italy	Pavarin et al. (2020)	1.1.1982 to 31.12.2016	31.12.2016	Retrospective treatment data	Cocaine users treated at a public treatment centre for drug addiction	32.0	18 015 (n=1 993)	100	5.55 (4.56-6.75)	n.a.	Yes, ICD-10
Italy	Pavarin et al. (2019)	1.1.1975 to 31.12.2016	31.12.2016	Retrospective treatment data	Heroin users treated at public treatment centre for addiction	28.9	125 413 (n=8 502)	1 603	12.78 (12.17-13.42)	10.60 (10.09-11.03)	Yes, ICD-10
Italy	Pavarin/Fioritti (2017)	1.1.1989 to 31.12.2013	31.12.2013	Retrospective treatment data	Cocaine users treated at public treatment centre for addiction	32.8	6 454 (n=852)	41	6.35 (4.68-8.63)	6.24 (4.60-8.48)	Yes, ICD-10
Italy	Pavarin et al. (2017)	1.1.1975 to 31.12.2013	31.12.2013	Retrospective treatment data	Heroin users treated at public treatment centre for addiction	29.1	74 467 (n=5 899)	1 069	14.36 (13.52-15.24)	13.16 (12.39-13.97)	Yes, ICD-10

1.1.13 Latvia

Table 1.13:
Latvia

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Latvia	Vanaga-Arāja et al. (2018); Vanaga-Arāja et al. (2019)	1.1.2013 to 31.12.2017	31.12.2017	Retrospective treatment data from Narcological Register	Opioid, stimulant and (or) synthetic cannabinoid users in treatment	29.2	6 327 (n=2 315)	182	28.8 (n.a.)	5.3 (4.56-6.10)	Yes, ICD-10
Latvia	Unpublished	1.1.2000 to 31.12.2012	31.12.2012	n.a.	Amphetamine users	n.a.	8 085.1 (n=1 709)	n.a.	n.a.	n.a.	Yes
Latvia	Unpublished	1.1.2000 to 31.12.2009	31.12.2009	n.a.	Opioid users in treatment	n.a.	21 294.3 (n=3 644)	n.a.	n.a.	n.a.	Yes

1.1.14 Lithuania

Table 1.14:
Lithuania

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Lithuania	Stukas et al. (2021)	1.1.2017 to 31.12.2017	31.12.2020	National e-health information system	Drug users admitted to inpatient and outpatient treatment centres	34.1	710.9 (n=231)	14	19.7 (11.7-33.3)	12.7 (7.5-21.4)	Yes, ICD-10
Lithuania	EMCDDA Workbook (2019)	n.a.	2019	Information Technology and Communications Department under the Ministry of the Interior	Former prisoners whose main cause of death was related to drugs	n.a.	n.a.	n.a.	n.a.	n.a.	Yes

1.1.15 Luxembourg

Table 1.15:
Luxembourg

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Luxembourg	Origer et al. (2013)	1.1.1985 to 31.12.2011	31.12.2011	Data from law enforcement and drug use surveillance sources and of forensic evidence	Fatal overdose cases related to opiates and cocaine use	n.a.	n.a. (n=340)	340	n.a.	n.a.	Yes

1.1.16 Netherlands

Table 1.16:
Netherlands

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Netherlands	de Vos et al. (2013); Grady et al. (2011); van Santen et al. (2014); van Santen et al. (2021)	1.1.1985 to 31.12.2016	31.12.2016	Open, prospective cohort study *(Amsterdam Cohort Study)*	Persons who use drugs recruited by means of local methadone outposts, a STD clinic, and word of mouth	30 (median)	2012: 18 575 (n=1 254) 2016: n.a. (n=1 661)	2012: 406 2016: 476	2012: 21.9 (19.8-24.1) 2016: n.a.	2012: 13.9 (12.6-15.3) 2016: n.a.	Yes

1.1.17 Poland

Table 1.17:
Poland

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Poland	Sierosławski (2014); Sierosławski (2019)	1.1.2000 to 31.12.2014	31.12.2016	Treatment data from residential treatment psychiatric facilities	All patients diagnosed with ICD 10 code F11, F16, F18, F19	31.1	346 735 (n=42 771)	5 489	15.8 (15.4–16.3)	3.4 (3.3–3.5)	Yes, ICD-10

1.1.18 Portugal

Table 1.18:
Portugal

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Portugal	Pombo/Costa (2017)	1.1.1992 to 31.12.2013	31.12.2013	Treatment data from hospital addiction unit	Heroin users in treatment	35.1	n.a. (n=222)	30	n.a.	n.a.	Yes

1.1.19 Romania

Table 1.19:
Romania

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Romania	Iliescu et al. (2011)	1.1.2001 to 31.12.2006	15.09.2010	Treatment data	Opiate users treated in medical units aged 15-49 years	23.37	20 188.11 (n=2 707)	118	5.75 (n.a.)	6.5 (n.a.)	Yes, ICD-10

1.1.20 Slovakia

Table 1.20:
Slovakia

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Slovakia	Kastelová et al. (2014)	1.1.1999 to 31.12.2012	31.12.2013	Treatment data	Drug users treated at centre for treatment of drug dependencies	24	n.a. (n=3 316)	158	6.6 (n.a.)	n.a.	n.a.
Slovakia	EMCDDA Workbook (2020)	1.1.1999 to 31.12.2018	31.12.2019	Treatment data linked with information of health insurance companies	Drug users treated at centre for treatment of drug dependencies	26	41 120 (n=5 339)	238	5.79 (n.a.)	n.a.	n.a.

1.1.21 Slovenia

Table 1.21:
Slovenia

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Slovenia	Lovrecic et al. (2013); Lovrecic et al. (2016)	1.1.2004 to 31.12.2006	31.12.2013	Drug Users' Treatment Evidence database	Mainly opioid users admitted to outpatient treatment centres	27	n.a. (n=3 949)	206	n.a.	n.a.	Yes, ICD-10
Slovenia	Jandl et al. (2020); EMCDDA Workbook (2018)	1.1.2009 to 31.12.2012	31.12.2015	Retrospective cohort study	Mainly opioid users outpatient and inpatient treatment centres and prisons	30.7	29 146 (n=5 157)	135	n.a.	3.9 (3.3-4.7)	Yes, ICD-10

1.1.22 Spain

Table 1.22:
Spain

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Spain	Molist et al. (2018)	1.1.1997 to 31.12.2007	31.12.2018	Retrospective cohort study	Heroin and cocaine users admitted to outpatient drug dependence treatment in publicly funded facilities		Heroin: 118 902 (n=15 305) Cocaine: 65 346 (n=11 905)	2 354	n.a. (only age group-specific data reported)	n.a. (only age group-specific data reported)	Yes, ICD-10
Spain	Colell et al. (2018)	1.1.1997 to 31.12.2011	31.12.2011	Retrospective cohort study	Cocaine users (CUD) with concurrent alcohol (CAUD) or opiates disorder (COUD)	CUD: 31.6; CAUD: 33.2; COUD: 32.3	71 924.5 (n=10 539)	716	6.0 (5.1-7.0)	CUD: 4.1 (3.5-4.8); CAUD: 3.4 (2.9-3.9); COUD: 11.6 (10.5-12.8)	Yes, ICD-10
Spain	Brugal et al. (2016)	1.1.1997 to 31.12.2007	31.12.2008	Treatment data	Heroin or cocaine users treated in in outpatient centres	n.a.	Heroin: 118 902 (n=15 305); Cocaine: 65 346 (n=11 905)	2 703	n.a. (only gender-specific data reported)	n.a. (only gender-specific data reported)	Yes, ICD-10
Spain	Sanvisens et al. (2014)	1.1.1985 to 31.12.2006	31.12.2008	Treatment data	Heroin, cocaine, and alcohol users admitted for hospital detoxification	29 (median)	Heroin: 38 577 (n=3 388); Cocaine: 7 155 (n=945)	1 380	Heroin: 3.1 (2.9-3.2) ×100 PY; Cocaine: 2.8 (2.5-3.2) ×100 PY	n.a.	Yes, ICD-10
Spain	de la Fuente et al. (2014)	1.1.1997 to 31.12.2007	31.12.2008	Treatment data	Cocaine and heroin users (CHUs) and only cocaine users (OCUs) admitted to drug treatment	CHU: 32.4; OCU: 30.0	132 824 (n=20 730)	1 691	12.7 (n.a.)	CHU: 14.3 (12.6-16.2); OCU: 5.1 (4.3-6.0)	n.a.

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Spain	Barrio et al. (2013)	1.1.2004 to 31.12.2006	31.7.2010	Cohort recruited using incentive-driven chain-referral methods	Cocaine users recruited from drug scenes and non-treatment settings	23.0	3 922 (n=714)	9	2.3 (1.2-4.4)	4.7 (2.4-9.0)	Yes, ICD-10
Spain	Jimenez-Trevino et al. (2011)	1.1.1980 to31.12.1984	n.a. (25 years)	Treatment data	Heroin users admitted to methadone treatment for the first time	25.87	n.a. (n=159)	106	n.a.	22.51 (22.37-22.64)	Yes

1.1.23 Sweden

Table 1.23:
Sweden

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Sweden	Skogens et al. (2019)	1.1.1982 to 31.12.1983	31.12.2013	Treatment data and personal data from interviews (SWEDATE data)	Substance misusers treated in inpatient units	n.a.	n.a. (n=1 163)	466	n.a.	n.a.	n.a.
Sweden	Fugelstad et al. (2019)	1.1.2006 to 31.12.2014	31.12.2014	Retrospective study of forensic data from Toxreg database	Individuals that died of poisoning and who had received SUD treatment before their first recorded opioid prescription for pain control	n.a.	n.a. (n=2 834)	2 834	n.a.	n.a.	Yes, ICD-10
Sweden	Fridell et al. (2019)	1.1.1970 to 31.12.1995	31.12.2012	Treatment data from inpatient detoxification and short-term rehabilitation unit	Patients consecutively admitted to a Swedish detoxification unit for substance use disorders	Men: 26.7; Women: 25.9	n.a. (n=1 405)	594	number of deaths divided by number of PY: Men: 2.28%; Women: 1.87%	Men: 5.68 (5.04-6.11) Women: 4.98 (4.08-5.88)	Yes, ICD-10
Sweden	von Greiff et al. (2018)	1.1.1982 to 31.12.1983	31.12.2013	Treatment data and personal data from interviews (SWEDATE data)	Substance misusers in inpatient treatment	n.a.	n.a. (n=1 163)	466	n.a.	Men: 11.7 (10.5-12.9) Women: 10.3 (8.1-12.4)	Yes, ICD-10

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Sweden	Åhman et al. (2018)	1.1.1987 to 31.12.2011	31.12.2011	Retrospective cohort study based on data from needle exchange Program	Participants in needle exchange program	33 (median)	27 698 (n=2 019)	448	1.6 per 100 PY	8.3 (7.5-9.1)	Yes, ICD-10
Sweden	Ledberg (2017)	1.1.2006-31.12.2011	30.9.2013	Swedish prescription-drug registry	Persons initiating MMT	41 (median)	n.a. (n=441)	67	n.a.	n.a.	Yes, ICD-10
Sweden	Abrahamsson et al. (2017)	31.7.2005 to 31.12.2012	31.12.2012	Retrospective register-based open cohort study	Individuals who were dispensed methadone or buprenorphine as opioid maintenance treatment	34.4 (median)	21 438 (n=4 501)	356	16.6 (n.a.)	n.a.	Yes, ICD-10
Sweden	Manrique-Garcia et al. (2016)	1.1.1969 to 31.12.1970	31.12.2011	Longitudinal cohort study	Swedish male military conscripts who use cannabis	18.5	n.a. (n=45 375)	3 918	n.a.	n.a.	Yes, ICD-10
Sweden	Ericsson et al. (2014)	1.1.200 to-31.12.2006	31.12.2008	Interview-based database	Amphetamine users in the Swedish criminal justice system	37.4	(n=1 396)	49	n.a.	4.1 (3.0-5.4)	Yes, ICD-10
Sweden	Hakansson/Berglund (2013)	1.1.2001 to 31.12.2006	31.12.2008	Database of criminal justice clients with substance use problems	Ex-prisoners with substance use problems	n.a.	n.a. (n=4 081)	166	n.a.	Females: 7.0 (3.6-12.2), males: 7.7 (5.6-9.0)	Yes, ICD-10

1.1.24 Norway

Table 1.24:
Norway

Study site, coverage	Publications	Enrolment period	End of follow-up	Data and linkage	Population and setting	Mean age at enrolment (years)	Person-years followed up (participants)	Number of deaths	Crude mortality rate per 1 000 PY (95% CI)	Standardised mortality ratio (95% CI)	Causes of death information
Norway	Bech et al. (2019)	1.1.2014 to 31.12.2015	31.12.2015	Observational patient register study combined with data from medical records	Individuals in opioid agonist treatment	n.a.	14 659 (n.a.)	200	1.4 (1.2–1.6) per 100 PY	n.a.	Yes, ICD-10
Norway	Bukten et al. (2019)	1.1.1997 to 31.12.2009	31.12.2009	Norwegian opioid maintenance registry	All patients in OMT	37.5	29 172 (n=6 871)	697	3.0 (11.7–14.3)	n.a.	Yes, ICD-10
Norway	Bukten et al. (2017)	1.1.2000 to 31.12.2014	31.12.2014	Norwegian Prison Registry	Former prisoners	n.a.	n.a. (n=91 190)	882	12.5 (11.6–13.3)	n.a.	Yes, ICD-10
Norway	Gjersing/Bretteville-Jensen (2018)	30.9. to 30.11.2013	31.10.2015	Prospective cohort recruited in street- and low-threshold services	Polysubstance users	41.5	1 722.66 (n=884)	44	2.52 per 100 PY	Women: 26.11 (10.06–54.87); Men: 10.71 (6.39–16.81)	No
Norway	Gjersing/Bretteville-Jensen (2014)	March, June and September 1997	31.12.2010	Prospective cohort recruited outside NSP facility	Injecting drug users	32.5	1 927 (n=172)	45	Women: 16.0 (8.0–31.9); Men: 26.0 (18.0–35.8)	Women: 39.4 (0.2–220.8); Men: 21.3 (5.7–54.1)	Yes, ICD-10

1.2 Overall results

The studies reviewed in this mapping and overview were significantly heterogeneous in extent of follow-up, included populations, sample sizes and other variables. Consequently, mortality varied significantly across countries and populations, which suggests that multiple factors contribute to the higher risk of death observed in people who use drugs.

» **Mean age** of the study samples ranged from 17 years old PWID in the Czech Republic (Zabransky et al. 2011) to 41.5 years old persons in substitution treatment in Norway (Bech et al. 2019).
» Studies that reported **median age** of their sample ranged from 29 in Spain (Colell et al. 2018) to 41 in Sweden (von Greiff et al. 2018).
» **Study populations** included persons who use drugs (without further specification), people who inject drugs, opioid (heroin), cocaine, amphetamine, stimulant and/or synthetic cannabinoid and polysubstance users, people in opioid substitution treatment (either buprenorphine, methadone or other), patients in in- and outpatient treatment for substance use disorders, persons released from prison, military conscripts, and clients from sexual health clinics, low-threshold services and NSP sites.
» **Sample sizes** ranged from n=82 in a community-based cohort of persons who inject heroin (O'Kelly/O'Kelly 2012) to n=91 190 in a cohort of former prisoners included in the Norwegian Prison Registry (Bukten et al. 2017).
» Regardless of the population studied, **crude mortality rates** ranged from 2.3 per 1 000 person-years (95% CI 1.2-4.4) in Spain (Barrio et al. 2013) to 28.8 per 1 000 person-years (95% CI n.a.) in Latvia (Vanaga-Arāja et al. 2019). However, a Danish HIV cohort study reported even 122 per 1 000 PY (95% CI 104-143) in patients infected with HIV through injection drug use.
» **Standardised mortality rates** ranged from 3.4 (95% CI 3.3-3.5) in patients treated in residential treatment psychiatric facilities in Poland (Sierosławski 2014; Sierosławski 2019) to 39.4 (0.2-220.8) in female and 21.3 (5.7-54.1) in male injecting drug users who were recruited outside a NSP facility in Norway (Gjersing/Bretteville-Jensen 2014).

By reporting crude mortality rates and standard mortality ratios, many studies have shown that the (excess) risk of death of people using drugs is substantially higher than in the general population. However, several studies used different approaches to examine mortality in people using drugs, e.g., percentage frequency of mortality and/or annual percentage change of mortality rates, Cox regression analyses and/or proportional hazard modelling, Poisson regression reporting adjusted prevalence ratios, competing-risks regression models to estimate sub hazard ratios. The large variety of measures to investigate mortality risks calls for a more standardised reporting of mortality rates and ratios by specialists in those fields. Guidelines on how and why to use crude and aged/gender standardised mortality rate as well as standardised mortality ratios might assist future endeavours to be clearer and more consistent and will allow for better comparability between countries and populations.

Reporting of cause-specific mortality was varied, and cause of death not always coded consistently (e.g., from coronial files, or according to ICD-10, and if the latter, which codes had been used for specific causes of death). These inconsistencies underline the importance of a greater use of standardised definitions for specific causes of death, in line with the classification in four major subgroups (drug-induced mortality, HIV/AIDS, other and unknown causes) as suggested by the EMCDDA.

In this overview, samples were drawn largely from treatment centres or other services, limiting the confidence with which we can generalise these findings to non-treatment-seeking users. It is possible that the mortality rates among community samples may be different and potentially lower due to substantial barriers faced by individuals with severe substance use disorders, including stigma, poorer access to treatment, and higher burden of medical and psychiatric comorbidity (Bahji et al. 2020). The studies that measured in- and out-of-treatment periods carefully showed that out-of-treatment mortality was often significantly higher among members of these cohorts and that treatment is protective against mortality. Study and population characteristics that predict mortality levels should be taken into account in future studies.

Considering the size of mortality risk among this group, mortality rates could be reduced by enhanced provision of evidence-based targeted measures such as opioid substitution treatment and take-home naloxone programmes. Beyond overdoses, deaths due to other causes could also be tackled by an integrated approach including early diagnosis and treatment of hepatitis and HIV; mental health diagnosis and treatment and suicide prevention, prevention and screening for cancer (in particular those associated with smoking and alcohol use) and improvement of security, housing and leaving condition

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Dalman, Christina. From the Department of Public Health Sciences, Karolinska Institutet, Stockholm; the Institute of Social Medicine, University of Rio de Janeiro State, Rio de Janeiro; and the Center for Epidemiology and Community Medicine, Stockholm County Council, Stockholm.

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Vallecillo, Gabriel. Institute of Neuropsychiatry & Addictions, Parc de Salut Mar, Universitat Autonoma de Barcelona, Barcelona, Spain.

Bolao, Ferran. Department of Internal Medicine, Hospital Universitari de Bellvitge, Universitat de Barcelona, L'Hospitalet de Llobregat, Spain.

Rivas, Inmaculada. Municipal Centre for Substance Abuse Treatment (Centro Delta), IMSP Badalona, Badalona, Spain.

Fonseca, Francina. Institute of Neuropsychiatry & Addictions, Parc de Salut Mar, Universitat Autonoma de Barcelona, Barcelona, Spain.

Fuster, Daniel. Section of General Internal Medicine, Boston Medical Center, Boston University School of Medicine, Boston, MA, USA.

Torrens, Marta. Institute of Neuropsychiatry & Addictions, Parc de Salut Mar, Universitat Autonoma de Barcelona, Barcelona, Spain.

Perez-Hoyos, Santiago. Department of Preventive Medicine and Public Health, Vall d'Hebron Institut de Recerca, Universitat Autonoma de Barcelona, Barcelona, Spain.

Pujol, Ramon. Department of Internal Medicine, Hospital Universitari de Bellvitge, Universitat de Barcelona, L'Hospitalet de Llobregat, Spain.

Tor, Jordi. Department of Internal Medicine, Hospital Universitari Germans Trias i Pujol, Fundacio Institut d'Investigacio en Ciencies de la Salut Germans Trias i Pujol, Universitat Autonoma de Barcelona, Badalona, Spain.

Muga, Roberto. Department of Internal Medicine, Hospital Universitari Germans Trias i Pujol, Fundacio Institut d'Investigacio en Ciencies de la Salut Germans Trias i Pujol, Universitat Autonoma de Barcelona, Badalona, Spain. Electronic address: rmuga.germanstrias@gencat.cat.-115-120

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