

Mortality among people with substance use disorders: A toolkit for classifying major causes of death

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Overview

- Some people with substance use disorders, particularly people who inject drugs and people with cocaine¹, amphetamine², or opioid dependence³, are at elevated risk of mortality. These elevated risks tend to be concentrated across a few key domains. Some of those are related to the manner in which drugs are taken (e.g. contraction of blood borne viral infections such as HIV through sharing of injection equipment); others may be related to the effects of drug and alcohol use (e.g. liver disease) and others still as relatively direct consequences of acute drug intoxication (e.g. accidental drug overdose).
- Classifying deaths into appropriate categories is not a straightforward task. Multiple iterations of the World Health Organization's (WHO) International Classification of Diseases exist, each of which defines deaths slightly differently. Some codes are not readily interpretable as belonging to a distinct grouping. Hundreds of codes exist, so the volume of categories may present challenges.
- This bulletin provides an overview of some key references that provide guidance on classifying major causes of death that occur among people who use illicit drugs. It is intended to make categorization of deaths among illicit drug users an easier process, and perhaps one that is undertaken more consistently across studies.
- It provides groupings for both the International Classification of Diseases Version 9 (ICD-9) and Version 10 (ICD-10). The comparable codes in each are listed alongside each other. There may be differences in the deaths captured due to the version change, and this should be noted when analysing data across time.
- The source of each of these groupings is provided alongside each for ease of reference.
- Feedback on these groupings or suggestions for further groupings are welcomed.
- This is an update of a technical report from 2009⁴

Table 1: Definitions for major causes of death

Cause of death category	ICD-9	ICD-10	Sources
All injury and poisoning (excl. alcohol-related)	304, 305.2-305.9, E800-E869, E880-E929, E950-E999	F11-F16, F19, F55, V00-X99, Y00-Y39, Y85-Y87, Y89	CHO injury and poisoning indicator (Link) <ul style="list-style-type: none"> - NB: F codes added to ICD-10 to include drug related deaths in circumstances of dependence (likewise 300 codes for ICD-9) and to encapsulate all deaths in subcategories below - Does not include accidental or intentional poisoning by exposure to alcohol (X45, X65, Y15)
Drug-induced deaths <i>Two definitions are provided. The first is a narrower definition and captures codes specifically related to drug use disorders and poisonings.</i>	304, 305.2-305.9, E850-E858, E950.0-E950.5, E962.0, E980.0-E980.5	F11- F16, F19, F55, X40- X44, X60-X64, X85, Y10-Y14	Santo, T., Clark, B., Hickman, M., Grebely, J., Campbell, G., Sordo, L., ... & Degenhardt, L. (2021). Association of opioid agonist treatment with all-cause mortality and specific causes of death among people with opioid dependence: a systematic review and meta-analysis. JAMA psychiatry ⁵
<i>The second definition¹, is broader and captures drug-related diseases in addition to drug use disorders and poisonings. Note, there are several ICD-10 codes in this definition for which there is no corresponding ICD-9 code due to lack of mention of drug-induced. These include D, E, F18, G, I, J, L, and M. ²</i>	292, 304, 305.2-305.9, 790.99, E850-E858, E950.0-E950.5, E962.0, E980.0-E980.5	<i>Underlying cause of death:</i> F11.0-F11.5, F11.7-F11.9, F12.0-F12.5, F12.7-F12.9, F13.0-F13.5, F13.7-F13.9, F14.0-F14.5, F14.7-F14.9, F15.0-F15.5, F15.7-F15.9, F16.0-F16.5, F16.7-F16.9, F18.0-F18.5, F18.7-F18.9, F19.0-F19.5, F19.7-F19.9, D52.1, D59.0, D59.2, D61.1, D64.2, E06.4, E16.0, E23.1, E24.2, E27.3, E66.1, G21.1, G24.0, G25.1, G25.4, G25.6, G44.4, G62.0, G72.0, I95.2, J70.2-J70.4, L10.5, L27.0, L27.1, M10.2, M32.0, M80.4, M81.4, M83.5, M87.1, R78.1-R78.5, X40-X44, X60-X64, X85 Y10-Y14	Chrzanowska, A., Man, N., Sutherland, R., Degenhardt, L. & Peacock, A. (2021). Methods for “Trends in drug-induced deaths in Australia, 1997-2019”. Drug Trends Bulletin Series. Sydney: National Drug and Alcohol Research Centre, UNSW Sydney. ⁶ 3303.0 - Causes of Death, Australia, 2016 (Link)
Suicide	E950-E959	X60- X84, Y87.0	CHO suicide indicator (Link)
Non-poisoning suicides	E950.6-E959	X66-X85, Y87.0	

Cause of death category	ICD-9	ICD-10	Sources
Violence	E960-E969	X85-Y09, Y87.1	CHO violence indicator (Link)
Motor vehicle and transport accidents	E810-E825, E929.0	V01-V99	CHO motor vehicle crash injury indicator (Link) and CHO unintentional injuries indicators (Link) - NB: modified to only the ICD-10 chapter 'Transport Accidents' including all codes in this chapter
Falls/fires/burns/drownings	E880-E886, E888; E890-E899; E910	W00-W19, W65-W74, X00-X09	CHO unintentional injuries indicators (Link)
All liver-related	070, 155, 570, 571, 572-573	B15–B19, B94.2, C22, I85.0, K70–K77, O98.4, P35.3	Amin J, Law M, Bartlett M, Kaldor J, Dore G. Causes of death after diagnosis of hepatitis B or hepatitis C infection: a large community-based linkage study. Lancet 2006; 368: 938–45. - Added obstetric and neonatal hepatitis codes from CHO viral hepatitis indicator: NB: I85.0 (Oesophageal varices with bleeding) added
Viral hepatitis	070	B15-B19, B94.2, I85.0, O98.4, P35.3	CHO potentially avoidable mortality table - (Link) - NB: I85.0 (Oesophageal varices with bleeding) added
All alcohol-related	291, 303.0, 303.9, 305.0, 357.5, 425.5, 535.3, 571.0-571.3, E860.0-E860.2 ²	E24.4, F10, G31.2, G62.1, G72.1, I42.6, K29.2, K85.2, K86.2, K70, K86.0, R78.0, X45, X65, Y15	- Causes of Death, Australia methodology, 2020 (Link); - ICD9 translation assisted by Chikritzhs et al 2002 'Alcohol-related codes: Mapping ICD-9 to ICD-10' Technical Report from NDRI and Dept of Health, Western Australia (Link)
Cancer	140-208, 238.4, 238.7, 273.1	C00-C97, D45-D46, 47.1, D47.3-D47.5	CHO indicator for cancer (Link)
Cardiovascular disease	390-459	I00-I99, G45, G46	CHO cardiovascular disease indicator (Link)
Chronic lower respiratory disease	490, 491, 492, 493, 496	J40-J46	CHO chronic respiratory disease indicator (Link)
Digestive disorders	531-534, 540-543, 550-553, 574-577	K25-K28, K35-K38, K40-K46, K80-K83, K85-K86, K91.5	CHO potentially avoidable mortality table (Link)
HIV-related	042-044, 279.10	B20-B24	ABS definition in 3303.0 - Causes of Death, Australia, 2006, explanatory notes point 42 (Link)
Influenza and pneumonia	480-488	J09-J18	CHO indicator (Link)
Injecting-related diseases	038, 040.0, 040.8, 041.0, 041.1, 041.8, 041.9, 112.5, 112.81, 324.X, 394.0, 394.2, 394.9, 395, 396.8, 397.0, 421.X, 424.X, 451, 453.2, 453.3, 453.8, 453.9, 459.1,	A48.0, G06.0, G06.1, G06.2, L02.X, L03.X, L08.8, L08.9, L97, L98.4, L98.8, L98.9, M72.6, R02, B37.6, I33.0, I33.9, I34.0, I34.2, I34.8, I34.9, I35.X, I36.X, I37.X, I38, I39.X, T82.6, A40.X, A41.X, A49.1, A49.8, A49.9, B37.7, R57.2, R65.1, R65.9,	Colledge-Frisby, S., Jones, N., Larney, S., Peacock, A., Lewer, D., Brothers, T. D., Hickman, M., Farrell, M., & Degenhardt, L. (in press). The impact of opioid agonist treatment on hospitalisations or injecting-related diseases among an opioid dependent population: A retrospective data linkage study. Drug Alcohol Depend. ⁷

Cause of death category	ICD-9	ICD-10	Sources
	459.81, 459.89, 459.9, 680.X, 681.X, 682.X, 686.8, 707.1, 707.8, 707.9, 709.8, 709.9, 711.0, 711.4, 711.9, 722.9, 728.86, 730.0, 730.1, 730.2, 730.8, 730.9, 746.00, 785.4, 785.52, 995.9, 995.90, 995.91, 996.61	M00.X, M86.X, M89.9, M46.2, M46.3, M46.4, I80, I82.2, I82.3, I82.8, I82.9, I87.0, I87.2, I87.8, I87.9, A48.8, A49.0, I26.9	
Skin and soft tissue infections	040.0, 324.X, 680.X, 681.X, 682.X, 686.8, 686.9, 707.1, 707.8, 707.9, 709.8, 709.9, 728.86, 785.4	A48.0, G06.0, G06.1, G06.2, L02.X, L03.X, L08.8, L08.9, L97, L98.4, L98.8, L98.9, M72.6, R02	Colledge-Frisby, S., Jones, N., Larney, S., Peacock, A., Lewer, D., Brothers, T. D., Hickman, M., Farrell, M., & Degenhardt, L. (in press). The impact of opioid agonist treatment on hospitalisations or injecting-related diseases among an opioid dependent population: A retrospective data linkage study. Drug Alcohol Depend. ⁷
Endocarditis	112.81, 394.0, 394.2, 394.9, 395, 396.8, 397.0, 421.X, 424.X, 746.00, 996.61	B37.6, I33.0, I33.9, I34.0, I34.2, I34.8, I34.9, I35.X, I36.X, I37.X, I38, I39.X, T82.6	Colledge-Frisby, S., Jones, N., Larney, S., Peacock, A., Lewer, D., Brothers, T. D., Hickman, M., Farrell, M., & Degenhardt, L. (in press). The impact of opioid agonist treatment on hospitalisations or injecting-related diseases among an opioid dependent population: A retrospective data linkage study. Drug Alcohol Depend. ⁷
Sepsis and bacteraemia	040.8, 041.1, 038, 038.0, 038.1, 038.10, 038.19, 038.2, 038.3, 038.4, 038.41, 038.8, 038.9, 041.0, 041.8, 041.9, 112.5, 785.52, 995.9, 995.90, 995.91	A40.X, A41.X, A49.1, A49.8, A49.9, B37.7, R57.2, R65.1, R65.9, A48.8, A49.0, I26.9	Colledge-Frisby, S., Jones, N., Larney, S., Peacock, A., Lewer, D., Brothers, T. D., Hickman, M., Farrell, M., & Degenhardt, L. (in press). The impact of opioid agonist treatment on hospitalisations or injecting-related diseases among an opioid dependent population: A retrospective data linkage study. Drug Alcohol Depend. ⁷
Septic arthritis	711.0, 711.4, 711.9	M00.X	Colledge-Frisby, S., Jones, N., Larney, S., Peacock, A., Lewer, D., Brothers, T. D., Hickman, M., Farrell, M., & Degenhardt, L. (in press). The impact of opioid agonist treatment on hospitalisations or injecting-related diseases among an opioid dependent population: A retrospective data linkage study. Drug Alcohol Depend. ⁷
Osteomyelitis	722.9, 730.0, 730.1, 730.2, 730.8, 730.9	M86.X, M89.9, M46.2, M46.3, M46.4	Colledge-Frisby, S., Jones, N., Larney, S., Peacock, A., Lewer, D., Brothers, T. D., Hickman, M., Farrell, M., & Degenhardt, L. (in press). The impact of opioid agonist treatment on hospitalisations or injecting-related diseases among an opioid dependent population: A retrospective data linkage study. Drug Alcohol Depend. ⁷

Cause of death category	ICD-9	ICD-10	Sources
Venous diseases	451, 453.2, 453.3, 453.8, 453.9, 459.1, 459.81, 459.89, 459.9	I80, I82.2, I82.3, I82.8, I82.9, I87.0, I87.2, I87.8, I87.9	Colledge-Frisby, S., Jones, N., Larney, S., Peacock, A., Lewer, D., Brothers, T. D., Hickman, M., Farrell, M., & Degenhardt, L. (in press). The impact of opioid agonist treatment on hospitalisations or injecting-related diseases among an opioid dependent population: A retrospective data linkage study. <i>Drug Alcohol Depend.</i> ⁷

Table Notes: ¹ Provided by the Australian Bureau of Statistics; ² Table 2 provides drug-induced death definitions by drug class and Table 3 provides drug-induced deaths definitions by intent; ³ No equivalent ICD-9 code for acute alcoholic pancreatitis

Table 2. Drug-induced deaths by drug class

Drug class	ICD-9	ICD-10
Antiepileptic, sedative-hypnotic, and antiparkinsonism drugs	304.1*, 305.4*	<i>UCOD</i> : Drug-induced death <i>MCOD</i> : T42.0-T42.8
Opioids	304.0*, 304.7*, 305.5*, E935.0-E935.2	<i>UCOD</i> : Drug-induced death <i>MCOD</i> : T40.0-T40.4, T40.6 OR <i>UCOD</i> : F11 <i>MCOD</i> : (any)
Amphetamines & other stimulants	304.4*, 305.7*	<i>UCOD</i> : Drug-induced death <i>MCOD</i> : T43.6 OR <i>UCOD</i> : F15 <i>MCOD</i> : (any)
Antidepressants	305.8, E939.0	<i>UCOD</i> : Drug-induced death <i>MCOD</i> : T43.0-T43.2
Antipsychotic and neuroleptics	E939.3	<i>UCOD</i> : Drug-induced death <i>MCOD</i> : T43.3-T43.5
Non-opioid analgesic, antipyretics, and antirheumatics	965.1-965.9, E935.3-E935.9	<i>UCOD</i> : Drug-induced death <i>MCOD</i> : T39.0-T39.9
Alcohol	291, 303, 305.0*	<i>UCOD</i> : Drug-induced death <i>MCOD</i> : T51.0, T51.9
Cannabis derivatives	304.3*, 305.2*	<i>UCOD</i> : Drug-induced death <i>MCOD</i> : T40.7 OR <i>UCOD</i> : F12 <i>MCOD</i> : (any)
Cocaine	304.2*, 305.6*	<i>UCOD</i> : Drug-induced death <i>MCOD</i> : T40.5 OR <i>UCOD</i> : F14 <i>MCOD</i> : (any)

Table Notes: *UCOD*, underlying/primary cause of death; *MCOD*, multiple causes of death;

Table 3. Drug-induced deaths by intent

Cause of death category	ICD-9	ICD-10
Accidental drug-induced deaths	E850-E858	<p><i>UCOD</i>: X40-X44</p> <p>OR</p> <p><i>UCOD</i> (Prior to 2013^a): F11.0-F11.5, F11.7-F11.9, F12.0-F12.5, F12.7-F12.9, F13.0-F13.5, F13.7-F13.9, F14.0-F14.5, F14.7-F14.9, F15.0-F15.5, F15.7-F15.9, F16.0-F16.5, F16.7-F16.9, F18.0-F18.5, F18.7-F18.9, F19.0-F19.5, F19.7-F19.9, <i>MCOD</i>: X40-X44</p>
Accidental opioid-induced deaths	E850.0	<p><i>UCOD</i>: X42</p> <p><i>MCOD</i>: T40.0-T40.4 or T40.6 [Excl. if T40.6 with (T40.5, T40.8 or T40.9)]</p> <p>OR</p> <p><i>UCOD</i>: X44</p> <p><i>MCOD</i>: T40.0-T40.4 or T40.6</p> <p>OR</p> <p><i>UCOD</i>: X40, X41, X43</p> <p><i>MCOD</i>: (T40.0-T40.4 or T40.6) AND no other T-codes present</p> <p>OR</p> <p><i>UCOD</i> (Prior to 2013^a): F11.0-F11.5, F11.7-F11.9, F12.0-F12.5, F12.7-F12.9, F13.0-F13.5, F13.7-F13.9, F14.0-F14.5, F14.7-F14.9, F15.0-F15.5, F15.7-F15.9, F16.0-F16.5, F16.7-F16.9, F18.0-F18.5, F18.7-F18.9, F19.0-F19.5, F19.7-F19.9,</p> <p>AND</p> <p>{ <i>MCOD</i>: X42 with (T40.0-T40.4 or T40.6) [Excl. if T40.6 with (T40.5, T40.8 or T40.9)]</p> <p>or</p> <p><i>MCOD</i>: X44 with (T40.0-T40.4 or T40.6)</p> <p>or</p> <p><i>MCOD</i>: X40, X41, X43 with (T40.0-T40.4 or T40.6) AND no other T-codes present }</p>
Intentional drug-induced deaths	E950.0-E950.5	<p><i>UCOD</i>: X60-X64</p> <p>OR</p> <p><i>UCOD</i> (Prior to 2013^a): F11.0-F11.5, F11.7-F11.9, F12.0-F12.5, F12.7-F12.9, F13.0-F13.5, F13.7-F13.9, F14.0-F14.5, F14.7-F14.9, F15.0-F15.5, F15.7-F15.9, F16.0-F16.5, F16.7-F16.9, F18.0-F18.5, F18.7-F18.9, F19.0-F19.5, F19.7-F19.9, <i>MCOD</i>: X60-X64}</p>

<p>Intentional opioid-induced deaths</p>	<p>No corresponding code¹</p>	<p><i>UCOD</i>: X62 <i>MCOD</i>: T40.0-T40.4 or T40.6 [Excl. if T40.6 with (T40.5, T40.8 or T40.9)] OR <i>UCOD</i>: X64 <i>MCOD</i>: T40.0-T40.4 or T40.6 OR UCOD: X60, X61, X63 MCOD: (T40.0-T40.4 or T40.6) AND no other T-codes present OR (Prior to 2013) <i>UCOD</i>: F11.0-F11.5, F11.7-F11.9, F12.0-F12.5, F12.7-F12.9, F13.0-F13.5, F13.7-F13.9, F14.0-F14.5, F14.7-F14.9, F15.0-F15.5, F15.7-F15.9, F16.0-F16.5, F16.7-F16.9, F18.0-F18.5, F18.7-F18.9, F19.0-F19.5, F19.7-F19.9, AND {MCOD: X42 with (T40.0-T40.4 or T40.6) [Excl. if T40.6 with (T40.5, T40.8 or T40.9)] or MCOD: X44 with (T40.0-T40.4 or T40.6) or MCOD: X40, X41, X43 with (T40.0-T40.4 or T40.6) AND no other T-codes present}</p>
<p>Undetermined drug-induced deaths</p>	<p>E980.0-E980.5</p>	<p><i>UCOD</i>: Y10-Y14 OR (Prior to 2013^) <i>UCOD</i>: F11.0-F11.5, F11.7-F11.9, F12.0-F12.5, F12.7-F12.9, F13.0-F13.5, F13.7-F13.9, F14.0-F14.5, F14.7-F14.9, F15.0-F15.5, F15.7-F15.9, F16.0-F16.5, F16.7-F16.9, F18.0-F18.5, F18.7-F18.9, F19.0-F19.5, F19.7-F19.9, MCOD: Y10-Y14</p>
<p>Undetermined opioid-induced deaths</p>	<p>No corresponding code¹</p>	<p><i>UCOD</i>: Y12 <i>MCOD</i>: T40.0-T40.4 or T40.6 [Excl. if T40.6 with (T40.5, T40.8 or T40.9)] OR <i>UCOD</i>: Y14 <i>MCOD</i>: T40.0-T40.4 or T40.6 OR UCOD: Y10, Y11, Y13 MCOD: (T40.0-T40.4 or T40.6) AND no other T-codes present OR</p>

	<p><i>UCOD: (Prior to 2013[^]):</i> F11.0-F11.5, F11.7-F11.9, F12.0-F12.5, F12.7-F12.9, F13.0-F13.5, F13.7-F13.9, F14.0-F14.5, F14.7-F14.9, F15.0-F15.5, F15.7-F15.9, F16.0-F16.5, F16.7-F16.9, F18.0-F18.5, F18.7-F18.9, F19.0-F19.5, F19.7-F19.9, AND { MCODE: Y12 with (T40.0-T40.4 or T40.6) [Excl. if T40.6 with (T40.5, T40.8 or T40.9)] or MCODE: Y14 with (T40.0-T40.4 or T40.6) or MCODE: Y10, Y11, Y13 with (T40.0-T40.4 or T40.6) AND no other T- codes present }</p>
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Table Notes: UCOD, underlying/primary cause of death; MCODE, multiple causes of death;

¹No ICD-9 codes directly match ICD-10 undetermined and intentional opioid deaths. However, since ICD-9 has no contributing cause categories, all ICD-9 opioid-related deaths are technically undetermined, including 304.0*, 304.7*, and 305.5*. Researchers may consider defining all ICD-9 non-accidental opioid-related deaths as undetermined (incl. intentional) but should be reported separately from deaths coded **using** ICD-10 in this category.

[^]Prior to the 2013 reference year, the 2006 version of the ICD-10 was the most recent version used for coding deaths, with the exception of two updates after 2006. The first update was in 2007 related to the use of mental and behavioural disorders due to psychoactive substance use, acute intoxication (F10.0, F11.0....F19.0) as an underlying cause of death. If the acute intoxication initiated the train of morbid events, it is now assigned an external accidental poisoning code (X40-X49) corresponding to the type of drug used. For example, if the death had been due to alcohol intoxication, the underlying cause before the update was F10.0, and after the update the underlying cause is X45, with poisoning code T51.9.

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