# High mortality among youth offenders

## Implications for prevention and policy

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NORWEGIAN CENTRE FOR VIOLENCE
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| Key findings | Evidence[1] |
|---|---|
| 1. Youth offenders had a substantially elevated risk of premature mortality | Strong |
| 2. Mortality was highest among those with indicators for more extensive or severe offending or justice involvement (e.g. imprisonment vs community sanctions, or violent vs non-violent crime) | Moderate |
| 3. Despite a lower mortality risk compared to the severe youth offenders, most deaths still occurred among youth with less severe justice involvement | Moderate |
| 4. Prominent causes of death were largely preventable: Suicides, accidental drug poisonings (overdoses), accidents and homicides. | Moderate to strong |
| 5. A substantial proportion of deaths occurred before age 25 | Moderate |
| 6. Greater relative mortality was seen among females compared to males when each was compared to the general population. Estimates were uncertain due to fewer females in the cohorts. | Limited to moderate |
| 7. Substance use and psychiatric conditions were consistently associated with mortality and may explain some of the excess mortality risk. | Moderate |
| 8. There was some evidence that socioeconomic and family circumstances explained some of the excess mortality among youth offenders. | Limited |
| **Implications for prevention and policy** | |
| 1. Contact with the police or justice system is a critical opportunity to identify unmet health and social needs and prevent premature deaths. | |
| 2. Collaboration between services and relevant institutions is essential to reach youth offenders outside the justice system (e.g. completed sanctions or < 15 years of age). | |
| 3. Prevention strategies should focus on suicide prevention, and mental health and substance use intervention, in addition to crime prevention. | |
| **Key knowledge gaps** | |
| 1. Few studies focused exclusively on offending before age 18, and there were no studies on youth offending and mortality from Norway. | |
| 2. There is limited evidence on the pathways linking youth offending to premature mortality, especially the roles of education, employment and socioeconomic disadvantage. | |
| 3. Female youth offenders are underrepresented in the research on youth offending and mortality. | |
| 4. No eligible studies were identified that specifically investigated mortality among people involved in sexual offending or sexually harmful behaviours before age 18. | |

[1] Evidence ratings are narrative judgements based on the quantity, consistency, precision and methodological limitations of the available research; they are not formal GRADE ratings.

# Summary

**Background:** In the spring of 2026, NKVTS was commissioned by the Norwegian Directorate of Health to prepare a knowledge summary showing the extent of mortality (all causes and specific causes) among people who have committed crime, violence and/or sexual abuse before the age of 18. The summary also includes perspectives on risk factors at the individual and system level, and how these factors are connected to mortality.

**Methods:** Evidence on youth offending and mortality was restricted to the Nordic countries and other countries with comparable justice- and welfare systems (e.g. some European countries, Australia, New Zealand). Systematic searches were conducted in PubMed and PsycInfo databases and supplemented with searches for reports and other sources not registered in these databases.

**Findings:** We found 16 publications from 11 cohorts with a primary focus on youth offending and mortality, and an additional 5 publications from 5 cohorts with a secondary focus on youth offending and mortality. The literature indicates substantially elevated mortality risk for youth offenders, particularly for those who had been imprisoned or were repeat offenders. Although the mortality risk was highest among severe youth offenders, most deaths still occurred among youth offenders with less severe justice involvement. The deaths largely had preventable causes, such as overdose, suicide, accidents or homicide. Many deaths occurred at an early age, and there were indications that a substantial proportion of deaths occurred before age 25. There was also evidence that the relative increase in mortality, compared with the corresponding general population, was greater among female than male youth offenders. Factors that were most strongly associated with premature mortality, in addition to more severe criminal involvement, were substance use and mental disorders, with some evidence of socioeconomic and parental factors also associated with mortality risk.

**Conclusions and implications:** Together, these findings indicate that youth offenders represent a group with accumulated disadvantage, with elevated mortality representing one of the most severe and tragic outcomes. Youth offending may therefore serve both as a critical signal of unmet support needs and as a strategic opportunity for intervention to improve life trajectories before transitioning to adulthood. Mental healthcare, suicide prevention and substance-use interventions should therefore be central components of prevention.

NKVTS aims to be reliable, work in accordance with national guidelines from the Directorate of Health, and present up-to-date and evidence-based information in a format that is easy to understand for professionals and decision-makers.

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# Norwegian summary

**Bakgrunn:** Våren 2026 fikk NKVTS i oppdrag av Helsedirektoratet å utarbeide en kunnskapsoppsummering som viser omfanget av dødelighet (alle dødsårsaker og spesifikke dødsårsaker) blant personer som har utøvd kriminalitet, vold og/eller seksuelle overgrep før fylte 18 år. Oppsummeringen inkluderer også perspektiver på risikofaktorer på individ- og systemnivå og hvordan disse faktorene er forbundet med dødelighet.

**Metode:** Litteraturen om ungdomskriminalitet og dødelighet ble begrenset til de nordiske landene og andre land med sammenlignbare retts- og velferdssystemer (f.eks. enkelte europeiske land, Australia og New Zealand). Det ble gjennomført systematiske søk i databasene PubMed og PsycInfo, supplert med søk etter rapporter og andre kilder som ikke er registrert i disse databasene.

**Funn:** Vi fant 16 publikasjoner fra 11 kohorter med et primært fokus på ungdomskriminalitet og dødelighet, og ytterligere 5 publikasjoner fra 5 kohorter med et sekundært fokus på ungdomskriminalitet og dødelighet. Litteraturen indikerer en betydelig forhøyet risiko for dødelighet blant unge lovbrytere, særlig blant dem som hadde vært fengslet eller begått gjentatte lovbrudd. Selv om risikoen for dødelighet var høyest blant unge med mer alvorlig kriminalitet, forekom de fleste dødsfallene likevel blant unge lovbrytere med mindre alvorlig involvering i rettssystemet. Dødsfallene skyldtes i stor grad årsaker som kunne vært forebygget, som overdoser, selvmord, ulykker eller drap. Det var også resultater som indikerte at dødsfallene forekommer i ung alder, og at en betydelig andel av dødsfallene skjedde før fylte 25 år. Flere studier viser også at den relative risikoen for død, sammenlignet med befolkningen generelt, var høyere blant kvinnelige enn blant mannlige unge lovbrytere. Faktorene som, i tillegg til mer alvorlig involvering i kriminalitet, var sterkest forbundet med tidlig dødelighet, var rusmiddelbruk og psykiske lidelser. Det var også noe dokumentasjon på at sosioøkonomiske og foreldrerelaterte faktorer var forbundet med dødelighetsrisiko.

**Konklusjoner og implikasjoner:** Samlet indikerer disse funnene at unge som er involvert i rettssystemet, utgjør en gruppe med en opphopning av belastninger, der forhøyet dødelighet representerer et av de mest alvorlige og tragiske utfallene. Involvering i rettssystemet kan derfor fungere både som et kritisk signal om udekkede støttebehov og som en strategisk mulighet for tiltak som kan forbedre livsforløp før overgangen til voksenlivet. Psykisk helse, selvmordsforebygging og rusmiddelbruk bør derfor være sentrale områder som adresseres gjennom tiltak.

NKVTS har som mål å være pålitelig, arbeide i samsvar med nasjonale retningslinjer fra Helsedirektoratet og presentere oppdatert og kunnskapsbasert informasjon i et format som er lett å forstå for fagpersoner og beslutningstakere.

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# Background and purpose

Premature mortality can be considered one of the most severe and tragic outcomes. For society, premature and avoidable deaths result in substantial losses of human potential, productivity, and future contributions, in addition to the healthcare, welfare, and justice-related costs associated with the vulnerabilities that often precede premature death (Łyszczarz, 2019).

There is strong evidence of elevated mortality among criminally involved adult populations, including in Norway. Many studies have examined mortality after prison release, specific causes such as overdose, and differences in mortality following release from high- and low-security prisons (Borschmann et al., 2024; Bukten et al., 2022; Bukten et al., 2017; Martinez et al., 2026; Skardhamar & Skirbekk, 2013; Svendsen et al., 2024; Tverborgvik et al., 2023). There is less research on youth offending and mortality, particularly in Europe and the Nordic countries. One systematic review published in 2026 focused solely on mortality among youth offenders between ages 10 to 19 years (Martinez et al., 2026), including 8 study cohorts from the US (4), Australia (2), Scotland (1), and Estonia (1). Overall, the review indicated that mortality was 6 times higher among youth offenders than the general population. This leaves a need to summarize evidence that is relevant to Norway and other countries with comparable justice, health, and social systems.

For youth involved in the justice system, the heightened mortality risk can be viewed as the culmination of a long trajectory of accumulated disadvantage; including adversity, poor mental health, substance use problems, educational exclusion, and socioeconomic disadvantage from an early age. Criminal involvement among children and young people is considered a marker of severe social disadvantage (Astridge et al., 2023; Friestad & Skardhamar, 2026; Kurpiel & McVie, 2025; Savolainen et al., 2018; Skjærvø et al., 2024; Thomas et al., 2025). Young people in contact with the justice system frequently experience multiple vulnerabilities, including poor mental health (Beaudry et al., 2021; Borschmann et al., 2020; Murie et al., 2026; Rice et al., 2023), substance use disorders (Yonek et al., 2019), school exclusion (Arnez & Condry, 2021; Bond & Davidson, 2025; Huttunen et al., 2023), family adversity (Aazami et al., 2023; Duran-Bonavila et al., 2017), and weak attachment to the labour market (Dorsett & Thomson, 2025). Justice-involved young people also report greater severity of childhood trauma, adversity, and other stressors such as poverty (Baglivio & Epps, 2016; Gunuboh, 2023). Justice involvement before the age of 18 indicates that these vulnerabilities have accumulated early in the life course.

While cumulative early risk may precede youth offending, contact with the justice system itself may further compound disadvantage by disrupting development, limiting educational and employment opportunities, and increasing the risk of recidivism, social exclusion, and mental health problems (Ackerman et al., 2024; Thomas et al., 2025). Youth justice involvement therefore represents both a **critical risk period**, and a **strategic window** in which coordinated, evidence-based responses can fundamentally alter life trajectories (Jäggi et al., 2020).

## Application of knowledge to the Nordic context

Although recent review and registry-based studies consistently report elevated mortality among justice involved youth, application of their findings to the Norwegian context should be made with caution. Many recent syntheses combine evidence from countries with substantially different justice, welfare, and healthcare systems (Martinez et al., 2026), or acknowledge that these

differences play a significant role in mortality rates (Borschmann et al., 2024). A large share of the evidence comes from the USA, where social and institutional contexts differ markedly from those in the Nordic countries. One review already highlighted lower relative mortality estimates in the USA than in Europe. This may partly reflect higher incarceration rates and smaller mortality differences between justice involved and general populations in the USA (Borschmann et al., 2024). Countries with lower incarceration rates often have prison populations with more severe offending and accumulated health risk factors.

Furthermore, many systematic reviews apply stringent inclusion criteria related to data types and outcome measures, which may exclude publications and reports that could be relevant for a Nordic context. For example, the largest and most up-to-date synthesis applied no country restrictions but included only eight cohorts because it prioritised homogeneity among the included studies (Martinez et al., 2026). Another meta-analysis drew on large international adult cohorts and did not focus specifically on adolescent justice exposure (Borschmann et al., 2024). These key factors underscore the need for a broader synthesis of evidence from countries with comparable welfare and justice systems, to support cautious generalisation to Nordic settings and identify remaining knowledge gaps.

## Aims and scope of the current review

As commissioned by the Norwegian Directorate of Health, the current review aimed to assess and synthesize all available evidence on premature mortality among people involved in criminal activity. We aimed to focus on young people aged approximately 10-18 years when involved in criminal activity/the justice system, while also allowing studies that had a wider age range, as long as a substantial proportion of the population was under 18. All types of criminal or justice system involvement were considered. To be applicable to the Nordic context, the synthesis focused on findings from countries with broadly comparable welfare, healthcare, and justice systems, including the Nordic countries, broader Europe, Australia and New Zealand. All types of study designs were considered.

| | |
|---|---|
| Population: | Primarily youth aged 10–18 involved in crime or the justice system |
| Types of criminal involvement: | Charged, convicted, imprisoned, community sanctions. |
| Types of mortality: | All- cause, suicide, overdose / poisoning, accidental death, violent death, disease. |
| Countries of relevance: | Nordic countries, broader Europe, Australia and New Zealand |

# Methods

## Literature search

Systematic searches were conducted in PubMed and PsycINFO and covered literature published between 1 January 2000 and 29 August 2026. Search terms included concepts relating to young people, criminal offending or criminal justice involvement, and mortality. The complete search strategies, including the exact search terms and combinations, are provided in Appendix 1.

The systematic database searches were supplemented by targeted searches for studies addressing specific gaps identified during the review process. One such gap was mortality outcomes among youth sexual offenders or persons with sexually harmful behaviours in youth (see Appendix 1 for search strategies).

Grey literature (defined as any research or findings reported outside of academic, peer-reviewed and published articles) was also considered, including reports published by governmental agencies, research institutions, and other relevant organizations. The current review included original investigations and therefore other reviews and meta-analyses were not themselves included in the synthesis, yet were used to identify potentially eligible primary studies not captured by our searches.

## Inclusion and exclusion criteria

Studies from the United States were excluded despite the substantial amount of US research concerning youth offending. This decision was made because important differences in criminal law, the treatment of children and adolescents within the criminal justice system, firearm availability and regulation, and health and welfare systems may limit the applicability of US findings to Norway.

**Table 1:** Eligibility criteria for inclusion of publications

| Inclusion criteria | Exclusion criteria |
|---|---|
| 1. Published between 1 January 2000 and 29 August 2026<br>2. Reported all-cause or cause-specific mortality outcomes<br>3. Included individuals who had engaged in offending or had formal criminal justice involvement before the age of 18<br>4. Included a cohort from a Nordic or other European country, Australia, or New Zealand<br>5. Reported original empirical research, and was not a review, editorial, commentary or other publications without original empirical data | 1. Only reported mortality as a composite outcome, e.g. “disability and mortality”<br>2. Reported only deaths occurring during imprisonment or detention<br>3. Did not distinguish between youth and adult offending at all, or the majority of the offending population described were clearly older adults<br>4. No full text available |

# Screening and selection

The database searches identified 1 568 potentially relevant records, after removal of duplicates. Titles and abstracts were screened against the eligibility criteria (Table 1), followed by full-text assessment of potentially relevant publications. Screening was conducted by primarily one reviewer. In addition to the database searches, targeted and grey literature searches, reference list screening, or other sources were conducted.

# Data extraction

Information was extracted using standardized tables in Excel. Extracted information included: country and study design; characteristics and size of the study population; participants' age at offending or criminal justice involvement; definition and measurement of criminal involvement; comparison or reference population; follow-up period; number of deaths; and mortality measures.

When several publications reported findings from the same or overlapping cohorts, these publications were linked and considered together to avoid treating the same participants as independent evidence (see Table 2 for grouping of publications from the same cohorts).

# Evidence synthesis

The included studies varied considerably in their population definitions, forms of criminal or justice system involvement, comparison groups, follow-up periods, mortality outcomes and statistical methods. Given this heterogeneity, the findings were synthesised narratively rather than statistically pooled. The narrative synthesis compared findings across studies to identify recurring patterns, differences and areas of uncertainty. Crude and adjusted findings were distinguished, and the different measures used, including cumulative mortality risks, mortality rates, standardised mortality ratios, hazard ratios, and odds ratios, were considered when interpreting the results. Attention was given to differences in age, sex, definitions of criminal involvement, the timing and duration of follow-up, reference populations and variables included in adjusted analyses.

Strength of evidence was assessed narratively, considering the number and size of the cohorts, consistency and precision of the findings, and major methodological limitations. Findings were categorised as having limited, moderate or strong supporting evidence. These ratings informed interpretation but were not used to exclude studies. The aim was to provide a comprehensive and accessible account of the evidence while recognising that estimates derived from different methods and populations are not necessarily directly comparable.

# Methodological considerations

### Youth criminal involvement

The cohorts and studies vary both in how they define the criminal involvement of the youth (e.g. self-reported crime, been charged, been convicted, been imprisoned), and the age range they include (e.g. ages 15-17, 10-20, 15-21 years). Many countries have different justice system trajectories for youth and young adults up to for instance age 21, making it natural for research to focus beyond age 18. From a developmental perspective, this also makes sense, as cognitive, emotional and physical development continues until age 25. Similarly, countries with the age of criminal responsibility at 15 years often have less data on criminal involvement before age 15,

while countries with a lower age of criminal responsibility will include a lower age range. We attempted to make these differences in age groups clear in tables and throughout the text and point out when these different definitions should be taken into consideration when interpreting findings. We have included all studies that have a reasonable focus on youth offending that has occurred prior to age 18. When discussing the youths in the cohorts broadly, we will use the term "youth offending", despite some not having convictions, and some being older than age 18.

### Cohorts are nearly always defined based on registered crime (registry-based data)

Almost all studies included in this review are registry-based. This means that the cohort is defined based on data on crime and justice in official registries. Not all registries will contain all data on justice system involvement, for instance many can exclude data on those below the age of 15. This also means that persons with criminal involvement that has not been registered, i.e. where one has not been arrested or charged, are not included in the registry-based cohorts.

This means that results from cohorts are rarely directly comparable to each other, however together they contribute to the overall understanding of the relationship between youth offending and premature mortality.

### Variation in follow-up period

A shorter follow-up period allows less time for the outcome (death) to occur, thus a cohort with a follow up period of 10 years will have fewer deaths relative to the number of persons in the cohort, compared to a cohort with a 25-year follow-up. The average age of death will also be affected by the length of the follow-up, as the cohort will only have information on the deaths that occur early and at a younger age, and no information on deaths that occur after the end of the follow-up period.

### Crude/unadjusted and adjusted findings

Several studies report adjusted findings. Crude or unadjusted findings and adjusted findings answer different questions about the relationship between youth offending and mortality, and both can provide useful information.

Crude or unadjusted findings describe the mortality observed in a group without accounting for other characteristics related to mortality, such as age, sex, socioeconomic circumstances, mental health or substance use. They provide a direct picture of the mortality burden, but comparisons between studies should be made cautiously when population characteristics or follow-up periods differ.

Adjusted analyses take some of these characteristics into account. They show whether an association between youth offending and mortality remains after holding constant the factors included in the analysis. However, they do not prove that youth offending causes increased mortality, as other relevant factors may not have been measured or included in the model.

The factors included in adjusted analyses vary between studies, depending on the available data and the study's research question. Consequently, adjusted estimates from different studies may not be directly comparable. When interpreting such estimates, it is therefore important to consider what each study adjusted for.

# Findings and interpretations

## Cohorts and studies identified and included

The systematic searches identified 16 eligible publications. Two additional publications were identified through other systematic reviews, and three through supplementary Google searches, resulting in a total of 21 included publications.

Of these, 16 had a primary focus on youth offending and mortality and reported original data from 11 cohorts (Table 2). A further five publications examined youth offending as a relevant factor in mortality but did not have youth offending and mortality as their primary focus. These represented five additional cohorts (Table 3).

The 21 publications were therefore based on 16 cohorts. Thirteen cohorts were represented by one publication each, two by two publications each, and one by four publications. To avoid presenting overlapping findings as independent evidence, results are reported by cohort rather than publication, with all relevant publications referenced. Throughout this knowledge summary, cohorts are identified using their country of origin and the age range during which criminal or justice system involvement was measured, for example, “the Australia 10-18 cohort” and “the Sweden 15-20 cohort.”

All 16 cohorts were based on registry or administrative data. Two also included self-reported information, and two included information from clinical records. The cohorts originated from Sweden (six), Australia (four), Denmark (two), Finland (two), Estonia (one), and Scotland (one).

The studies either followed young people with recorded criminal or justice system involvement to examine all-cause or cause-specific mortality, or included youth offending as an explanatory factor in analyses of mortality in a general or other relevant population. The ages at which criminal involvement was measured varied considerably. Several studies began measuring involvement at age 15, and the upper age limit was 21 years or younger in all but one cohort, which measured criminal involvement between ages 15 and 35. The proportion of females in the justice involved groups ranged from 0% to 29%. Definitions of criminal involvement ranged from being charged with an offence to receiving a prison sentence. Table 4 provides an overview of the mortality outcomes and statistical measures reported by the cohorts.

**Table 2:** Overview of included cohorts and studies with a primary focus on youth offending and mortality

| Country | Age range[1] | Cohort size | Data source | Years of follow-up | % female offenders | Definition of criminal involvement | Type of mortality | Publications from Cohort (Author, year) |
|---|---|---|---|---|---|---|---|---|
| **Australia** | 10-18 | 48 670 | Registry | 25 | 24% | Charged with crime only<br>Sentenced to community service or prison | All cause and cause specific | Willoughby, 2021; 2023<br>Calais-Ferreira, 2023<br>Kinner, 2025 |
| **Australia** | 11-20 | 2 849 | Registry | 16 | 8% | Sentenced to prison | All cause and cause specific | Coffey, 2003; 2004 |
| **Australia** | 13-21 | 515 | Registry & self-report | 10 | 17% | Sentenced to community service or prison | All cause and cause specific | Kinner, 2015 |
| **Estonia** | 14-17 | 252 | Registry | 15 | None | Juvenile institution | All cause | Saar, 2012 |
| **Finland** | 15-21 | 3 832 | Registry | 18 | 2.3% | Sentenced to prison[2] | All cause and cause specific | Sailas, 2006 |
| **Scotland** | 14-19[3] | Not reported | Registry | 22 | Not reported | Sentenced to prison | All cause | Graham, 2015 |
| **Sweden** | 0-20[4] | 2 039 | Registry & clinical notes | 25 | None | Adolescent criminal involvement | All cause | Larm, 2015 |
| **Sweden** | 15-17 | 45 643 | Registry | 18 | 29% | Convicted (Formal criminal justice reaction[5]) | All cause and cause specific | BRÅ, 2021 |
| **Sweden** | 15-18 | 49 398 | Registry & self-report | 35 | None | Convicted of crime | All cause and cause specific | Stenbacka, 2014; 2019 |
| **Sweden** | 15-19 | 992 881 | Registry | 15 | 24% | Convicted of crime | Suicide | Björkenstam, 2011 |
| **Sweden** | 15-20 | 1 839 711 | Registry | 20 | Not reported | Convicted not prison<br>Sentenced to prison | All cause | Siponen, 2023 |

[1] Age range at time of criminal/justice system involvement.

[2] The cohort excludes youth sentenced to short (<3 months) or long (>4 years) prison sentences, approximately 2% of the youth prison population.

[3] This study does not have a specific youth perspective; however, it reports separately on death occurring at ages 14-19, which implies the offending has taken place within that age frame.

[4] The methods section states that delinquency was coded from birth to age 20, based on mandatory reports to social services from the police.

[5] Includes assumed responsibility: court convictions, accepted penalty orders and waivers of prosecution (not acquittals or dismissed due to insufficient evidence). Referred to as convictions for simplicity throughout the rest of the text.

**Table 3:** Overview of cohorts with a secondary focus on youth offending and mortality

| Country | Age range[1] | Cohort size (population type) | Data source | Years of follow-up | % female offenders | Definition of criminal involvement | Type of mortality | Publications from Cohort (Author, year) |
|---|---|---|---|---|---|---|---|---|
| **Australia** | <18 | 16 453 (in opioid substitution treatment) | Registry | 13 | 21% | Imprisoned | All cause | Degenhardt, 2014 |
| **Denmark** | 15-19 | 27 219 (committed suicides) | Registry | 26 | Not reported | Violent and sexual offenders | Suicide | Webb, 2012 |
| **Denmark** | 15-35[2] | 80 997 (general population) | Registry | 20 | 29% | Convicted of violent crime[3] | Unnatural/external | Steeg, 2019 |
| **Finland** | 15-19[4] | 3 030 (offenders referred for psychiatric evaluation) | Registry & clinical notes | 36 | 9% | Offenders | All cause, natural and unnatural | Lindberg, 2017 |
| **Sweden** | 13-19 | 14 608 (general population) | Registry | 15 | Not reported | Delinquency noted by the welfare office[5] | All cause, natural, unnatural deaths after age 37[6] | Hiyoshi, 2021 |

[1] Age range at time of criminal/justice system involvement.

[2] Focus on violent crime and mortality, but includes persons with convictions for violence from age 15-35. However, although the study does not take age of criminal involvement into consideration in their analysis, the registered deaths have mostly occurred at a young age (median age at death: 21 years; 37% of deaths occurred before age 20; 70% of deaths occurred before age 25). This means that violent convictions for a large proportion of the deceased must have occurred in adolescence or young adulthood. The study also included other adolescence risk-factors, therefore included as supplementary evidence.

[3] The study used a wide definition of violent crime, including threats to safety and intimidation: homicide, assault, robbery, aggravated burglary or arson, possessing a weapon in a public place, violent threats, extortion, human trafficking, abduction, kidnapping, rioting, public order offenses, terrorism and sexual offences.

[4] Though the age range is 15-19, 43% of the cohort had conducted their index offence as minors, i.e. before turning 18.

[5] The definition of delinquency seems to involve substance use, which is considered an offense by law, however substance use can be considered more health related than crime related, and a possible confounder when defining the delinquency variable, as substance use is a competing influence on mortality.

[6] This study has focused on a specific subgroup. The main exposure in the study is parental death at age 0-12 years, followed by exposure to mediating factors, including adolescent delinquency when aged 13-19, and socioeconomic mediators while aged 27-37. The main outcome, mortality, is included for those still alive at age 37, with deaths of interest occurring from age 38-63. This means that deaths before the age of 38 are excluded from the study, this was altogether 253 deaths that are not further described. This means that findings related to mortality from this study are specific to adult/older adult mortality.

# Measures of premature mortality in youth offender research

We present an overview of outcomes and statistical methods used in the included literature (Table 4). When interpreting studies on mortality, it is important to note that choices related to study design and statistical analysis can impact the findings and whether comparisons between studies are meaningful (Kinner et al., 2013).

**Table 4:** Overview of types of mortality measures/outcomes from the included cohorts

| Country | Age range | Author, year | Cumulative mortality risk (%) | Mortality rate | Mortality rate ratio | Std. mortality ratio | Odds/ Hazard ratio |
|---|---|---|---|---|---|---|---|
| Australia | 10-18 | Willoughby, 2021; 2023 Calais-Ferreira, 2023 Kinner, 2025 | X | X | | X | X - HR |
| Australia | 11-20 | Coffey, 2003; 2004 | X | X | X | X | |
| Australia | 13-21 | Kinner, 2015 | X | X | | | |
| Estonia | 14-17 | Saar, 2012 | X | | | X | |
| Finland | 15-21 | Sailas, 2006 | X | | X | X | X - OR |
| Scotland | 14-19 | Graham, 2015 | | | | X | |
| Sweden | 0-20 | Larm, 2015 | X | | | | X - OR |
| Sweden | 15-17 | BRÅ, 2021 | X | | | X[1] | |
| Sweden | 15-18 | Stenbacka, 2014; 2019 | X | | | | X - HR |
| Sweden | 15-19 | Björkenstam, 2011 | X | | X | | |
| Sweden | 15-20 | Siponen, 2023 | X | X | | | X - HR |
| **Secondary focus on youth offenders and mortality** | | | | | | | |
| Australia | <18 | Degenhardt, 2014 | | | | | X - HR |
| Denmark | 15-19 | Webb, 2012 | | | | | X - OR |
| Denmark | 15-35 | Steeg, 2019 | X | | X | | |
| Finland | 15-19 | Lindberg, 2017 | | | | | X – OR/HR |
| Sweden | 13-19 | Hiyoshi, 2021 | | | | | X – HR |

Std. = Standardised [1]For the Sweden 15-17 cohort, a comparison was made between the mortality rate among the offenders and a matched sample of the general population, which seems to fit the criteria for a standardized mortality ratio, although it is not reported as such in the publication.

We present findings from the different cohorts according to the statistical method used, standardised mortality ratios, mortality rates per person-years, hazard ratios and odds ratios, to make the results easier to interpret. Each group of findings is preceded by a short explanation of how results derived from the different methods should be interpreted. Some cohorts presented more than one mortality measure (Table 4); all reported measures are included in the corresponding tables.

# All-cause mortality risk

## Mortality compared with the general population

The **standardized mortality ratios (SMRs)** compare the number of deaths observed in a youth offender population with the number that would be expected based on mortality rates in a non-offending reference population, after accounting for differences in factors such as age, sex and calendar period.

An SMR of 1.0 indicates that the observed number of deaths is equal to the number expected. An SMR above 1.0 indicates excess mortality, while an SMR below 1.0 conversely indicates fewer deaths than expected based on the mortality rates in the reference population. For example, an SMR of 2.0 indicates that twice as many deaths occurred as would be expected based on mortality rates in the reference population.

The **95% confidence interval** reflects the uncertainty surrounding the estimate. Wider intervals indicate greater uncertainty.

SMRs from different study cohorts or countries should be compared cautiously if they are based on different reference populations, calendar periods, age ranges, or standardisation procedures.

Six cohorts reported standardised mortality ratios for all-cause mortality outcomes (Table 5). Youth offending was consistently associated with higher rates of death than would have been expected in a matched general population, especially for those who had received prison sanctions, and for females.

**Table 5:** Standardized Mortality Ratios (SMRs); Risk of death relative to general populations

| Country | Age range | Cohort size | Range of follow-up (no of years) | Criminal involvement | All-cause SMRs (95% Confidence Intervals) | | |
|---|---|---|---|---|---|---|---|
| | | | | | Overall | Male | Female |
| Australia | 10-18 | 48 670 | 1993-2017 (25) | Any contact | 4.2 (3.9-4.4) | - | - |
| | | | | - Charge only | 3.5 (3.2-3.7) | - | - |
| | | | | - Community service | 4.3 (3.9-4.7) | - | - |
| | | | | - Imprisoned | 6.4 (5.7-7.1) | - | - |
| Australia | 11-20 | 2 849 | 1988-2003 (16) | Imprisoned | - | 9.4 (7.4-11.9) | 41.3 (20.2-84.7) |
| Estonia | 14-17 | 252 | 1985-1999 (15) | Juvenile institution | - | 2.1 (1.6-2.8) | - |
| Finland | 15-21 | 3 832 | 1984-2002 (18) | Imprisoned | - | 7.4 (6.7-8.1) | - |
| Scotland | 14-19 | N/R[1] | See footnote[2] | Imprisoned | - | 6.2 (5.2-7.3) | 15.9 (8.2-27.8) |
| Sweden[3] | 15-17 | 45 643 | 2001-2018 (18) | 1 conviction | - | 1.0 | 2.5 |
| | | | | 2-3 convictions | - | 2.0 | 5.0 |
| | | | | 4-8 convictions | - | 5.0 | 12.5 |
| | | | | 9+ convictions | - | 11.0 | 25.0[4] |

[1] Cohort size not reported, as the age group was a subgroup in a larger study. [2] The follow-up period is 1996-2007 (12 years), however this is the SMR for deaths that occurred by age 19 only, so the SMR reflects only the very early deaths, though the follow-up period of the cohort is long. [3] For the Sweden 15-17 cohort, a comparison is made between the mortality rate among the offenders and a matched sample of the general population, which seems to fit the criteria for a standardized mortality ratio, although it is not reported as such. [4] Confidence intervals are not reported. The confidence intervals may be large for the female estimates as the number of females and female deaths is low, likely making the SMR estimates for females uncertain.

Findings from Australia, Finland and Scotland show mortality rates to be six to nine times higher for youth offenders who had been imprisoned than would have been expected based on general population numbers (Coffey et al., 2003; Graham et al., 2015; Kinner et al., 2025; Sailas et al., 2006). For female youth offenders with imprisonment the rates were even higher, with 16 and 41 times more deaths than expected, though estimates are less certain due to the low numbers of female deaths in the cohorts (Coffey et al., 2003; Graham et al., 2015). The Estonia 14-17 study found mortality to be two times higher among youth delinquents placed in a juvenile institution, although it is clear that this was a specialised unit for youth, it is difficult to ascertain whether it was a prison institution or an alternative sanction (Saar & Markina, 2012).
The Australia 10-18 cohort found mortality to be four times higher than in the general population among youth offenders who had been charged with no conviction or given community sanctions (compared to six times higher for youth offenders with prison sanctions) (Kinner et al., 2025).

In the Sweden 15-17 cohort, mortality increased with the number of convictions, and the relative increase was greater among females than males. Youth who had received 4-8 reactions had a mortality rate five times higher than expected among males and 12 times higher for females, while those with 9 or more justice reactions had an 11 times higher mortality rate for males, and 25 times higher for females (Brå, 2021).

## Differences in mortality rates

**Mortality rate per person-years** reflects the frequency of death in a population. It is based on both the number of deaths observed and the length of time individuals were followed. The total follow-up time is expressed as *person-years*, which are calculated by adding together the time each individual contributed to the study. For example, 100 people followed for one year contribute 100 person-years.

The mortality rate is calculated by dividing the number of deaths by the total number of person-years and is often reported as the number of deaths per 10,000 or 100,000 person-years. Expressing mortality in this way makes it easier to compare populations and studies with different numbers of participants and different follow-up periods. Such comparisons should nevertheless be interpreted cautiously if studies differ with respect to factors such as calendar period, age distribution, or sex distribution.

When mortality rates are available for a comparable reference population, a **mortality rate ratio (MRR)** can be calculated. The MRR compares mortality rates between youth offenders and a reference population and indicates the relative difference in mortality. An MRR of 1.0 indicates equal mortality rates, an MRR above 1.0 indicates higher mortality in the study population, and an MRR below 1.0 indicates lower mortality. MRRs should be interpreted alongside the underlying mortality rates, as they describe relative rather than absolute differences.

Six of the cohorts with a primary focus on youth offending and mortality reported mortality rates per person-years or mortality rate ratios (Table 6), however as the Sweden 15-19 cohort (Björkenstam et al., 2011) was suicide-specific, their results are reported under the chapter about cause-specific mortality and in Table 9.

The highest mortality rate when adjusting for time-at-risk (observed person-years) was seen among youth offenders who had been sanctioned with prison (Table 6). In the Australia 11-20 cohort, the

subgroup who were imprisoned aged 15-17 had a mortality rate of 112 per 10 000 person years (Coffey et al., 2004). The overall cohort aged 11-20 had a mortality rate of 72. Mortality rates were also reported separately for youth offenders with violent crime (116) and property crime (65). The Sweden 15-20 cohort reported mortality rates of 56 for youth offenders with imprisonment and 12 for those with convictions and an alternate sanction to prison (Siponen et al., 2023). The Australia 10-18 cohort reported a mortality rate of 33 for youth offenders with prison sanctions, 23 for those sanctioned to community service, and 18 for those with charges only (Kinner et al., 2025). Finally, the Australia 13-21 cohort that mixed convicted youth with prison and community sanctions found a mortality rate of 42 (Kinner et al., 2015).

**Table 6:** Mortality rates per 10 000 person-years observed for youth offender populations (and matched general population where available)

| Country | Age range | Cohort size | Criminal involvement | Number of deaths (%) | Mortality rate per 10 000 person-years[1] | | Mortality rate ratio (95% CI) |
|---|---|---|---|---|---|---|---|
| | | | | | Offender | Non-offender | |
| Australia | 10-18 | 48 670 | Any contact | 1 431 (2.9%) | 21.9 | - | - |
| | | | - Charge only | 661 (2.3%) | 18.1 | - | - |
| | | | - Community service | 430 (3.3%) | 23.2 | - | - |
| | | | - Imprisoned | 340 (4.5%) | 33.1 | - | - |
| Australia | 15-17[2] | 1 351 | Imprisoned | 86 (6.4%) | 112.0 | - | - |
| | 11-20 | 2 849 | Imprisoned, all | 143 (5.0%) | 72.0 | - | - |
| | | 1 662 | - Imprisoned violence | 83 (5.0%) | 116.0 | - | - |
| | | 888 | - Imprisoned property | 48 (5.4%) | 65.0 | - | - |
| Australia | 13-21 | 515 | Sanctioned (prison or community) | 19 (3.7%) | 41.9 | - | - |
| Finland | 15-21 | 3 832 | Imprisoned, all | 435 (11.4%) | 102.5 | 15.5 | 6.6 (-) |
| | | | - death age 15-19 | 19 (-) | 77.4 | 8.2 | 9.5 (6.0-14.9) |
| | | | - death age 20-24 | 140 (-) | 90.8 | 12.2 | 7.4 (6.3-8.8) |
| | | | - death age 25-29 | 152 (-) | 115.7 | 13.6 | 8.5 (7.2-10.0) |
| | | | - death age 30-34 | 89 (-) | 116.1 | 17.3 | 6.7 (5.4-8.3) |
| | | | - death age 35-39 | 14 (-) | 82.4 | 24.3 | 3.4 (2.0-5.7) |
| Sweden | 15-20 | 1 839 711 | Convicted, not prison | 2 376 (1.1%) | 12.4 | 3.2 | 3.9 (-) |
| | | | Imprisoned | 282 (4.6%) | 56.4 | 3.2 | 17.6 (-) |

[1] Mortality rates that were reported per 1000 or 100 000 person years observed in the studies were converted to mortality rates per 10 000 person years for this table. [2] The Australia 11-20 cohort reports mortality rates separately for those who were imprisoned when aged 15-17 (Coffey, 2004), which is a core target group for this knowledge summary, therefore this subsample of the overall cohort has been separated out for this table.

Two of the cohorts presented mortality rates from a comparable general population, which allowed the calculation of mortality rate ratios. The Finland 15-21 cohort showed an overall nearly seven times higher rate of death among youth offenders with imprisonment compared to the general population (Sailas et al., 2006). The study further showed that the rates of death were particularly high for younger offenders, with nine times more deaths in the age group 15-19 years, seven times

more for ages 20-24, over eight times more for ages 25-29, nearly seven times more for ages 30-34, and finally three times more for ages 35-39.

In the Sweden 15-20 cohort there was an over 17 times higher mortality among youth offenders with imprisonment compared to the general population, and a four times higher mortality rate for youth offenders that were convicted but not sanctioned to prison (Siponen et al., 2023).

In addition, one of the cohorts with a secondary focus on youth offending and mortality reported relevant mortality rates. The Denmark 15-35 cohort focused specifically on violent convictions, self-harm and mortality from unnatural causes (Steeg et al., 2019). The authors reported both unadjusted and adjusted mortality rate ratios, and included age, sex, substance misuse disorder, hospital treated psychiatric disorders, and socioeconomic position in the adjusted analysis. The unnatural cause mortality rate ratios (unadjusted and adjusted) for persons with violent conviction and no self-harm was 5.2 (CI: 4.4-6.1) and 3.3 (CI: 2.82-3.93), for those with violent convictions and self-harm the ratios were 29.4 (CI: 23.1-37.4) and 8.6 (6.5-11.4). Thus, there was a three times higher rate of death among those with violent convictions only, and a nearly nine times higher rate of death among those with violent convictions and self-harm, while adjusting for several relevant risk factor.

## Differences in mortality over time

**Hazard ratios (HR)** compare how quickly an event, such as death, occurs over time in a group of interest and a reference group. They take into account both whether and when events occurred, as well as differences in follow-up time.

An HR of 1.0 indicates no difference between the groups, an HR greater than 1 indicates a higher rate of death in the group of interest, while an HR below 1 indicates a lower rate. For example, an HR of 2.0 means that deaths occurred at about twice the rate among those still alive in one group compared with the other. An HR of 0.70 indicates a rate about 30% lower.

Hazard ratios are commonly estimated using a **Cox proportional hazards regression model**, which can adjust for measured differences between groups, such as age, sex, education, or health status. This allows the groups to be compared while accounting for these factors, although the analysis cannot account for factors that were not measured or included in the model.

Hazard ratios are usually reported with a 95% confidence interval, which reflects the uncertainty surrounding the estimate.

Importantly, a hazard ratio describes the relative rate at which deaths occur over time, not the absolute probability or number of deaths.

Two cohorts (both Swedish) reported Hazard ratios from unadjusted and adjusted cox regression models comparing mortality among youth offenders and non-offenders. Overall, the hazard of death was 2-11 times higher for offending youth, after the studies had adjusted for socioeconomic and individual factors that were available to them (see Table 7 for details). Further, the hazard of death reported for youth offenders convicted of violent crime was twice as high as for those with non-violent crime (Sweden 15-18) (Stenbacka et al., 2019), and the hazard of death was over three times higher among youth offenders who were sentenced to prison compared to those without imprisonment (the Sweden 15-20) (Siponen et al., 2023).

**Table 7**: Hazard-ratios (HR) for mortality, from unadjusted and adjusted Cox Proportional Hazards regression models

| | | | | | All Cause HRs (95% Confidence Intervals) | |
|---|---|---|---|---|---|---|
| **Country** | **Age range** | **Range of follow-up (no of years)** | **Cohort size** | **Type of crime** | **HR** | **Adjusted HR[1]** |
| Sweden | 15-18 | 1969-2004 (35) | 49 398 | Violent | 4.69 (3.44-6.38) | 4.29 (3.08-5.96) |
| | | | | Non-violent | 2.72 (2.43-3.04) | 2.16 (1.93-2.42) |
| Sweden | 15-20 | 1993-2013 (20) | 1 839 711 | Convicted - not imprisoned | 3.6 (3.4-3.7) | 3.02 (2.9-3.2) |
| | | | | Imprisoned | 15.1 (13.4-17.0) | 10.8 (9.5-12.2) |

[1] The Sweden 15-18 cohort adjusted for medication for own psychiatric problems, intelligence, emotional control, psychiatric diagnosis at conscription, conduct problems at school, previous contacts with police and/or juvenile authorities, problem drinking and substance use. The Sweden 15-20 cohort adjusted for sex, birth year, and parental education.

In addition, two studies with a secondary focus on youth offending and mortality reported hazard ratios. One study that primarily investigated the relationship between losing a parent before age 12 and later mortality, found that when building a statistical model including e.g. parental death, parent mental health, socioeconomic status in childhood and later in life, that delinquency when aged 13-19 had the strongest association with higher hazard of mortality (HR: 1.06, CI: 1.03-1.09), and that delinquency further increased the hazard of mortality through its association with lower education and lower income (Hiyoshi et al., 2021). Similarly, a study primarily focusing on the association between opioid substitution therapy and mortality after release from prison found that juvenile offending was associated with an increased hazard of death (HR: 1.18, CI: 1.00-1.40), in a statistical model adjusting for a number of opioid use treatment and crime related factors (Degenhardt et al., 2014).

## Other mortality findings

The Finland 15-19 cohort found that 22% of delinquents and 3% of the control group had died during follow up, amounting to eight times higher odds of death (Odds ratio: 8.11, CI: 6.05-10.86). The increased odds were highest for unnatural causes of death, and delinquents who had committed violent crimes had twice the risk of death compared to those with non-violent crime (Lindberg et al., 2017).

In the Sweden 0-20 cohort of adolescents in treatment for alcohol or substance use disorders, youth offending was associated with higher mortality between ages 21 and 45. After adjustments for hospitalisations related to mental disorders, substance use disorders and physical disorders, as well as adult criminal convictions, people with a history of both drug treatment and youth offending had just over twice the odds of death compared with a general population (Odds ratio: 2.14, CI: 1.33-3.45). This cohort excluded people who died before age 21. The estimates therefore describe mortality among those who survived into adulthood and do not capture deaths occurring in childhood or adolescence.

# Cause-specific mortality risk

Cause-specific mortality is often divided into two overarching categories; External/unnatural mortality and Internal/natural mortality. Unnatural causes of death result from outside

environmental forces and includes accidents, homicide and suicide, while internal causes of death include internal disease or bodily malfunction or natural bodily breakdown.

Eight cohorts report on cause-specific premature mortality. Some of the included studies reported risk-related measures for several causes of mortality, while others reported on only suicide mortality, for instance. As for all-cause mortality, the reporting of cause-specific mortality differs between studies, with some reporting standardised mortality ratios, some mortality rates per person years, or other statistics. Results are summarised according to the specific cause of death and then methodology to facilitate interpretation.

## Suicide deaths

Five cohorts investigated suicide-specific mortality risk, reporting standardised mortality ratios, mortality rate ratios and hazard ratios.

The Australia 10-18 and 11-20 cohorts found that youth offenders had about 4-9 times more suicide deaths compared to the general population (Coffey et al., 2003; Kinner et al., 2025), with youth offenders with prison sanctions at the higher end (7-9 times more suicide deaths), while those with charges only or community service sanctions had about 4 times as many suicide deaths as expected. The suicide mortality rates per person years are also notably higher for the imprisoned youth offenders compared to non-imprisoned (Table 9).

**Table 8:** Standardized mortality ratios for suicide deaths

| Country | Age range | Year range of follow-up (no of years) | Cohort size | Type of justice contact | Standardised Mortality ratio: Suicide (95% CI) |
|---|---|---|---|---|---|
| Australia | 11-20 | 1988-2003 (16) | 2 849 | Imprisoned *males only* | 9.2 (5.8-14.7) |
| Australia | 10-18 | 1993-2017 (25) | 48 670 | Any contact | 4.4 (4.1-4.8) |
| | | | | Charged only | 3.8 (3.3-4.3) |
| | | | | Community service | 4.2 (3.5-5.0) |
| | | | | Imprisoned | 7.2 (6.1-8.6) |

In the Sweden 15-19 cohort the suicide rate was up to 12 times higher (male) and 44 times higher (female) for youth offenders compared to non-offending youth (Björkenstam et al., 2011). There was a clear pattern of higher suicide rates the more convictions they had (Table 9). When youth offending was included in a statistical model with substance abuse and mental health disorders, the suicide risk associated with youth offending was lower, but still 3-4 times higher compared to non-offending youth.

**Table 9:** Mortality rates and mortality rate ratios for suicide deaths

| Country, age range (cohort size) | Criminal involvement | Sex | Number of deaths | Mortality rate per 10 000 person-years[1] (95% Confidence intervals) | | Mortality rate ratio (95 % confidence intervals) | |
|---|---|---|---|---|---|---|---|
| | | | | Offender[2] | Non-offender | Unadjusted | Adjusted |
| Sweden, 15-19 (992 881)[3] | 1 conviction | F: | 44 | 1.8 (-) | 0.7 (-) | 2.6 (1.9–3.6) | 1.7 (1.2–2.4) |
| | | M: | 196 | 3.1 (-) | 1.4 (-) | 2.2 (1.9–2.6) | 2.0 (1.7–2.4) |
| | 2-4 convictions | F: | 12 | 3.5 (-) | 0.7 (-) | 5.1 (2.8–9.0) | 1.6 (0.9–3.0) |
| | | M: | 182 | 7.0 (-) | 1.4 (-) | 5.0 (4.2–5.9) | 3.8 (3.2–4.5) |
| | 5 + convictions | F: | 7 | 31.1 (-) | 0.7 (-) | 44.5 (21.0–94.1) | 5.7 (2.5–13.1) |
| | | M: | 105 | 17.2 (-) | 1.4 (-) | 12.3 (10.0–15.1) | 6.6 (5.2–8.3) |
| Australia, 11-20 (2 849) | Imprisoned | All | 34 | 17.0 (12-24) | - | - | - |
| Australia, 10-18 (48 670) | Any contact | All | 495 | 7.6 (6.9-8.7) | - | - | - |
| | Charged only | All | 233 | 6.4 (5.6-7.2) | - | - | - |
| | Community service | All | 137 | 7.4 (6.2-8.7) | - | - | - |
| | Imprisoned | All | 125 | 12.2 (10.2-14.5) | - | - | - |

[1] Mortality rates that were reported per 1000 or 100 000 person years observed in the studies were converted to mortality rates per 10 000 person years for this table. [2] Confidence intervals not reported for the Sweden 15-19 cohort. [3]Adjusted for: birth year, substance abuse and mental illness aged 0-19, parental education, lone parental household, household receiving social assistance, household receiving disability pension, adoption, foster care, place of residence, country of birth (own and parental) (Björkenstam et al., 2011)

Two cohorts found an association between violent offending and suicide. The Denmark 15–35 cohort found higher suicide mortality rate ratios both among people with a violent conviction only (MRR: 2.7, CI: 1.9–3.9) and among those with both a violent conviction and hospital-treated self-harm (MRR: 7.1, CI: 4.4–11.5) (Steeg et al., 2019). This finding was after adjusting for substance misuse disorders, psychiatric disorders, and socioeconomic position (parental income, education and employment). Finally, the Sweden 15-18 cohort found that violent crime (HR: 2.14, CI: 1.12-4.11) was associated with a higher hazard for suicide death compared to non-violent crime (HR: 1.37, CI: 1.03-1.81), after adjusting for e.g. psychiatric problems, intelligence, emotional control, conduct problems, and substance use (Stenbacka et al., 2019).

## Accidental deaths and unintentional poisoning

Several cohorts reported on mortality risk for accidental deaths, including unintentional poisonings/overdose, and transport accidents. The reporting of and categorisation within accidental deaths was particularly diverse, thus we are omitting some results because they are difficult to place in a context and interpret.

The Sweden 15-18 cohort investigated mortality from unintentional injury specifically and found that youth offenders had a nearly 5 times higher hazard of death from unintentional injury, when adjusting for substance use treatment (Stenbacka & Jansson, 2014).

The Denmark 15-35 cohort found a mortality rate ratio of 3.7 (CI: 2.9-4.7) for violent convictions alone and MRR: 5.9 (CI: 3.3-10.6) for those with violent convictions and hospitalisation for self-harm (Steeg et al., 2019).

**Table 10:** Standardized mortality ratios for deaths caused by accidents/unintentional injury

| | | | | | Standardised mortality ratios (95% CI) | | |
|---|---|---|---|---|---|---|---|
| Country | Age range | Range of follow-up (no of years) | Cohort size | Type of justice contact | Unintentional poisoning | Injury or accident | Transport accident |
| Australia | 11-20 | 1988-2003 (16) | 2 849 | Imprisoned, *males only* | 26.0 (17.9-36.9) | 5.7 (3.6-9.2) | - |
| Australia | 10-18 | 1993-2017 (25) | 48 670 | Any contact | 8.2 (7.0-9.6) | - | 4.4 (3.9-5.0) |
| | | | | - Charged only | 6.2 (5.1-7.7) | - | 4.1 (3.4-4.9) |
| | | | | - Community service | 8.4 (6.6-10.7) | - | 4.7 (3.8-5.9) |
| | | | | - Imprisoned | 14.6 (11.3-18.9) | - | 5.1 (3.8-6.8) |

### *Unintentional poisoning/overdose*

Two cohorts from Australia (Table 10) report between 6 and 26 times more deaths from unintentional poisoning among youth offenders as would be expected in the general population (Coffey et al., 2003; Kinner et al., 2025). For youth offenders who have been imprisoned, this difference is particularly strong, with 15-26 times more deaths from poisoning than expected.

When looking at mortality rates per 10 000 person years, the rate of deaths from accidental poisoning was 2.4 among youth offenders with charges only, 3.5 for those who were convicted to community sanctions and 5.6 for those who were convicted to imprisonment (Kinner et al., 2025).

In the Danish 15-35 with a history of violent convictions, the mortality rate ratio for overdose death was the most striking (MRR: 14.6, CI: 9.9-20.0) and was even higher for those with both violent crime and self-harm, though the estimate is uncertain due to low statistical power, as can be seen from the large confidence interval (MRR: 195.5, CI: 110.2-346.7) (Steeg et al., 2019).

The Sweden 15-18 cohort found that violent crime (HR: 2.81, CI: 1.66-4.77) was associated with a higher hazard for overdose death compared to non-violent crime (HR: 1.79, CI: 1.39-2.31), after adjusting for e.g. psychiatric problems, intelligence, emotional control, conduct problems, and substance use (Stenbacka et al., 2019).

### *Transport accidents*

Although several cohorts report that traffic accidents are common causes of death (see Figure 1), few have analysed the specific risks associated with this type of accident. The Australia 10-18 cohort found that death following a transport accident occurred 4-5 times more than would be expected (Table 10), but with little difference depending on type of sanction (Kinner et al., 2025).

## Violence/Homicide deaths

Violence related deaths are relatively rare among people with youth offending, but more common compared to non-offenders. Comparing the Australia 10-18 cohort of youth in contact with the justice system to the general population, death caused by assault (4% of all deaths) was 7 times higher, over 6 times higher for males and nearly 14 times higher for females (Willoughby et al.,

2023). Further, the hazard for violent death was twice as high for youth who had received prison sanctions compared to youth who had been charged with a crime only (HR: 2.5, CI: 1.2-5.3). Indigenous Australians also had a higher hazard of violent death (HR: 2.5, CI: 1.5-4.4). When investigating toxicology reports for those who had died from violence, alcohol or substance use was revealed in most cases (cannabis in 70% of cases and alcohol in 65% of cases) (Willoughby et al., 2021).

The Finland 15-19 cohort of offenders who had undergone a psychiatric evaluation, found that the mortality risk was twice as high for those with violent offenses compared to those with non-violent offenses (Hazard ratio: 2.01, CI: 1.14-3.57) (Lindberg et al., 2017).

### Internal or natural causes

One study reported on non-communicable disease specifically. The Australia 10-18 cohort found that youth offenders were 1.7 times more likely to die from a non-communicable disease compared to an age and sex matched non-offending general population (Calais-Ferreira et al., 2023). This was driven by deaths due to cardiovascular disease and digestive conditions. The rate was higher when the first contact with the youth system was at an earlier age, and when the contact had resulted in a prison sanction.

The Australia 10-18 cohort found that youth with a charge only or community sanctions had about twice the number of internal cause deaths as expected (SMR: 1.7 CI: 1.4-2.1, and SMR: 2.1, CI: 1.7-2.7), while those with a prison sanction had nearly three times the expected deaths from internal causes (SMR: 2.8, CI: 2.1-3.7) (Kinner et al., 2025).

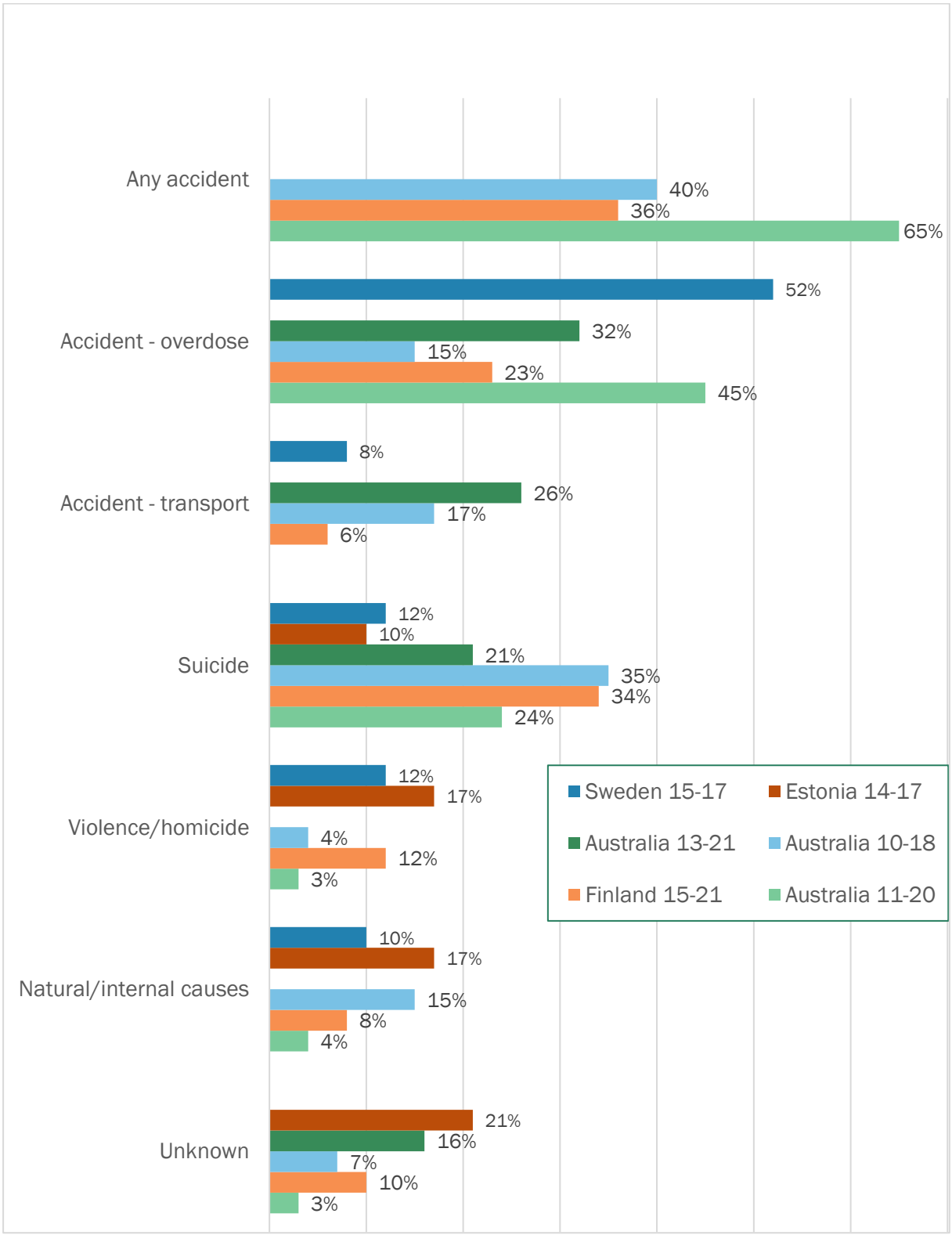
## Most common causes of death

Six cohorts provide the distribution of different causes of death among those who have died. The studies differ in which specific causes they focus on, and whether they separate overdoses and transport accidents from other types of accidental death. Despite these differences, there are some overall patterns (Figure 1). The differences in cause of death patterns across studies are likely linked to differences in age and severity of crime in the cohorts, levels of comorbidities, length of follow-up periods, and perhaps also country. As most cohorts consist mainly of males, cause-specific distributions may be different for female youth offenders.

Accidental deaths were the most common cause across studies, accounting for 36-65% of deaths, and seemed to be largely related to accidental poisoning/overdoses (15-52%) and transport related accidents (8-18%). Suicide mortality was another major cause, accounting for 10-35% of deaths in the cohorts. Deaths from violence or homicide constituted a significant minority (3-17%) in all cohorts, but accounted for a particularly high proportion of deaths (12%) in the Finland 15-21 cohort (Sailas et al., 2006) and in the Sweden 15-17 cohort subsample of offenders with 9 or more convictions (Brå, 2021), and 17% of deaths among a subsample of persistent offenders in the Estonia 14-17 cohort (Saar & Markina, 2012). Deaths from natural or internal causes were more common in the cohorts with a longer follow-up period (Kinner et al., 2025), which falls in line with the assumptions that mortality from diseases or bodily malfunction generally occurs later in life.

The Denmark 15-35 cohort reported that among those who had committed violence without self-harm, the proportion who died from unintentional poisoning was 29%, while among those who had both committed a violent crime and self-harmed the proportion was 52% (Steeg et al., 2019).

**Figure 1:** Overview of distribution of causes from six cohorts that report cause-specific mortality




The Sweden 15-17 cohort only reports cause-specific mortality for a subsample of n=199 serious offenders with 9 or more convictions. The percentages from the Estonia 14-17 cohort are based on a subgroup of persistent offenders.

# Age at death and timing of premature mortality

## Mortality before age 25

The available evidence indicates that a substantial proportion of deaths among people involved in crime during youth occur in adolescence or early adulthood (see number of deaths outlined in Table 6). The Finland 15-21 cohort found that mortality was 9 times higher for youth offenders aged 15-19 and 7 times higher for those aged 20-24 (Sailas et al., 2006). The Australia 11-20 cohort found that mortality was approximately 7-10 times higher before age 25 and approximately 3-8 times higher at older ages (Coffey et al., 2003).

A large Australian cohort provides further evidence of mortality at very young ages. Altogether 1 328 people (2.7%) of those who had been in contact with the youth justice system at ages 10-18 had died during the 25-year follow-up period. Among those who died, the median age at death was approximately 24 years (Willoughby et al., 2023). A subsequent analysis found that 415 (29%) of deaths occurred before age 20 and 395 (28%) at ages 20-24. In total, 810 deaths, or 57% of all observed deaths, occurred before age 25 (Kinner et al., 2025). Violence related deaths also occurred at a young age: the median age at death from violence was 24 years (Willoughby et al., 2021).

Deaths from non-communicable diseases occurred somewhat later in the Australian youth justice cohort, but still at a notably young age: the median age at death from a non-communicable disease was 30.5 years (Calais-Ferreira et al., 2023).

## Interpreting reported ages at death

Mean and median ages at death must be interpreted in relation to the follow-up period of each cohort. None of the cohorts were followed until all, or even most, participants had died. In most studies, approximately 95% or more of participants were still alive at the end of follow-up. Consequently, the reported mean or median describes the ages of the relatively small proportion who died during the observation period; it does not estimate the average lifespan of everyone who had offended or been imprisoned during youth.

Follow-up duration also affects the observed age at death. A study with three years of follow-up can capture only deaths occurring shortly after cohort entry and will therefore generally report a younger median age at death than a study following participants for several decades. The reported figures should therefore not be interpreted as indicating that people involved in youth crime die, on average, in their twenties. Instead, they demonstrate that a substantial number of deaths occurred during adolescence and early adulthood, within the periods covered by the studies.

# Time trends

Although most of the included studies are published fairly recently (7 published between 2020 and 2025, and 6 published between 2015-2019), the need for long follow-up periods to study mortality means the time of offending dates back several decades in many of the cohorts. There could be policy changes or other factors that impact the association between youth offending and mortality over calendar time. There is no evidence to reliably indicate whether there is a decline or increase in mortality risk for youth offenders over calendar time, however some studies have compared mortality risk from different periods of their follow-up time. The Australia 11-20 cohort found no differences in mortality rates when separating into offending during the time-periods 1988-1991,

1992-1995 and 1996-1999 (Coffey et al., 2004). The Finland 15-21 cohort found that less than 2% of youth offenders imprisoned in the time period 1984-1989 had died after 3 years, while over 3% of youth imprisoned in the time periods 1990-1995 and 1996-2000 had died after 3 years (Sailas et al., 2006).

# Sex differences in mortality

Young women and men may have different pathways into and out of the justice system, including different patterns of trauma exposure, mental health problems, substance use and service use. Because most young people who receive criminal justice sanctions are male, the cohorts included in this review are either exclusively or predominantly male. Consequently, the overall findings, and particularly the distributions of causes of death, are largely driven by data on males.

Young women who enter the justice system constitute a comparatively small, marginalized and highly vulnerable population (Svendsen et al., 2023). Their relatively low numbers mean that they are frequently under-represented in research. Moreover, the small number of deaths among females often results in imprecise estimates with wide confidence intervals. Findings for females must therefore be interpreted cautiously.

## Absolute mortality and mortality relative to the general population

Most deaths recorded in youth justice cohorts occur among males. This partly reflects the much larger number of males in these cohorts and, for some causes, higher mortality rates among males. However, studies comparing youth offenders with the general population sometimes find a greater *relative* increase in mortality among females (see Table 5).

The Australia 11-20, Scotland 14-19 and Sweden 15-17 cohorts all reported much higher standardised mortality ratios among female youth offenders, compared to what was reported for males. While the standardised ratios mostly ranged from 5-11 for males, most estimates for females were at roughly 12-40 times the expected deaths (Brå, 2021; Coffey et al., 2003; Graham et al., 2015).

A higher standardised mortality ratio does not mean that female youth offenders had a higher absolute mortality rate than males. Because mortality is generally lower among young females in the general population, even a relatively small number of deaths among female youth offenders can produce a large ratio. As the female populations that were investigated were relatively small and had fewer incidents of death, estimates are more uncertain for female youth offenders compared with males. That said, confidence is increased by findings from youth offender populations mirroring findings that are seen in the adult offender populations, where studies typically find that males have about 4-9 times more deaths than expected, while females range roughly from 6-27 times more deaths than expected (Zlodre & Fazel, 2012).

## Violence related mortality

In the Australia 10-18 cohort, violence related mortality was approximately 14 times higher among females and six times higher among males than in the corresponding general population (Willoughby et al., 2023). Nevertheless, males accounted for most assault deaths in the cohort.

One study investigated the circumstances surrounding violent deaths. Among females, fatal violence was more frequently associated with relationship breakdown or violence by a current or former intimate partner. Among males, deaths were more frequently preceded by an altercation

and involved violence by friends, acquaintances or other people outside an intimate relationship (Willoughby et al., 2023; Willoughby et al., 2021). These findings suggest that strategies to prevent violence-related mortality may need to address different circumstances and risk factors among young women and men.

## Overall interpretation of sex differences

The available evidence presents two complementary perspectives. Most deaths among youth offenders occur among males, thus males constitute the largest absolute burden of premature mortality. At the same time, female youth offenders may experience a particularly large increase in mortality relative to other young females in the general population and may face distinct risks, particularly in relation to intimate-partner violence.

The limited number of females and deaths among females makes it difficult to draw firm conclusions about sex differences. Cause specific death is typically not presented for males and females separately, or only presented for males as the numbers related to cause-specific deaths are too small for females (for example Coffey et. al., 2003), which means that cause-specific findings may not be generalizable to female youth offenders. More studies reporting both absolute and relative mortality separately for females and males are needed to inform appropriately tailored prevention and service responses.

# Factors associated with mortality risk

The included studies identified several characteristics associated with mortality among youth offenders. These concerned for example the seriousness and persistence of offending, the extent of contact with the justice system, family and parental factors, and co-occurring substance use and mental health problems.

The studies cannot establish a causal direction, however it is possible that the elevated mortality rates seen in more justice involved youth are linked to greater pre-existing health, social and psychosocial needs, but may also be linked to exposure to the justice system, imprisonment and interruptions of adolescent development, and connections to crime involved peers and environments (Hughes et al., 2020; Patton et al., 2016; Sawyer et al., 2012).

## Serious and repeated justice involvement

The findings from the included cohorts indicate a gradient: mortality tends to be higher among people with more serious, repeated or prolonged justice involvement, and most of all for imprisoned youth offenders.

### *Younger age at first justice involvement*

Evidence concerning age at first justice involvement was limited. In the Australia 11-20 cohort, younger age at first admission was associated with higher all-cause mortality. Younger age at admission was particularly strongly associated with death from unintentional injuries (Coffey et al., 2004).

In the Australia 10-18 cohort, mortality from non-communicable diseases was elevated relative to the general population both among those whose first youth justice contact occurred before age 14 and among those whose first contact occurred later. The relative elevation was greater in the younger group (Calais-Ferreira et al., 2023). Overall, these findings suggest that early justice

involvement may help identify young people with particularly high and accumulated vulnerability. However, the evidence is insufficient to conclude that younger age at offending independently increases mortality.

### *Repeated justice involvement*

Repeated offending and repeated justice-system contact were relatively consistently associated with higher mortality. The Sweden 15-17 cohort found gradually increasing all-cause mortality risk with increasing numbers of convictions (see Table 5) (Brå, 2021). In the Sweden 15-18 cohort, mortality increased with the number of convictions, particularly for deaths caused by unintentional injuries (Stenbacka & Jansson, 2014).

Similarly, the Australia 11-20 cohort had higher all-cause mortality among young people with repeated admissions to youth detention. After adjustment for age at admission, the mortality hazard was approximately 70% higher among those with known repeat admissions than among those with a single admission (Coffey et al., 2004).

The Australia 10-18 cohort found that being under adult correctional supervision in the community remained associated with mortality after adjustment for other characteristics (Kinner et al., 2025).

A clear gradient was also found for suicide mortality (see Table 9). Compared with people without convictions, the fully adjusted suicide mortality rate ratio increased from 1.7 among females with one conviction to 5.7 among females with five or more convictions. Among males, the corresponding estimates increased from 2.0 to 6.6 (Björkenstam et al., 2011).

### *Prison sanctions*

The highest mortality estimates were generally observed among people who had experienced youth detention or imprisonment (see Table 5, 6 and 7). The Australia 10-18, Australia 11-20, Finland 15-21, and Scotland 14-19 cohorts reported all-cause mortality rates 6-9 times higher than expected among youth offenders who had been imprisoned (Coffey et al., 2003; Graham et al., 2015; Kinner et al., 2025; Sailas et al., 2006).

Within the Australia 10-18 cohort, all-cause mortality increased across levels of youth justice contact. The standardized mortality ratio was 3.5 among people who had only been charged, 4.3 among those who had received a community-based order and 6.4 among those who had experienced detention (Kinner et al., 2025). In the same cohort, imprisonment was also associated with more than twice the subsequent risk of violence-related death (Hazard ratio: 2.5, CI: 1.2-5.3) compared with being charged only, after adjustment for sex, age at youth justice contact, violent offending and later contact with adult corrections (Willoughby et al., 2023).

Continuing involvement with the adult prison system was also associated with mortality. In the Australia 10-18 cohort, having two or more adult incarcerations was associated with twice the hazard of death from non-communicable diseases, as was longer accumulated periods in adult prison (Calais-Ferreira et al., 2023).

These findings should not be interpreted as demonstrating that detention or imprisonment caused the increased mortality. Young people who experience detention generally have more extensive justice involvement and may differ from those receiving less restrictive responses in several health and social respects. Consistent with this interpretation, The Australia 10-18 cohort found that mortality was lower during periods of incarceration than during periods without justice supervision

(Kinner et al., 2025). Only 1.6% of all deaths occurred in custody; almost all occurred in the community.

Although mortality rates were highest among those who had been sanctioned with prison, most youth offenders were never in prison (see Table 6). Consequently, most deaths occurred among people who had only been charged or had received community-based sanctions (Kinner et al., 2025) or convicted but not sanctioned to prison (Siponen et al., 2023). Preventive measures should therefore not be restricted to young people who have been imprisoned.

None or few of the included studies separately examined mortality following electronic monitoring or compared specific forms of youth-oriented sanctions, community programmes or different detention settings. The studies also provided little information about conditions within youth detention facilities or differences between imprisonment in youth-specific and adult institutions.

### *Violent offending*

Several studies found higher all-cause mortality among people convicted of violent offenses, both in studies focused specifically on violent offending, and in studies comparing violent with non-violent offending. There is also evidence of violent offending increasing the risk of some specific causes of death, in particular suicide deaths.

The Denmark 15-35 cohort found that violent crime and violent crime combined with hospitalisation for self-harm, were particularly associated with all-cause mortality, and all unnatural cause-specific categories of mortality (Steeg et al., 2019).

In the Sweden 15-18 cohort of male conscripts, in adjusted analysis (see Table 7), those who were convicted of violent crime in their youth had a four times higher hazard of death, while those with non-violent convictions had twice the hazard of death, compared to those with no convictions (Stenbacka et al., 2019). Violent offending was particularly strongly associated with alcohol- and drug-related death (Hazard ratio: 2.8, CI: 1.7-4.8), fatal accidents (Hazard ratio: 2.5, CI: 1.2-5.5) and suicide (Hazard ratio: 2.1, CI: 1.1-4.1).

The Sweden 15-19 cohort which investigated suicide mortality specifically, found that violent offending was more strongly associated with suicide than non-violent offending. In fully adjusted analyses, the mortality rate ratio for suicide among those convicted of violent offences was 4.2 for both females and males. For non-violent offending, the corresponding estimates were 1.5 for females and 2.2 for males (Björkenstam et al., 2011).

Despite the NICE guidelines including research on long-term outcomes among children and youth with harmful sexual behavior as a key recommendation in 2016 (NICE, 2016), our searches did not find literature on mortality among youth sexual offenders, or youth with sexually harmful behavior. Rather, sexual offences were included in the broader violent offences group, likely because sexual offending is less common, and it is difficult to make reliable mortality estimates of a rare outcome such as mortality in a small population. In adult populations there were findings that sexual offences are associated with elevated mortality, in particular suicide mortality. Often the focus in these studies was on offences related to child sexual abuse, which may be of limited relevance to youth offenders (Key et al., 2021).

## Substance use

Alcohol or substance use, indicated through self-report, hospitalization for substance use treatment, or drug-related offences, emerged as one of the factors most consistently associated

with mortality. In the Australia 13-21 cohort, though a smaller study with some uncertain estimates, self-reported opioid use (Hazard ratio: 4.3, CI: 1.5-13.0), non-medical use of sleeping tablets (HR: 5.0, CI: 1.9-13.0) or pain medication (HR: 5.6, CI: 1.3-25.0), polysubstance use (HR: 2.8, CI: 1.0-8.0) and injecting drug use (HR: 4.4, CI: 1.5-13.0) during adolescence were associated with higher all-cause mortality (Kinner et al., 2015). The Finland 15-21 cohort also found that youth offenders who had been hospitalized for substance dependence had 62% higher odds of mortality (OR: 1.62, CI: 1.28-2.04), with a mortality rate of 128 per 10 000 person years (Sailas et al., 2006).

The study also found that almost half of the deaths occurred while under the influence of alcohol (43%), drugs (26%), or both (31%) (Sailas et al., 2006). The Australia 10-18 cohort also investigated toxicology reports for those who had died from violent causes and found cannabis in 70% of cases and alcohol in 65% of cases (Willoughby et al., 2021).

In the Australia 11-20 cohort, having a drug-related offence was associated with drug-related death (HR 2.5, 95% CI 1.5–4.1) (Coffey et al., 2004).

Substance use also appeared to account for part of the association between youth offending and suicide. In the Sweden 15-19 cohort, adjustment for substance misuse before age 19 produced the largest reduction in the association between youth offending and suicide (Björkenstam et al., 2011).

In the highly selected Finland 15-19 cohort of youth offenders who underwent forensic psychiatric assessment, comorbid alcohol or substance use disorders were not clearly associated with additional mortality (Lindberg et al., 2017). This finding does not necessarily demonstrate that substance use was unimportant. Substance use and psychiatric morbidity were already common in this selected population, and the relatively small number of deaths may have limited the study's ability to identify differences between diagnostic groups.

## Mental health problems and self-harm

In the Finland 15-21 cohort, the overall standardised mortality ratio was 7.4 (Table 5), however when the cohort was stratified according to who had received psychiatric treatment or not, the mortality rate was eight times higher for those with psychiatric treatment (SMR: 8.3, CI: 7.3-9.4) and 6 times higher for those without (SMR: 6.3, CI: 5.4-7.3), indicating that some of the excess mortality risk associated with youth offending might be accounted for by psychiatric illness (Sailas et al., 2006).

Further, the authors conducted separate analyses for hospitalisation for substance dependence, psychosis, personality disorder or depression and childhood onset psychiatric disorders, and found that all except childhood onset disorders were associated with approximately 54-63% higher odds of death (Sailas et al., 2006). Childhood onset disorders were associated with a 55% reduction in odds of death, though the interpretation of this is unclear, due to the relatively low number of persons who had received treatment in their childhood.

Conversely, the Sweden 15-20 cohort found that, among youth offenders not sanctioned with prison, any childhood psychiatric disorder was associated with an increased hazard of death (Hazard ratio: 2.2, CI: 1.9-2.6), with the strongest association for externalising disorders (HR: 3.3, CI: 2.7-4.1) and internalising disorders (HR: 2.9, CI: 1.9-4.4), and a smaller, yet significant increase in hazard for neurodevelopmental disorders (HR: 1.4, CI: 1.0-1.94) (Siponen et al., 2023). Among youth offenders with prison sanctions, the lower statistical power due to fewer cases did not allow

for the same analysis, however an increased hazard for mortality was found for any childhood psychiatric disorder (HR: 1.7, CI: 1.2-2.5) and for externalising disorders (HR: 2.3, CI: 1.5-3.7).

The Denmark 15-35 cohort illustrates a particularly high mortality associated with overlapping self-harm and violent offending. Compared with people with neither history, mortality rate ratios for unnatural causes were elevated among those with a history of violent offending (MRR: 5.2, CI: 4.4-6.1) and among those with hospital-treated self-harm (MRR: 12.6, CI: 10.8-14.8), but were highest among people with both histories (MRR: 29.4, CI: 23.1-37.4) (Steeg et al., 2019).

The Finland 15-19 cohort was specifically selected on psychiatric comorbidity and included offenders who had gone through a psychiatric evaluation which resulted in a diagnosis for 93% of the cohort (Lindberg et al., 2017). The study found an increased mortality risk; however, they did not find any differences in risk when comparing schizophrenia spectrum disorders with conduct disorders/personality disorders. This can be difficult to interpret, as the population is highly selected for psychiatric comorbidity and there could be competing risk factors related to schizophrenia disorders and conduct or personality disorders that impact mortality.

## Socioeconomic and parental factors

Data on socioeconomic and family background factors were limited, but some of the included studies were able to report on or adjust for some of these.

The Denmark 15-35 cohort found that the socioeconomic status of the parents (income, education, employment) was lower for persons who died compared to those who were still alive at the end of the observation period (Steeg et al., 2019).

The Sweden 15-20 cohort found an increased hazard for death associated with having a parent with a psychiatric disorder or a parent with criminal convictions (Siponen et al., 2023), indicating that these types of factors contribute to the overall mortality risk associated with youth offending. The study also adjusted for parental education in analyses, but did not report any mortality risk statistics related to parental education.

The Sweden 13-19 cohort, which has a primary focus on parental death and mortality, included parental education and household income into statistical models together with youth offending, and found that youth offending had a unique impact on mortality, but also an indirect impact through increasing the likelihood of lower education and thus lower income, which in turn was associated with mortality risk (Hiyoshi et al., 2021).

In the Sweden 15-19 cohort that investigated suicide specifically, a number of parental and family socioeconomic factors were included in adjusted analysis (see footnote of Table 9), these did reduce the mortality risk associated with youth offending, indicating that parental and socioeconomic factors may have a role in the suicide risk seen among offending youth (Björkenstam et al., 2011).

Few of the included studies include detailed socioeconomic variables, however, broader research on youth offending indicates strong associations with socioeconomic disadvantage, low educational attainment, and weak labour market attachment. Family adversity and exposure to violence are also common. These factors likely contribute indirectly to increased mortality risk.
Crime involved youth as a group have an accumulation of risk factors for adverse health outcomes and mortality. Several adversities that are over-represented within crime involved youth have been associated with increased risk of mortality in general, non-crime populations. For instance, contact with social services/child protection services have been associated with a four times higher risk of

suicide in Northern Ireland, even when the child was assessed as not in need of support (McKenna et al., 2023).

Although youth with an immigration background or Indigenous status are often overrepresented in youth offender populations, the research on this related to mortality is limited. The Australian cohorts have a strong focus on indigenous youth and find increased mortality risk in this group, in particular for males, however the transferability of these findings to Norwegian and Nordic contexts is uncertain. We do know from research in Norway that when controlling for other socioeconomic factors, immigration status is not associated with a likelihood of reimprisonment for youth offenders (Skjærvø et al., 2024), which makes it possible that any association between immigration status and mortality may also be mediated through social disadvantage.

# Overall interpretation of findings

Evidence from the Nordic countries, Europe, and Australia consistently indicates that youth offenders have a substantially elevated risk of premature mortality. The excess mortality is largely driven by preventable causes, particularly suicide, overdose, accidents, and homicide. Many deaths occur during adolescence and early adulthood, including a substantial proportion before ages 20 and 25.

Among youth offenders who had been imprisoned or had more severe or repeated criminal involvement, relative mortality estimates generally indicated mortality around 6-11 times as high as the relevant comparison population. Among those with less extensive justice involvement, mortality was approximately 2-5 times higher. These ranges should be interpreted as broad summaries because the studies used different populations, comparison groups, follow-up periods, and statistical measures.

Youth offenders had substantially elevated premature mortality, largely from preventable causes. Many deaths occurred before age 25.

Although the highest individual risk was found among youth offenders with extensive justice involvement, most deaths occurred in the larger population with less severe involvement. The population burden of premature mortality is therefore not confined to the relatively small group who have experienced imprisonment or persistent offending.

Although females were underrepresented in the cohorts, and estimates less certain, confidence is increased by sex differences being in line with findings from adult offender populations. Several studies found a greater relative elevation in mortality among female youth offenders than among males when each was compared with the corresponding general population. Some estimates indicated mortality 25-40 times higher than among females in the general population. That said, as the youth offender population is predominantly male, most premature mortality occurred among males.

Mortality risk was highest for extensive or severe youth offenders, but most deaths occurred in the larger group with less extensive justice involvement.

The association between youth offending and mortality probably reflects the documented accumulation and interaction of vulnerabilities across the life course for this group. Substance use and mental health problems were the factors most consistently associated with mortality, particularly suicide, overdose, and accidental death. Some studies also found that socioeconomic and parental circumstances accounted for part of the association, although direct evidence concerning these factors was limited.

Broader evidence shows that youth offenders frequently experience poverty, family instability, educational disengagement, exposure to violence, and other forms of adversity. Subsequent marginalization, including exclusion from education and employment, stigma, reduced access to healthcare and support services, and continuing justice involvement, may compound these vulnerabilities. Justice involvement may therefore be understood primarily as a marker of accumulated health and social needs. The available evidence does not establish that offending or justice system contact itself causes the elevated mortality, though there could be bidirectional effects.

Youth offending is likely best understood as a marker of accumulated health and social vulnerabilities.

# Implications for policy and practice

Premature mortality among youth offenders should be recognised as both a public health and a criminal justice concern. Contact with the police or justice system provides an important opportunity to identify health and social needs and connect young people with appropriate support.

Continuity of support is central when young people complete sanctions and leave the justice system, or as in Norway, turn 18 and may be transferred to adult sanctions. Many deaths occur before the age of 25, thus adolescence and the transition to adulthood are crucial time periods for mortality prevention.

Contact with the police or justice system is a critical opportunity to identify unmet health and social needs and prevent premature deaths.

The findings further support a broad approach to preventing premature mortality among youth offenders. More intensive support may be warranted for those with psychiatric comorbidity, high-risk substance use, repeated offending, violent offending or prison sanctions. However, preventive efforts should not be restricted to high-risk groups, as most deaths occur among the larger population with less extensive justice involvement.

Prevention must reach beyond imprisoned or high-risk youth offenders, and support should continue into adulthood.

There is no clear evidence on what interventions are effective in preventing premature mortality among youth offenders (Welsh et al., 2022). Given the findings related to high suicide rates and mental health and substance use comorbidity, it is reasonable to assume mental healthcare, suicide prevention, substance use treatment, and overdose prevention should be central components of the response. As youth offending is highly associated with socio-economic disadvantage, and there is evidence that social strain is associated with mortality generally and in youth offenders, education, employment, housing, family circumstances, and access to healthcare, are facets that should be included in mortality prevention. It follows from this that effective prevention will likely require coordination across health, welfare, education, child protection, police and the justice system rather than being the responsibility of the justice system alone.

Effective prevention will require coordination across health, welfare, education, child protection, police and the justice system.

## Implications for the Norwegian context

Norway has several existing opportunities for interventions for youth offenders. The community sanctions youth follow-up and youth punishment, administered by the National Mediation Service, and the specialised youth units within the Correctional Service provide frameworks for individually adapted and multidisciplinary follow-up. In addition, established youth teams provide enhanced follow-up for imprisoned youth offenders aged 18-24. These arenas could be used more systematically to assess mental health and substance use, suicide and overdose risk, and broader social circumstances, and to connect young people with appropriate services. However, they do not reach young people at risk of offending who have not entered the justice system and may not ensure continuity after a sanction has been completed and justice involvement ends. The need for early and coordinated support extends beyond young people currently serving a sanction.

Norway has been criticised for placing minors in ordinary adult prisons, and for the excessive use of solitary confinement. In Meld. St. 31 (2024–2025), the Government set out plans to stop

placement of children in adult prison, increase the capacity of specialised youth units from ten places at the end of 2024 to 27 places in 2026, phase out the temporary placement of minors at Eidsberg Prison and consider expanding the multidisciplinary youth teams. The white paper also emphasised the need to assess how the best interests of the child and other principles of the UN Convention on the Rights of the Child are applied in decisions concerning young people (United Nations, 1989). These proposals should be implemented and evaluated in a manner that preserves the high threshold for imprisoning children and ensures continuity of healthcare, education and welfare support.

Recent Norwegian assessments indicate that the potential in existing frameworks has not been fully realised. A joint report by the Norwegian Directorate of Health, the Norwegian Directorate for Children, Youth and Family Affairs, and the National Mediation Service identified insufficient knowledge among welfare services about youth sanctions and their responsibilities towards youth that receive these sanctions. It also found gaps and geographical differences in services addressing mental health, substance use, violence and harmful sexual behaviour, as well as a lack of systematic assessment of risk and protective factors. The report proposed ten measures to strengthen coordination, clarify responsibilities, improve access to specialised expertise and establish more systematic assessment and referral procedures (Helsedirektoratet et al., 2023).

These concerns were reinforced by the Office of the Auditor General's investigation of the authorities' response to child and youth crime. The investigation concluded that the authorities' preventive efforts had been insufficient, and that collaboration across sectors and administrative levels remained inadequate. It identified unclear responsibilities, insufficient access to suitable measures and weaknesses in the continuity, particularly during transitions between institutions, prisons and community services. The Office of the Auditor General recommended stronger coordination between the police, municipalities, child welfare services and other relevant services, improved information exchange and better continuity during transitions (Riksrevisjonen, 2025).

Existing governmental plans and intentions for youth crime in Norway must be implemented and efforts to assess the need for further measures must be continued.

Similarly, in NOU 2024:3 Joint Efforts Against Extremism, central themes are social exclusion, marginalisation, and inadequate services. The risk factors for radicalisation are largely overlapping with those seen for youth offending and premature mortality, including social and familial disadvantage and mental health concerns. The case review conducted by the Extremism Commission also found that many of the people examined had been in contact with several parts of the support system during their upbringing, underscoring the opportunities for intervention. The Commission's recommendations stress that preventing radicalisation and extremism is not primarily a matter of security measures. Rather, they align with broader approaches to preventing youth offending, morbidity and premature mortality: earlier intervention, more binding collaboration, clearer arrangements for information sharing, and stronger coordination between schools, health services, child welfare services, NAV, municipalities and the police (NOU 2024:3; Meld. St. 13 (2024–2025)).

Recent concerns that vulnerable children and young people may be deliberately recruited into criminal networks further strengthen the case for early, coordinated intervention addressing both exposure to crime and the underlying health and social needs associated with premature mortality (Meld. St. 31 (2024–2025)).

Taken together, the Norwegian policy documents and the findings of this knowledge summary support an approach in which youth offending is treated not only as a justice issue, but also as a possible indication of unmet health and social needs. Early intervention and coordinated follow-up should explicitly include mental health, substance use, suicide and overdose risk, education, housing and family circumstances. Particular attention is needed at transitions, including when a young person turns 18, completes a sanction, leaves an institution or is released from prison. The available evidence does not establish which Norwegian service model will reduce mortality, but it provides a public health rationale for implementing and systematically evaluating coordinated initiatives.

Finally, the lack of Norwegian mortality studies represents an important knowledge gap. Such studies are needed to determine the extent to which the findings of this knowledge summary apply in the Norwegian context. There is a need for systematic evaluation of mortality and health outcomes among youth offenders, both to establish mortality and risk factors among youth offenders in the Norwegian context, and to identify the impact of interventions, different types of sanctions or policy changes. Norway's national registers provide an opportunity to examine long-term mortality and causes of death following different forms of youth justice involvement, while taking socio-economic factors into account.

There is a need to establish the extent of mortality in Norway and evaluate long-term outcomes for different types of sanctions, services and interventions.

# Strengths and limitations of the evidence

Though there is consistent evidence across studies, direct comparisons between studies should be made cautiously because cohorts vary considerably in their definitions of offending, age ranges, follow-up periods, and mortality measures. However, given that these studies are consistent, despite differences in countries, cohorts, definitions of offending, and statistical approaches, this can increase the confidence that the association between youth offending and premature mortality is robust.

Many of the included studies were large registry-based cohorts with reliable mortality data and long follow-up periods. These designs are particularly well suited to studying rare outcomes such as premature mortality. However, the geographical evidence base remains relatively narrow: Most studies included in the current review originated from Australia and Sweden, with more limited evidence from other countries. Though Scandinavian countries such as Sweden, Finland and Denmark were represented and likely reflect contexts broadly comparable to Norway, the evidence base would be strengthened by additional Norwegian studies examining mortality among youth offenders within the specific legal, welfare, and healthcare context of Norway.

The evidence was strongest for all-cause mortality, where multiple large studies consistently demonstrate elevated mortality compared with the general population. Similarly, there was relatively strong evidence for deaths due to suicide, overdose, poisoning, and other accidental causes. In contrast, evidence for some specific causes of death, such as homicide and disease-related mortality, is less certain because these outcomes are rarer and therefore based on fewer deaths.

Several studies examined mortality over extended periods of follow-up, allowing for insight into mortality extending into adulthood. Few studies investigated mortality after age 30/40, therefore

evidence on premature mortality rates occurring later in life is limited, particularly mortality due to chronic disease or other internal causes largely associated with aging.

Further, girls and women constituted a minority in most cohorts, and the number of deaths among females was often small. Consequently, estimates for females, particularly for specific causes of death, remain more uncertain than those for males.

This review attempted to focus on offending occurring before age 18, therefore addressing a distinct developmental period. However, several studies included broader age ranges extending into early adulthood. If mortality risk is highest among those who offend at the youngest ages, inclusion of older offenders may lead some studies to underestimate the mortality risk associated with offending during adolescence itself.

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# Appendix 1 – Search strategies

## Terms included in the main search

| Target population/10-18 years | Exposure/Crime | Outcome/Mortality |
|---|---|---|
| **Title/Abstract** | **Title/Abstract** | **Title** |
| Youth* | Crime* | Mortality |
| Child* | Criminal* | Death* |
| Adolesc* | Violen* | Fatal* |
| Minor | Sexu* | Homicid* |
| Minors | Incarc* | Overdose* |
| Juvenile* | Assault* | Poisoning* |
| Boy | Delinquen* | Dying |
| Boys | Offend* | Die |
| Girl | Prison* | Died |
| Girls | Imprison* | Dies |
| *Adolesc* | Jail* | Dead |
| *Puberty | Justice | Deceased |
| Teen | Justice-involved | Murder* |
| Teens | Custod* | Suicide rate* |
| Teenage* | Detention | Rate* of suicide |
| Underage* | Detained | Suicide incidence |
| Under-age* | Convict* | Incidence of suicide |
| Young-offender | Penal | Suicide risk |
| | Penitentiar* | Risk of suicide |
| | Inmate | Lethal suicide |
| | Offence | |
| | Felon* | **The term suicid* on its own was excluded** as it led to a large increase in irrelevant search results related to suicidal ideation, suicidal thoughts and suicide attempts. More specific terms were therefore used. |
| | Ex-offend* | |
| | Correctional | |
| | Remand | |
| | Bail | |
| | Probation* | |
| | Parole* | |
| | Community service | |
| | Electronic monitor* | |
| | Punish* | |

## Additional search strategies

Searching specifically for studies on mortality and sexual offences or harmful sexual behavior, through wide searches in PubMed and PsycInfo did not yield relevant results, for either youth or adult populations. Wide searches consisted of the target population search words in the title, combined with sexu* in title abstract and the mortality terms in title or abstract, including suicid*. Further, open searches were done in the google scholar and google search engines, and AI searches were conducted with ChatGPT.

| **Target population/10-18 years** | **Exposure/Crime** | **Outcome/Mortality** |
|---|---|---|
| **Title** | **Title/Abstract** | **Title/Abstract** |
| Youth* | Sexu* | Mortality |
| Child* | | Death* |
| Adolesc* | | Fatal* |
| Minor | | Homicid* |
| Minors | | Overdose* |
| Juvenile* | | Poisoning* |
| Boy | | Dying |
| Boys | | Die |
| Girl | | Died |
| Girls | | Dies |
| *Adolesc* | | Dead |
| *Puberty | | Deceased |
| Teen | | Murder* |
| Teens | | Suicid* |
| Teenage* | | |
| Underage* | | |
| Under-age* | | |
| Young-offender | | |