



**This thesis is submitted for the degree of Doctor of Philosophy**

# Offending, Physical Health and Premature Mortality: Associations Derived from Longitudinal and Meta-Analytic Evidence

**Guy Charles Mallett Skinner**

**Magdalene College**

Primary supervisor: Dr Maria Ttofi

Advisory team: Professor David Farrington and Professor Michael Lamb

Submission Date: 5th July 2021

Word Count: 64,899

## Declaration

This thesis is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the Preface and specified in the text. I further state that no substantial part of my thesis has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. It does not exceed the prescribed word limit for for the Faculty of Law Degree Committee.

**Guy Skinner's PhD Summary: Offending, Physical Health and Premature Mortality: Associations Derived from Longitudinal and Meta-Analytic Evidence**

Longitudinal investigations of associations between offending and health are rare. Studies which have investigated this relationship principally focus on mental health within samples of incarcerated offenders. Therefore, the physical health of offenders outside secure settings, henceforth 'community offenders', form an under-researched and potentially vulnerable group.

To address the limited knowledge on the relationship between community offenders and health, this thesis utilised access to a unique prospective longitudinal study, The Cambridge Study in Delinquent Development (CSDD), and conducted two global systematic reviews and meta-analyses. This aim of this thesis is to use these data sources to longitudinally, systematically, and meta-analytically investigate to what extent community offenders have poorer physical health across the life-course and die prematurely compared to non-offenders.

Chapter 1 provides an introduction together with a comprehensive review of the current evidence and theorizations behind the health-crime relationship. This highlights the limitations and gaps in the literature to date and sets out how this thesis seeks to contribute to this debate. Within Chapter 2, the first central focus, in contrast to the conviction and risk factor analyses previously performed, is on temporary versus persistently antisocial persons, based on three offending trajectories (see: Moffitt, 1993; Jolliffe, Farrington, Piquero, McLeod, & Van de Weijer, 2017b): Life-Course-Persistent, Adolescence-Limited, and Late-Onset offenders. These three typologies constitute qualitatively distinct types of persons and their different offending pathways may bear differential risks for adult health. By using data from the CSDD, the new approach in this thesis investigates the longitudinal impact of criminal behaviour on physical health problems in self-reports and General Practitioner (GP) data by testing the following hypothesis: individuals who commit offences earlier in their lives and have prolonged criminal careers will suffer from greater physical health problems than individuals who have short criminal careers. These early onset individuals, it is further hypothesised, will also have greater odds of injury and hospitalization than Late-Onset offenders, who in turn will have greater odds than Non-offenders.

These CSDD longitudinal analyses found that, when considering organic illnesses (respiratory tract, cardiovascular, musculoskeletal, skin, allergic, gastrointestinal and infectious illnesses)

and hospitalizations (the number of hospital visits), the impact of offending on health becomes more serious if offending persists beyond adolescence.

The second focus of Chapter 2 was to conduct further analyses investigating the relationship between psychosocial risk factors at age 8-10, antisocial personality (ASP) at ages 18, 32 and 48, and poor physical health (based on self-reports and GP records). These analyses found that high ASP scores at ages 18, 32 and 48 were related to a high prevalence of hospitalization. They also found that, according to GP records, high ASP scores at age 32 were related to poor physical health, and high ASP scores at age 48 were related to more mental illness and disabling medical conditions. These three CSDD analyses also highlight age-specific health implications related to the ages at which offenders begin and end their delinquent behaviour. Unfortunately, these findings could not be supplemented through a systematic review and meta-analysis, due to the paucity of existing studies. The worst consequence of poor physical health is premature mortality, so this element of the health-crime relationship was subsequently investigated in Chapter 3.

In Chapter 3, a systematic review and meta-analysis sought to establish whether community offenders die prematurely compared to non-offender community and population comparison samples. Thirty-six studies met the inclusion criteria ($N$= 1,116,614). Premature mortality is a significant issue for non-incarcerated offenders in general ($OR$= 3.42), and for ex-prisoners in particular ($OR$= 4.51). Offenders were more likely to die from unnatural violent causes ($OR$= 3.97) and natural causes ($OR$= 2.06) than non-offenders, with a meta-regression revealing that time at risk was not a significant factor ($z$= -0.01, $p$= 0.12). These results suggest that the rates of premature mortality previously found for offenders do not just reflect the impact of mental illness on these individuals, but rather that offending and its correlates may have a significant physiological impact on the body. Suicide was of particular interest when considering the causes of premature mortality in community offenders, one of the most prominent causes of death in offenders (Fazel, Benning, & Danesh, 2005) and males globally (WHO, 2018). A further systematic and review and meta-analysis was therefore conducted to investigate this significant element of the health-crime relationship.

In Chapter 4, a second systematic review and meta-analysis sought to establish whether community offenders were more likely to commit suicide compared with community and general population comparison groups. Fifteen studies met the inclusion criteria ($N$= 602,347)

and highlight that non-incarcerated offenders are significantly more likely to commit suicide compared with non-offenders (*OR*= 4.54), with time at risk being a non-significant factor. Ex-prisoners had a high likelihood of suicide (*OR*= 4.18), but not as high as offenders who had not been incarcerated (*OR*= 7.62).

Chapter 5 presents limitations concerning the studies conducted in Chapters 2, 3 and 4, in addition to providing recommendations for future research. Although this thesis could not provide directional or causal conclusions, Chapter 6 argues that the evidence provided suggests that the antisocial lifestyles that offenders lead when out of secure environments pose a significant risk to physical health. It is likely that the antisocial lifestyle of offenders causes processes which damage their health over time, and several criminological, epidemiological and medical theories are discussed to explain these links.

Overall, community offenders form a vulnerable group who require targeted interventions to reduce the incidence of poor physical health, mortality and suicide across the lifespan. Yet, the prior research and literature reviewed within this thesis demonstrates that community offenders form an under-researched group, with methodologically limited research conducted to date. Until there is further understanding of the health-crime relationship, the nature of these interventions remains impossible to comment upon. Future directions for new research are discussed which aim to produce further robust evidence on the relationship between community offenders and poor health, together with the differences between individual prospective longitudinal work and population level meta-analytic findings. These approaches should seek to establish causality and directionality of relationships and inform the design of future interventions.

The findings of this thesis, with respect to the health-crime relationship, should be viewed as a future public health challenge and continue to inform the evidence from which targeted interventions can be developed, with the aspiration of improving the health and life chances of community-based offenders.

## Acknowledgements

I am eternally indebted to my mother and father for their constant support and encouragement, in this PhD thesis and all other elements of my life.

I am extremely thankful to Professor David Farrington and Dr Maria Ttofi for their constant and consistent support throughout this doctoral dissertation.

I am also grateful to the Economic and Social Research Council (ESRC) for providing an Interdisciplinary Doctoral Training Partnership Studentship, without which, this work, and the subsequent opportunities, would not have been possible.

The CSDD data collection was funded mainly by the Home Office and the Department of Health. For carrying out criminal record searches, I am very grateful to Gwen Gundry in the 1960s and 1970s, Lynda Morley in the 1980s, Sandra Lambert in the 1990s, Debbie Wilson in the 2000s, Owen Thomas in 2011-12, and Lisa Robinson in 2017. I am also grateful to Professor Donald West for obtaining and coding the GP data, and to Dr Crystal Romilly for conducting the medical interviews at age 48.

## Table of Contents

## Chapter 1 - Introduction[1]

This thesis seeks to investigate relationships between physical health and premature mortality among community offenders. Community offenders are defined here as individuals who are not currently incarcerated or in psychiatric secure hospitals. The findings of this thesis therefore aim to provide novel evidence concerning the associations that exist between physical health, mortality and this under researched sub-group of offenders.

Offenders in the community are not in the care of Prison or Secure Psychiatric facilities in the same way they would be when in custody[2]. In terms of state support, the main responsibilities of offender managers in the community are to assess, supervise and rehabilitate offenders. While they can encourage offenders to address issues affecting the offenders' health and wellbeing, their ability to manage these issues is limited (Phillips, Gelsthorpe & Padfield, 2018; 2019; Phillips, Gelsthorpe, Padfield & Buckingham, 2017a). Additionally, the level of responsibility and accountability of the probation service for the health and well-being of offenders is substantially different from that of the prison service in relation to deaths and health problems in custody. Indeed, "[T]he level of responsibility and accountability of the probation service for the health and well-being of offenders is substantially different from that of the prison service in relation to deaths in custody (Ministry of Justice, 2017a, p. 3). Community offenders therefore form a lesser supported, and potentially more vulnerable, sub-group and thus merit heightened attention.

The thesis will centre around longitudinal analyses based upon prospective longitudinal data from the Cambridge Study in Delinquent Development (CSDD), together with two global systematic reviews and meta-analyses papers investigating physical health, premature mortality and suicide in offenders compared with non-offenders in community- and population-based samples. Structurally, this thesis begins with a literature review discussing pertinent criminological theories and the current evidence underlying the health-crime relationship. To ensure specificity, each subsequent chapter will contain an extended literature review specific

[1]Skinner, G. C. M., & Farrington, D. P. (*Under Review*). What we know and need to know about physical health versus offending: A literature review. *Aggression & Violent Behavior*.

[2] For example, in the United Kingdom (UK), HM Prison & Probation Service (HMPPS) would manage individuals in custody but have no responsibility for those in the community once court order sentences or post release supervision has ended.

to each research question, in addition to full analytic, methodological and discussion sections informing their results.

For many reasons, it is important that we have a thorough understanding of the welfare needs of community offenders and the most appropriate approaches to improve their health outcomes (Langan, 2005; Kenny, Nelson, Schreiner, Lennings & Butler, 2008). Firstly, there is a need to improve the wellbeing of this often-overlooked population, thereby reducing health disparities. With the UK government looking to move offenders out of prions and into the community, research on health and mortality outside prisons is increasingly essential (Herbert, 2010; Mills, 2011). Secondly, improving wellbeing is a well-known way to minimise reoffending (Hoeve, McReynolds, Wasserman & McMillan, 2013; Guebert & Olver, 2014). Thirdly, an emphasis on health can result in a broader community dividend by decreasing fear of crime and use of crisis treatment (Anders, Jolley, & Leaman, 2016; Home Office, 2004; National Probation Service, 2019). These arguments are not only humanistic, but also economic. The direct economic and social costs of offending are high (Home Office, 2018), and this research hopes to highlight the economic health burden that offending presents.

It is argued that this thesis makes several novel contributions to the field of health and epidemiological criminology. Firstly, few studies have the wealth of detailed, prospective, information about criminal careers and their association to health, with over a 50 year follow up period and high retention of the original participants. This is one of the most important contributions of the Cambridge Study in Delinquent Development. Secondly, no study to date has meta-analytically investigated the relationship between the likelihood of premature mortality and suicide in male and female community offenders compared to non-offenders, controlling for time at risk and mental illness. Thirdly, no study has investigated the relationship between physical health utilising prospective longitudinal samples meta-analytically in community offender samples, controlling for drug use. Fourthly, the methodological approaches in this thesis draw heavily on medical and public health sciences, encompassing the PRISMA guidelines approach to systematic reviews and meta-analyses, advocating for a shift to more robust methods in criminological enquiry.

This thesis will argue that offending is a public health issue. Additionally, it is suggested that collaborative research between clinical academics and criminologists is important in advancing knowledge about offending and about ill-health associated with offending, aiming to minimise

disability of individuals and costs to society. The findings of this study suggest that the current evidence base, and the lack of theorizations or frameworks which can account for the complicated dynamics underlying the health-crime relationship, make the development of interventions difficult and likely ill-informed at this time.

This thesis will now begin by providing a scoping review of established theoretical frameworks which seek to explain the health-crime relationship. With these key theoretical contexts and approaches in mind, a review of the current evidence underpinning the relationship between offending and health is then presented. This introductory section is not intended to be comprehensive, as literature reviews are provided within Chapters 2, 3 and 4, respectively, related to the specific topic of inquiry in those chapters.

**Criminological Theories investigating the Health-Crime Relationship**

Over the last twenty years there has been considerable development in the literature examining the relationship between crime and health. Many theories have been proposed within Criminology to explain the relationship between offending and health (Vaughn, Jackson, Testa, Holzer, Jaegers & Semenza, 2020a; Vaughn, Sala-Wright & Jackson, 2020b). Five key criminological theories will be discussed here.

This discussion of Criminological theories investigating the health-crime relationships will begin with Gottfredson and Hirschi's (1990) General Theory of Crime, which links crime to low self-control, and continues to be debated and investigated to this day (Nofziger & Johnson, 2020). This theory has spawned investigations into the links that may exist between low self-control and a wide range of undesirable behaviours (Arneklev, Grasmick, Tittle & Bursik, 1993; Evans, Cullen, Burton Jr, Dunaway & Benson, 1997; Paternoster & Brame, 1998; Pratt & Cullen, 2000). A general outcome of these works is the postulate that those in the population with low self-control require immediate satisfaction of their impulses, and that they achieve that satisfaction without due assessment of the future consequences for their life chances or future physical wellbeing.

Gottfredson and Hirschi (1990) themselves go further and argue that offenders are generally at risk for worse health in their future years than non-offenders, stating that "…offenders tend to be involved in accidents, illness, and death at higher rates than the general population" (p. 94). Additionally, Gottfredson and Hirschi argue that "…the traits composing low self-control are

also not conducive to the achievement of long-term individual goals. On the contrary, they impede educational and occupational achievement, destroy interpersonal relations, and undermine physical health … [and] well-being" (1990, p. 96). Thus, this theory argues that individual differences in self-control influence poor physical health and early mortality.

This theoretical link has not been extensively explored by subsequent researchers. Where it has been studied, the consensus is that low self-control is indeed a predictor of premature mortality (Miller, Barnes & Beaver, 2011; Piquero, Brezine & Turner, 2005a). Two studies on this topic linked a lack of control to early death, especially from homicide (Piquero et al., 2005a) and showed that 'poor choices', emanating from a lack of control, led to worse wellbeing and health problems (although the correlation was not very strong; see Miller et al., 2011). Similarly, work within Chapter 2 of this thesis will investigate whether individuals with higher levels of daring, a possible proxy for low self-control, are more likely to have worse health.

Terrie Moffitt's (1993) developmental taxonomy is another key milestone in the generation of criminological theory but, in the view of some scholars (e.g. Jackson & Vaughn, 2018), it has not been sufficiently exploited for its possible insights into the relationship between health and offending. Her original theory, including more recent extensions which will be covered later in this review, proposes that there are three types of offenders, each of which has a different etiology, behaviour and outcomes that impacts individuals throughout their lives.

The first cluster Moffitt identified was 'life-course-persistent' (LCP) offenders. In this group a far more long-term and definable etiology is seen to exist. This starts with the in-utero effects of maternal actions and continues with a childhood environment that does not have the ability to address and remedy the inherent individual problems that increasingly develop (McGloin, Pratt & Piquero. 2006). For example, evidence suggests that LCPs are influenced by cognitive deficits, an under-controlled temperament, hyperactivity, poor parenting, poverty, disrupted families, genetic and biological factors (for a review see McGee & Moffitt, 2019). Such childhood disadvantage is then reinforced once more by poor opportunities in adolescence, and these restrictions are accompanied by antisocial and ultimately criminal behaviours. These entrenched characteristics, Moffitt argues, continue across the whole of adult life, during which chances to change path are infrequent.

Only a limited amount of research has linked this taxonomy to mortality or poor health, with the majority of studies choosing to purely examine antisocial and criminal elements (Jolliffe, Farrington, Piquero, Loeber & Hill, 2017a; Jolliffe et al., 2017b), and fewer still controlling for the myriad of in-utero and environmental risk factors identified as significant in previous research. This is despite Moffitt predicting that "...life-course-persistent' antisocial lifestyles, violence, socioeconomic stress, and hostile personality will place them at greatest risk in midlife for poor physical health, cardiovascular disease, and early mortality" (Moffitt, 2003, p. 65).

Supporting her view, and addressing this gap in the literature, this thesis has discovered associations between poor health outcomes and offenders in the LCP category. Furthermore, individuals with the most antisocial personality characteristics were also found to have the greatest likelihood of poor health over time. The impact of personality, specifically childhood self-control, has also recently been found to predict offending behaviour across all age groups, with low self-control consistently resulting in higher deviant behaviour (Nofziger & Johnson, 2020). This recent research suggests that neuropsychological factors may not be needed to account for the health-offending relationship, in terms of offending profligacy. Rather, "…early socialization that leads to differing levels of self-control can predict the patterns of high and low offending over a large period of the life course" (Nofziger & Johnson, 2020, p. 760). This recent work has implications for the theorizations behind the health-offending relationship and the various personality, environmental and neuropsychological factors influencing 'offending', that may be significant across the life course.

Moffitt (2018) goes on to state that the pathological, and therefore long-lasting, behaviour of LCPs contrasts with those whose poor behaviour is situational and therefore short-term (Moffitt, 1994), and she terms this second cluster 'adolescence-limited' offenders. Here, early offending is related to the strain between fast-growing physical capability, desires, peer influence and low social access to adult behaviours (McGee & Moffitt, 2019). Consequently, rule-breaking occurs in areas such as vandalism, drug taking, and delinquency. However, these undesirable behaviours are time-limited and largely cease as adulthood is reached. Moffitt's adolescence-limited group is argued to be normative. Therefore, non-offending is exceptional according to Moffitt's taxonomies. There are, however, those adolescence-limited offenders who can be induced into a longer-term period of poor behaviour from amongst this group. This inducement is framed as a 'snare' by Moffitt and includes life events such as incarceration,

early pregnancy and drug abuse (Moffitt, 1993). This extends the range of factors that provide causality and confirm that the Moffitt theory has yet to sufficiently control for the numerous confounding variables that may influence and explain how crime and health interact across the life course (Van de Weijer, Bijleveld & Huschek, 2016).

In 2007, Piquero and colleagues (Piquero, Daigle, Gibson, Piquero, & Tibbetts, 2007a) pointed out that some of Moffitt's (2006) predictions have been challenged by subsequent research, including that multiple sub-classifications within taxonomies may exist, and that individuals within these taxonomies can change patterns and cease offending (Nagin, Farrington & Moffitt, 1995). However, evidence has been found that some life-course-persistent offenders 'recover' and leave that pathway (Moffitt, Caspi, Dickson, Silva & Stanton, 1996; Ezell & Cohen, 2005; Sampson & Laub, 2003). It has further been shown that some who stop offending can return to their previous behaviour and that ideas of abstaining have not been satisfactorily analysed (Piquero & Benson, 2004; Moffitt et al., 1996; Piquero et al., 2005a). This is an example of a gap in the literature, and one that has implications for the possible existence of previously unidentified confounding elements that may influence the health-crime relationship.

More recent research has suggested that a third of adolescence-limited offenders continue anti-social activity in later life as a result of such snares (McGee, Hayatbaksh, Bor, Aird, Dean & Najman, 2015). Some of this adolescent group have been characterized as a 'low-level chronic group' (formerly called 'recoveries' in Moffitt et al. 1996) (Moffitt, 2006). They may have started as LCPs in childhood but in their later teen years Moffitt originally stated that they seemed to "have apparently spontaneously recovered" (Moffitt et al. 1996, p. 402). Moffitt later retracted that idea of recovery in favor of chronic persistence and which, if correctly dissected, could shed light on what needs to be addressed to stop such behaviours persisting (Moffitt, 2006).

The chronic group might then also appear as what have been termed 'late-stage' adult offenders or 'late-onset' offenders, because they only appear in official records of offending more formally in adult life for the first time (Moffitt, 2006). Using official measures of offending, these individuals may only be identified as late-onset offenders if they were first detected by the criminal justice system as adults because of the adult nature of their offences, as opposed to less serious poor behaviour in their teenage years (McGee & Farrington, 2010).

In terms of theorizations, the crucial difference between Gottfredson and Hirschi (1990) and Moffitt (1993; 2018) is that the former would argue that life-course-persistent offenders differ in degree from other offenders, whereas the latter would argue that these two types of offenders differ in kind, because they are influenced by different risk factors (Jolliffe et al., 2017b). However, both theories would predict that life-course-persistent offenders are more extreme than other offenders in their deviant lifestyles.

To the extent that poor physical health and early deaths may be caused by deviant, risky and unhealthy lifestyles, it would be expected that life-course-persistent offenders would, on average, have worse physical health and die earlier than other offenders. Both the above theories would predict that the prevalence of physical health problems and early death would increase from non-offenders to one-time offenders to recidivists and then to chronic offenders (defined as committing five or more offences; see Farrington, 2020). However, while Gottfredson and Hirschi (1990) would predict that adolescence-limited offenders would tend to die earlier than non-offenders, it could be argued that Moffitt (1993) would not predict this, because adolescence-limited offenders would become similar to non-offenders after they give up offending. Indeed, Farrington et al. (2006) found that "desisters", who were convicted up to age 20 but not subsequently, were very similar to non-offenders in life success measures at age 48. re

Several research articles support Moffitt's theorizations in the context of health. For example, two studies have investigated poor well-being within Moffitt's developmental taxonomy using the Baltimore part of the National Collaborative Perinatal Project, which was a longitudinal study of several thousand subjects who were followed from birth to ages 27-33 (Piquero et al., 2007a; Piquero, Farrington & Blumstein, 2007b). Comparing adolescence-limited to long-term offenders, this work showed that it was the latter who were more likely to experience physical health issues. Additionally, the latter group also adopted antisocial practices (e.g. alcohol, cigarette, and drug use), increasing their likelihood of poor health (Piquero et al., 2007b). Piquero and colleagues (Piquero, Farrington, Nagin & Moffitt, 2010; Piquero, Shepherd, Shepherd & Farrington, 2011), and work currently under consideration, has related offending to early death in the Cambridge Study in Delinquent Development (CSDD). This unpublished work found that offending trajectories by age 48 differentially predicted health outcomes, with high-rate chronic offenders at the greatest risk – even when logistic regression modelling ruled

out individual or environmental childhood risk factors for offending as a likely common cause of offending and health problems (Piquero, Farrington, Shepherd & Auty, 2014).

In two further studies using data that examined trajectories in the Dunedin Multidisciplinary Health and Human Development Study, Odgers et al. (2007) firstly found at age 32 that, from four conduct problem trajectories (childhood-onset/life-course-persistent, adolescent-onset, childhood-limited, and low), the first cluster experienced the worst health burden – in terms of mental and physical health problems at 32 years of age measured via diagnostic interviews and physical examinations. In the second study using the same source of data, these researchers found a link between the use of alcohol or drugs before age 15 and an elevated likelihood of early pregnancy, school failure, substance dependency, sexually transmitted diseases and criminal activities. These results held up independently of early childhood behaviour (Odgers et al., 2008).

The inclusion of such a range of possible factors when examining the health-crime relationship highlights both a growing appreciation for the complexity of this relationship, and how previous research has not sufficiently controlled for the multitude of potentially confounding variables. Indeed, Braveman and Barclay (2009) recommend that "…a more holistic approach to developmental crime prevention that assesses the health and wellbeing of children is necessary to move this literature forward and create better alignment between criminal justice and public health policy" (p. 10). The exclusion of factors such as incarceration, violence and mental illness by this thesis within the systematic reviews and meta-analyses presented in Chapter 3 and 4 is intended to reflect such calls in the literature for a wider ranging and holistic approach to assessing the associations between all aspects of crime and health.

Other concerns relating to the utilisation of Moffitt's taxonomies have latterly been raised. A recent example is within The Oxford Handbook on Developmental and Life-Course Criminology (Farrington, Kazemian & Piquero, 2018a), which provides a wide ranging and authoritative review of the existing literature. While supportive of Moffitt's ideas, this book makes clear the increasingly diffuse range of causal factors and lifepaths that is now part of the debate surrounding her taxonomies. Indeed, the problem in current criminological research in investigating the relationship between health and offending is summarized by Van de Weijer and colleagues (Van de Weijer et al., 2016), who state that "…although some studies include control variables to control for some of these factors, it is almost impossible to measure and

control for all possible confounders" (p.93). There is therefore a need to appreciate the plethora of influencing factors in the health-crime relationship, while providing analyses which sufficiently control for possibly significant variables, or strongly highlight the limitations inherent within work in this field.

A further life-course criminology theory which may be useful in explaining the relationships found within this thesis is Sampson and Laub's Age-Graded Theory of Informal Social Control (1993). Sampson and Laub's theory has similarities with Moffitt's theorizations, in that it stresses life trajectories and divergent pathways. However, their age-graded theory of informal social control developed from the work of Elder (1995, 1998) and emphasises the importance of two distinct, yet co-occurring phenomena: state dependence and population heterogeneity. Future behaviour, according to Sampson and Laub, is both a reflection of (a) the social consequences of previous interactions and behaviours (state dependence), as well as (b) individual differences in people's predispositions towards these behaviours (population heterogeneity).

To provide an example, Sampson and Laub acknowledge that delinquency and social ties (to conventional individuals and institutions) have a reciprocal relationship over the life course, so that early bonds reduce the risk of adolescent offending, but that such offending (along with a criminal record) will also conflict with potential adult bonds, such as marriage and work. As a result, the mutual reinforcement between attenuated social bonds and delinquency over time is a potent explanation of stability of behaviour. Nonetheless, to account for change, they also accommodate serendipitous life occurrences that can act as tipping points, steering individuals away from a criminal career. For instance, life transitions like marriage or stable employment may operate as mechanisms of informal social control, situating individuals within the confines of a law-abiding life. Furthermore, human agency and luck, according to Sampson and Laub, also contribute to criminal desistance (Sampson & Laub, 2003).

Therefore, their theory is an age-graded theory of informal social control in that different sources of informal control have the potential to be turning points at different stages during the life course. This theory has several studies providing evidence to support its theorizations (Doherty, 2006; Sampson, Laub, & Wimer, 2006; Wright & Cullen, 2004). Indeed, multiple studies have found significant evidence of health differences among people with differing social identities and/or positions in the social structure (Vaughn et al., 2020a; 2020b).

Inequalities in wages, schooling, and housing, for example, have been shown to deepen the differences in physical health (Adler & Newman, 2002; Amone-P'Olak, Burger, Ormel, Huismanm Verhulst & Oldehinkel, 2009; Schreier & Chen, 2013; Skalamera & Hummer, 2016; Quon & McGrath, 2015). However, it has been argued that effectively controlling for all elements of social selection (e.g., environmental selection on the basis of pre-existing traits, like self-control) tends to attenuate support for social causation (Barnes & Beaver, 2012; Barnes, Boutwell, Beaver, Gibson, & Wright 2014; Wright, Caspi, Moffitt & Silva, 2001).

While the works of Gottfredson and Hirschi (1990), Moffitt (1993) and Sampson and Laub (1993) are informative in explaining both individual and clustered health and behavioural patterns, two further explanatory theories have attempted to explain the greater likelihood of poor physical health or the greater mortality rates amongst offenders (Laub & Vaillant, 2000; Tremblay & Pare, 2003).

Laub and Vaillant's (2000) study proposes additional causal components in the study of the health-crime relationship. Laub and Vaillant (2000) argue that poor health in general – even including low grade activities such as smoking and minimal levels of exercise – causes mortality amongst people who happen additionally to be offenders. Such varied health factors, that may affect both criminality and offending, but cannot be definitively shown to create a direct causal link, create a significant perception - that the relationship is complex and subject to debate in terms of directionality. Indeed, Laub and Vaillant (2000) stated "…whether poor self-care and premature health decline are caused more by childhood deprivation and poor self-worth or by impulsivity and/or by substance abuse was not answered with certainty." (Laub & Vaillant, 2000, p. 101).

These varied theoretical approaches to the health-crime relationship have resulted in the plethora of relevant variables that are labelled as 'confounding' or 'spurious' in nature by some writers (Van de Weijer et al., 2016). Van de Weijer and colleagues (2016) provide evidence for the idea of a "spurious model", encompassing cumulative, non-specific, confounding factors as causal within the health-crime relationship. Specifically, Van de Weijer et al. (2016) investigated the relationship between offending and mortality amongst and between high-risk offenders, followed to age 75 in Holland. They attempted to control for various confounding factors at the family level. The age of parents at death were controlled for, hence removing one possible 'confounding' factor. The surprising results, which are highly unusual compared to

most other research, are that mortality rates of offenders and non-offenders were not markedly different.

A further key theory was proposed by Tremblay and Pare (2003), who argue for a three-tier model of the causation of offending. Firstly, they suggest the existence of an 'occupational-hazard' effect. In this model, the likelihood of what Tremblay and Pare (2003) refer to as 'victimisation' will grow with the duration and intensity of a criminal career. They point to Cordeau's (1989) study of murder amongst co-offenders as evidence of the increase in threat over time and is the 'success' of a criminal path i.e. its development and possible upscaling in nature and progress. There is therefore, in this theory, a direct causal link between the length and nature of a criminal's career and their chances of poor health and early death. Here, the relationship of poor health, death and offending is not driven by the nature of the individual but by the exigencies of criminal occupational circumstances. This contrasts with what they term the 'spurious' relationships of Laub and Vaillant (2000).

A second explanatory model presented by Tremblay and Pare (2003), is that of 'strain-hazard'. This formulation is proposed by the authors to cover that percentage of the criminal population who have poorer health and die prematurely "…because they *want* to" (p. 313). They refer, in particular, to Lemert's (1967) 'strain-desistance hazards model' which sees crime, in itself, as a cause of severe strain and even of making life "not worth living any more" (Lemert, 1967, p. 131). This model expects the excess rate of mortality of offenders to grow larger with time, compared to non-offenders. Tremblay and Pare (2003) postulate that it is despair, rather than emotions such as anger, which becomes the key negative force at work on long-term offenders. Tremblay and Pare (2003) argue that this characteristic is evidenced in Lattimore and colleague's (Lattimore, Linster & MacDonald, 1997) mortality study of long-term inmates compared to young males in the general population. Early death, both self-inflicted and accidental, was found far more often in the former group.

Tremblay and Pare (2003) suggest that the generality implicit in the Gottfredson and Hirschi approach "…comes at a price" and that price is the ignoring of what appears to be distinctive risks inherent in crime (p. 319). These can be lifestyle or the internalised results of strain. In their summary, Tremblay and Pare (2003) suggest that future research will show excess offender mortality as destiny resulting from their choices, rather than something that "happens

to them" which is what the authors appear to conclude is the essence of the 'spurious' approach (p. 320).

In the context of Tremblay and Pare's (2003) theorizations, Zane, Welsh and Zimmerman (2018) point to the basic distinction between population heterogeneity and state dependence ideas (Nagin & Paternoster, 1991, 2000). They state that the 'general hazard' model of Tremblay and Pare falls within the population heterogeneity school because health-offending outcomes are the result of consistent personality traits across the whole population. These are then simply revealed as life progresses. The 'population heterogeneity' view is centred on individual differences that vary from person to person and are not subject to change - "…the persistent heterogeneity view is that behaviour over the life-course is a reflection of individual differences formed early in life that vary across persons and that are virtually impervious to change. As the persistent heterogeneity argument is applied to the offending-health relationship, it would expected that both offending and poor health/mortality emerge from the same factor(s)" (Piquero et al., 2014, p. 466).

This contrasts with state dependence, which argues for the impact of significant alterations and events during a person's life path, including the relationship between offending and health. The 'direct' and 'strain' theoretical variants are state dependent in that specific events, experienced throughout life, are what causes changes in the likelihood of poor health and premature mortality in relation to offending. Indeed, "…state dependence can consider offending to have its share of negative consequences, such that offenders become ensnared into a lifestyle that is characterized by the lack of attention to one's health" (Piquero et al., 2014, p. 466).

Some, however, see the two views are potentially capable of co-existence (Nagin & Paternoster, 2000). Moffitt's (1993) theory is an example of the two parts of life-course theorisation combining, with a general hazard/population heterogeneity-based life-course-persistent taxonomy and a state dependent 'adolescence-limited' offender group, in which normal development changes the person's relationship with crime (Nagin & Paternoster, 2000, p. 128).

Although this is not an exhaustive discussion of all criminological theories which may be applied to the health-crime relationship, these five key theories have been described in this

context in order to help contextualise the findings of this thesis and the current state of research, which is now discussed below.

**Evidence Informing Current Understanding of the Health-Crime Relationship**

A career spent in criminality has often been associated with various problems that accumulate across the life course (Hämäläinen & Pulkkinen, 1996; Huizinga & Jakob-Chien, 1999; Herrenkohl, Maguin, Hill, Hawkins, Abbott, & Catalano, 2000; Rönkä, Kinnunen, & Pulkkinen, 2001; Nikolic-Ristanovic, 2014; Stattin & Magnusson, 1996; Vaughn et al., 2020a; West & Farrington, 1977). Additionally, research so far undertaken in the field of Health and Epidemiological Criminology has suggested that offending may be associated with poor physical health and an increased risk of premature mortality (Baćak & Karim, 2019; Benson, 2013; Fazel & Baillargeon, 2011; Holzer, AbiNader, Vaughn, Salas-Wright & Oh, 2020; Kinner, Snow, Wirtz, Altice, Beyrer & Dolan, 2018; Odgers et al., 2007; Piquero et al., 2007a; Piquero et al., 2011; Reising, Ttofi, Farrington, & Piquero, 2019; Schwartz, Savolainen, Granger, & Calvi, 2020; Testa & Semenza, 2020).

There is also a substantial body of literature finding associations between worse health in individuals who are incarcerated, compared with those who are not (Borschmann et al., 2014; 2020; Braverman & Murray, 2011; Pajer, Kelleher, Gupta, Rolls, & Gardner, 2007). For example, studies have found an increased risk of exposure to infection and disease within prisons (Cloud, 2014; Massoglia, 2008a, 2008b; National Commission on Correctional Health Care, 2002; Johnson & Raphael, 2009; Stuckler, Basu, McKee, & King, 2009; Thomas & Torrone, 2008). Studies also show that stress factors, created by imprisonment, can exacerbate pre-existing health concerns (Desai, Goulet, Robbins, Chapman, Migdole, & Hoge, 2006; Holman & Ziedenberg, 2006; Wasserman & McReynolds, 2011). Furthermore, the actual act of being incarcerated itself can also generate life-long stress effects which, in turn, can have deleterious health consequences (Massoglia, 2008a).

Additionally, there are a substantial number of studies investigating links between offending and worse mental health, in both community and correctional samples (Fazel, Martin, Johan & Goodwin, 2007; Fazel & Seewalk, 2012; Karnick et al., 2009; Reising et al., 2019; Schnittker, Massoglia, & Uggen, 2012; Wibbelink, Hoeve, Stams, & Oort, 2017), in addition to behavioural health disorders, such as substance abuse (Wasserman, McReynolds, Schwalbe, Keating, & Jones, 2010). For example, between 40% and 70% of youth in detention meet

criteria for a mental health or substance use disorder (Abram, Zwecker, Welty, Hershfield, Dulcan, & Teplin, 2015; Fazel, Doll, & Långström, 2008; Teplin, Abram, McClelland, Dulcan, & Mericle, 2002), compared to 10-20% of youth never involved in the justice system (Merikangas, He, Brody, Fisher, Bourdon, & Koretz, 2010; SAMHSA, 2014; Wu, Gersing, Burchett, Woody, & Blazer, 2011). Indeed, high rates of mental illness and substance use frequently relate to both initial involvement in the justice system and criminal recidivism (Chassin, 2008; McReynolds, Schwalbe, & Wasserman, 2010; Jolliffe et al., 2017a; Jolliffe et al., 2017b).

However, longitudinal investigations of associations between offending, physical health and mortality in non-prison, non-correctional and non-forensic psychiatric samples are rare (Jackson & Vaughn, 2018). Of the few longitudinal studies that do study the relationship between physical health and offending, many do not examine the variations that may exist between offenders (Wade, 2001; Wen, Browning & Cagney, 2003). When studies do consider heterogeneity between offenders, little consideration has been given to the effect that offending may have on physical health specifically, with studies instead using broad categories of self-reported 'General Health'. For example, Testa and Semenza (2020) use a scale from 1-5 asking: "In general, how is your health?", and Odgers et al. (2007) uses 'Health Burden' variables, which include mental and physical health problems as a single category.

Moreover, there are issues with the operationalisation of offender heterogeneity comparisons, which often make group comparisons based on the number of offences committed (Laub & Vaillant, 2000; Piquero et al., 2007a) or the level of violence associated with the offending behaviour (Piquero et al., 2005b), and do not consider the differences between offenders and non-offenders.

For example, using data from the Multidisciplinary Health and Development Study, Odgers et al. (2007) found that life-course persistent offenders have a more significant health burden compared to lesser offending subgroups. However, this sample made comparisons across conduct problem subtypes in males, and did not provide a non-offender comparison group. Further recent studies, using data from National Longitudinal Study of Adolescent to Adult Health for instance, found that serious offending over the life-course is linked to a series of adverse physical health conditions (Baćak & Karim, 2019; Testa & Simenzab, 2020) and higher levels of cardiometabolic risk (Schwartz et al., 2020). Again, however, there is no non-offender

comparison. Rather, they compare individuals who have reported no serious offenses during the past 12 months preceding the survey with those who reported one or more such offences. There is therefore a gap in the literature for studies which investigate physical health using a clearly defined individual category and which provides comparisons with non-offender groups in the community or population at large (Schwartz et al., 2020).

Furthermore, amongst longitudinal offender populations, studies of mortality have been less prevalent than work that examines wellbeing (for reviews, see Massoglia & Pridemore, 2015; Wildeman & Muller, 2012; Wildeman & Wang, 2017). Of the studies conducted which investigate mortality, there has been a reliance on serious offender-based samples (often incarcerated), over a limited time period of investigation, and they often lack a theoretical framework. The absence of relevant data over meaningful time periods, and lack of reporting upon mortality itself, may partially explain the gap (Farrington & Hawkins, 2019; Teplin, McClelland, Abram & Mileusnic, 2005; Timonen et al., 2003). However, there are opportunities utilising global search strategies, across all time periods, to conduct a meta-analysis investigating this important and under-research relationship.

Additionally, suicide amongst non-institutional groups has also been accorded limited attention in contrast to the significant number of studies which have examined suicide and the risk factors for suicide in custody (Dooley, 1990; Fruehwald, Frottier, Matschnig, Konig, & Bauer, 2004; Shaw, Appleby, & Baker, 2003; Shaw, Baker, Hunt, Moloney, & Appleby, 2004; Towl, Snow, & McHugh, 2002). Indeed, it is well-established that prisoner suicide rates are elevated compared with age-matched general populations (Fazel, Grann, Kling, & Hawton, 2011). For example, the suicide rate of male prisoners in England and Wales between 1973 and 2003 was found to be 5 times higher than that of the general population (Fazel et al., 2005) and, in American jails, this rate is 8 times higher (DuRand, Burtka, Federman, Haycox, & Smith, 1995).

The risk of suicide in recently discharged forensic psychiatric patients is also high, with Fazel, Fiminska, Cocks and Coid's (2016a) meta-analysis, which contained 6 studies investigating suicide, finding a crude death rate of 325 per 100,000 person-years (95% CI 235–415). One study within this meta-analysis, by Lund, Hofvander, Forsman, Anckarsäter, and Nilsson (2013), reported that mentally disordered offenders sentenced to non-custodial sanctions had a crude death rate (CDR) as high as 3344 per 100,000 person-years (95% CI 1923–5754), which

compares to recently released prisoners without mental health issues, who were found to have a CDR of 155 per 100,000 person-years (95% CI 140-171) (Pratt, Piper, Appleby, Webb, & Shaw, 2006; see also Zlodre & Fazel, 2012).

Of the studies which have investigated the suicide of offenders in community samples, stark findings have been presented. For example, Biles and colleagues (Biles, Harding & Walker, 1999), within a broader study of mortality, examined those serving community 'correction orders' in Victoria, Australia. Analysing 7,000 offenders, Biles et al. (1999, p. 6) found that "…deaths in the community corrections population predictably continue to exceed those amongst both the prison and the comparable general populations."

However, these studies have rarely focused solely on suicide, are limited in geographic scope (Flannery, Singer & Wester, 2001) and often compare mortality between incarcerated and non-incarcerated offenders (Biles, 1994). Where studies do utilise non-offender populations, community offenders have been found to be significantly more likely to die from self-inflicted injuries (Binswanger, Blatchford, Lindsay & Stern, 2011; Sattar, 2003), with females particularly vulnerable (King et al., 2015; Pratt et al., 2006). Again, there appears to be a need for a systematic review and meta-analysis approach which can produce robust evidence synchronising the disparate literature on this topic, while controlling for histories of mental illness and drug/alcohol abuse, which are often key risk factors in elevating the likelihood of suicide (Bjork & Lindqvist, 2005). There is also a need for an evidence base comparing the likelihood of suicide within community offender populations with that of non-offenders (MacKenzie, Borrill & Dewart, 2013; Powis, 2002; Phillips et al., 2018; Pluck & Brooker, 2014; Sattar, 2001). Both of these gaps in the current literature will be addressed in this thesis.

Furthermore, in general, there has been a large focus on mental health and behavioural difficulties in offenders, and the impact incarceration has as a form of stressor (Desai et al., 2006; Holman & Ziedenberg, 2006; Wasserman & McReynolds, 2011). There has been little consideration of the singular impact that offending may have *in itself*, not simply because it may result in the stressful life event of incarceration (Massoglia, 2008a), and its additive and cumulative effect on physical health, rather than mental health (Shufelt & Cocozza, 2006). There is an opportunity therefore to explore the impact of offending as a distinct causation factor, outside of incarceration samples, on physical health alone.

In addition to the gaps in the literature identified above, it is also argued that in order to conduct valid research on the relationship between offending and health, it is crucial to investigate relative time at risk or the duration of criminal careers (Bartusch, Lynam, Moffitt & Silva, 2006; Moffitt & Caspi, 2001; Moffitt et al., 1996; Moffitt, Lynam, & Silva 1994; Piquero, 2001; Tibbetts & Piquero, 1999). A large body of research shows how criminal behaviour progresses from childhood to adulthood (Nagin et al., 1995; Sampson & Laub, 2005). Moffitt (1993) proposes a theoretical model to illustrate how developmental variations affect trajectories of offending over time. Most individuals do not consistently engage in criminal behaviour throughout their lives, while some chronic offenders offend repeatedly at a low or high level. Offenders are therefore not a homogeneous group of individuals and include multiple subgroups of persons whose behaviour is predicted by a range of differences in parenting practices, environmental factors, social group membership, and neuropsychological functioning (Piquero, 2008).

Given the heterogeneity of offenders, the conceptualisation and reporting of differing offending patterns over the life course is an extremely important area of Criminology (DeLisi & Piquero, 2011; Nagin & Land, 1993; Nagin & Tremblay, 2005). Research must therefore follow up offenders prospectively across the life-course (Farrington, 2019). Few such long-term prospective longitudinal criminological studies exist (Jolliffe et al., 2017b). Within the few studies which do use prospective longitudinal data, there are several limitations which make it difficult to draw conclusions relating purely to physical health or mortality in the absence of mental health or psychological health comorbidities, and often make it difficult to directly compare the differences between offenders, offender subtypes and non-offenders (Vaughn et al., 2020b).

One of the most influential studies recently to investigate the relationship between offending, physical health and mortality is the Cambridge Study in Delinquent Development (CSDD). The CSDD builds upon the influential work of Welsh et al. (2019) and Zane et al. (2018) in the Cambridge-Somerville Youth Study, Loeber and Farrington (2011) in the Pittsburgh Youth Study, and Piquero and colleagues within the Baltimore portion of the US National Collaborative Perinatal project (Piquero et al., 2007a). The CSDD is a unique prospective longitudinal study which operationalises offending in terms of criminal career duration, addressing a considerable gap in the literature. The CSDD has followed 411 individuals now for over 50 years, conducting medical interviews at ages 18, 32 and 48, providing provides

prospective longitudinal data on injury, illness and treatment-seeking behaviour as well as data concerning offending trajectories.

Health research from the CSDD sample of male offenders has been published widely at ages 16-18 and 27-32 (Shepherd, Farrington & Potts, 2002; 2004), and both positive and negative associations between health, offending and lifestyle factors have emerged. For example, convictions up to 32 were found to be associated with fewer respiratory illnesses and fewer illnesses overall at age 16-18 and fewer organic illnesses at age 27-32. Furthermore, concurrent antisocial behaviour was inversely related to respiratory infections at age 16-18 and to hospital admissions at age 27-32, possibly because of a protective effect of alcohol against infection (Cohen, Tyrrell, Russell, Jarvis & Smith, 1993). Childhood precursors of offending which were linked to a lower risk of infections at age 16-18 were high daring and low income. However, poor parental supervision predicted a higher risk of cardiovascular illness at age 27-32, while low nonverbal IQ predicted a higher risk of psychological illness at the same age (Shepherd et al., 2002; 2004).

Further inverse relations were found between antisocial behaviour at age 18 and health outcomes at age 32 – principally between heavy alcohol consumption and infections and organic illness. Self-reported offending at age 32 was related to low hospital admissions at the same age, although this may be because offenders were less likely to seek treatment (Shepherd et al., 2002; 2004). On the other hand, by age 32 earlier antisocial behaviours, like fighting after drinking and heavy smoking, had become positively related to illness (Cohen et al., 1993), and particularly to psychological disorders; and low job status was positively related to hospital admissions. Overall, a consistent finding up to age 32 in the CSDD was the link between childhood precursors of antisocial behaviour and later injury, convictions and concurrent antisocial behaviour. However, follow-up after age 32 into the later years of life are needed to fully investigate the impact offending has on health over the life course.

In summary, there is evidence that offending is linked to worse physical health and premature mortality. However, this evidence base has generally focused on samples of incarcerated offenders, is not necessarily prospective longitudinal in design and, if so, often only follows individuals to age 32. Furthermore, studies often do not consider criminal career duration, nor do they provide non-offender comparisons or disaggregate physical health from mental health in analyses.

The preceding literature also highlights that the relationship between offending and poor health outcomes is complicated. Previous research on the relationship between offending and physical health has consistently made the case that research needs to be life-long in its scope, broad based and that any causal relationships are not clear cut. Indeed, "...assessing how offending affects health is challenging because offending and poor health share many of the same causes and consequences… (and) in the presence of time-varying covariates, which are simultaneously predictors and effects of the presumed causal variable" (Hernan, Brumback & Robins, 2002, p. 18-19). For example, crime and negative health outcomes may both be the result of neuropsychological deficits resulting in low self-control/impulsivity. If this is the case, then crime is not causally related to negative health outcomes and addressing crime will not improve health outcomes.

It is particularly difficult to isolate the impact of the commission of an offence from factors that precede offending and indeed result from offending (e.g., imprisonment) and their respective enhancing or protective impacts on later health outcomes. For instance, does drug use lead to delinquency, which in turn leads to imprisonment where there is a further culture of drug use which negatively impacts on health over time, or is it the case that offending increases the likelihood of using and abusing drugs, which leads to imprisonment and further drug abuse? Or is imprisonment a protective factor in drug use, due to increase supervision, which subsequently reduces the health impact of drug use that individual would have experienced if they remained in the community? There is evidence for all of these directions of relationships, and none are conclusive (Testa & Semenza, 2020). The picture is further complicated when you consider co-morbidity of other risk factors, such as alcohol use, or indeed when comparing between the type, regularity of use, the dose and an individual's tolerance to a certain drug. Individual, parental, and environmental risk factors, in addition to a differential susceptibility to biological and environmental influences, will all likely influence the health-crime relationship and the direction of this complicated relationship.

Furthermore, from the literature review above, it is also still unclear how the relationship between health and offending unfolds in relation to time, maturation, the exact temporal order of health and offending events affect health. Moreover, knowledge on how the type of offending, repeated offending, and the depth of penetration within the criminal justice system differentially affect health outcomes is still underdeveloped.

More evidence is needed to disentangle and isolate the impact of crime on a range of negative physical health outcomes, producing robust causal rather than correlational evidence, whilst also considering the directionality of the health-crime relationship.

**Current Study**

There is therefore an opportunity to address the limitations of the current literature by undertaking an investigation of the relationship between physical health, mortality, suicide and offending over the life course. Previous research highlights the health vulnerability of community offenders compared to prison and non-offender comparisons, while also arguing the need for further study to inform current understanding of these relationships and to inform future targeted interventions (Vaughn et al., 2020b).

This thesis begins by presenting research which utilised the CSDD, building upon previous work which has linked violent offending, the frequency of offending (in terms of the number of convictions) and antisocial personality to an increased likelihood of poor physical health (Shepherd et al., 2002; 2004). This previous work has shown that, whilst offending rates decrease after adolescence, the impact on health of an antisocial lifestyle during adolescence persists and becomes more apparent in the later decades of life. However, previous researchers have not studied distinct offending trajectories, nor have they controlled for key risk factors beyond age 33. Chapter 2, uniquely, investigates both self-report and GP health data of community offenders up to age 48, categorising offenders into three trajectories: Adolescence-Limited (AL), Late-Onset (LO) and Life-Course-Persistent (LCP), and into different anti-social personality groups, comparing their respective odds of illnesses, injury and hospitalization.

Chapter 2 then argues that as the length of the criminal career increases, the likelihood of the offender having poorer physical health also increases. Furthermore, the greater the number of anti-social and psychosocial risk factors an individual has, the greater their likelihood of poor physical health. This chapter's findings, it is argued, provides evidence that limiting offending and antisocial behaviour to adolescence, or preventing individuals from offending at a later stage, is likely to have substantial benefits for health. Unfortunately, findings from these studies in Chapter 2 could not be expanded upon meta-analytically. After conducting a systematic search with the aim of conducting a global systematic review and meta-analysis, the lack of studies utilising community offender samples and a lack of specificity when detailing the nature

of ‘health’ meant a meta-analysis on these topics was not possible. This further systematic search now informs part of the discussion section of this thesis.

Building on the evidence from previous work in the CSDD and Chapter 2, it is then argued that the ultimate effect of poor physical health over the life course is premature mortality. Chapter 3 consequently sets out to establish whether the increasing duration of a criminal career is associated with increased likelihood of such premature mortality. Chapter 3 argues that premature mortality from natural causes (organic/physiological illness) is significantly more likely for community offenders compared to non-offenders and is likely a result of worse physical health across the life course – as identified in Chapter 2. Unnatural causes of death will also be argued to be more likely in community offenders compared to non-offenders.

A particularly prevalent cause of unnatural death within offender populations is often suicide. Chapter 4 thus provides meta-analytic evidence that, in addition to the widely documented influences that serious violence, traffic accidents and drug overdoses have on mortality of offenders (e.g., Nieuwbeerta & Piquero, 2008), suicide is also a major cause of premature mortality in community offenders - even when controlling for drug use, violence and excluding psychiatric samples.

In summary, Chapters 2, 3 and 4 provide evidence that community offenders are a particularly vulnerable sub-group of offenders, in terms of physical health, premature mortality and the likelihood of suicide. Each chapter contains a focused review of the relevant, specific literature, together with its own Discussion section. These will then be tied back together in Chapter 6 which will bring together all the findings of this research against the backdrop of the wider literature context set out above.

It is argued that this research provides several novel contributions to the field of health and epidemiological criminology. Firstly, this is the first work to investigate physical health in community offenders using a trajectory approach up to age 48, controlling for antisocial personality risk factors and comparing contemporaneous and prospective self-reports and GP data. Secondly, this is the first work to investigate premature mortality, suicide or physical health in community offenders - excluding drug use, death by homicide and controlling for differences in sample comparisons (community, population and ex-prison). Thirdly, this is the first work to investigate premature mortality or suicide in community offenders who do not

have a reported history of mental health. Fourthly, this is the first work to compare mortality, suicide and physical health of male and female community offenders meta-analytically. Fifthly, the meta-analyses are global in scope, containing over 1.5 million community offenders with non-offender comparisons, utilising prospective longitudinal designs and controlling for time at risk of offending. No such studies have been undertaken before.

Lastly, in the field of Criminology, systematic reviews often do not utilise 'Gold Standard' reporting approaches from the medical sciences, such as PRISMA guidelines. Utilising this approach advances and improves the methodologies that have been used to date in criminological research on this topic (Losel, 2018). It also reinforces the robustness of findings and conclusions obtained by this thesis with the aim of making an original contribution to scholarship in the field of health and crime.

## Chapter 2: Offender Trajectories, Antisocial Personality, Health and Hospital Admissions: Relationships in the Cambridge Study of Delinquent Development[3][4][5]

### Introduction

Offending is part of a constellation of social disorders, including truancy and substance abuse, many of which constitute significant health risks and causes a reduction in life success across a multitude of measures, including unemployment, relationship problems, accommodation problems, and low educational achievement (Farrington et al., 2006).

Research so far undertaken in this area has suggested that it is likely that offending "has detrimental consequences in other domains of life, including health…" (Benson, 2013: p. 133). However, longitudinal investigations of associations between offending and health outcomes are rare. In this regard, an important new opportunity has emerged from the Cambridge Study in Delinquent Development (CSDD) which provides prospective self-reported and General Practitioner (GP) reported longitudinal data on injury, illness and treatment-seeking behaviour as well as data concerning offending trajectories and antisocial personality.

### Physical Health Literature

The research so far undertaken in this area has suggested that offenders experience adverse health outcomes (Farrington, 1995; Fazel & Baillargeon, 2011; Hughes et al., 2020; Holzer et al., 2020; Kinner et al., 2018; Odgers et al., 2007; Shepherd et al., 2002; Testa & Semenza, 2020). There is evidence, for example, that young offenders and adults with criminal records are more likely to have a history of physical injuries of various kinds (Hughes et al., 2020). Literature also suggests that sexually transmitted, blood-borne infections and tuberculosis are also frequently seen among offenders (Kinner et al., 2018; Vaughn, Salas-Wright, DeLisi & Piquero, 2014).

[3]Skinner, G. C. M., Farrington, D. P., & Shepherd, J. P. (2020). Offender Trajectories, Health and Hospital Admissions: Relationships in the Cambridge Study in Delinquent Development. *Journal of the Royal Society of Medicine*, *113*(3), 110-118. doi: 10.1177/0141076820905319.

[4]Skinner, G. C. M., & Farrington, D. P. (2021). Self-reported and general practitioner recorded indicators of lifetime health up to age 48 according to offender type in the Cambridge Study in Delinquent Development. *Criminal Behaviour & Mental Health*, 31(3), 211-219. doi: 10.1002/cbm.2194.

[5] Skinner, G. C. M., & Farrington, D. P. (2020c). Antisocial Personality Versus GP Reported and Self-reported Health Outcomes. *Journal of Forensic Psychiatry & Psychology*. doi: 10.1080/14789949.2020.1864451.

Using data from the Cambridge Study in Delinquent Development (CSDD), Shepherd et al. (2002; 2004) found that convictions up to age 32 were associated with fewer respiratory illnesses and fewer illnesses overall at age 16-18 and fewer organic illnesses at age 27-32. Self-reported offending at age 32 was related to low hospital admissions at the same age. Piquero et al. (2011), also using the CSDD, found that high-rate chronic offenders have the highest risk of hospitalization and disability compared to other typologies of offenders. These interesting and perhaps incongruous findings highlight the need to study the health-crime relationship after age 32 in to later life, and take into account differing offending typologies.

Piquero and colleagues (Piquero et al., 2007b) found that life-course persistent offenders had a higher likelihood of physical health problems such as asthma, kidney problems, and heart trouble compared to Adolescent-limited and Late-Onset offenders. Other studies, such as the National Collaborative Perinatal Project (Piquero et al., 2007a) have also indicated that longer criminal careers are associated with a significantly higher incidence of poor physical health, in addition to an increased incidence of hospitalization. Using data from the Dunedin Multidisciplinary Health and Development Study, Odgers et al. (2007) have also identified life-course persistent offenders as possessing the greatest physical health burden, again compared to less prolific offending subgroups. Findings from the Add Health study also confirm that longer criminal career durations are associated with an increased number of physical health conditions (Baćak & Karim, 2019), and higher levels of cardiometabolic risk (Schwartz et al., 2020).

Taken as a whole, this body of research highlights that offending may be associated with negative physical wellbeing, and that certain subgroups, like life-course-persistent offenders, may be at greater risk of worse physical health outcomes than their lower level and non-offending comparators. Therefore, this current body of work suggests that there is a relationship between physical health and criminal career durations and trajectories over the life-course.

**Antisocial Personality**

The influence of psychosocial risk factors and antisocial personality variables has also been investigated up to age 32 (Shepherd et al., 2002; 2004). Shepherd et al. (2002) found that illness in general was not related to an antisocial personality at age 18 (23% of boys who suffered illnesses were antisocial, compared with 23% of the remainder: *OR*= 1.02). However, the boys who experienced respiratory tract illnesses at age 16-18 were significantly *less* likely to be

antisocial: 19% were antisocial, compared with 27% of the remainder (*OR*= 0.61). With regards to the elements of an antisocial personality, respiratory tract illnesses were negatively related to anti-establishment attitudes and having unprotected sex. Therefore, less healthy boys were less antisocial.

At age 32, there were also few significant links between measures of concurrent antisocial behaviour and illness. Antisocial personality measured by multiple indicators, including drunk driving, fighting after drinking, sexual promiscuity, and heavy smoking, was associated with poor mental health (*OR*= 7.23) up to age 32 but also with less physical illness (*OR*= 0.37) (Shepherd et al., 2004). On the other hand, by age 32 earlier antisocial behaviours, like fighting after drinking and heavy smoking, had become positively related to illness – particularly psychological disorders; and low job status was positively related to hospital admissions. Childhood precursors of offending which were linked to a lower risk of infections at age 16-18 were high daring and low income. However, poor parental supervision predicted a higher risk of cardiovascular illness at age 27-32, while low nonverbal IQ predicted a higher risk of psychological illness at the same age.

Therefore, research to date would indicate that an antisocial personality and its childhood precursors seem to be associated with both negative and positive health outcomes. However, whilst offending rates decrease after adolescence, the impact on health of an antisocial personality during adolescence may persist and become more apparent in the later decades of life. No study has investigated the impact of antisocial personality and lifestyle factors from age 10 to 48 on health, while controlling for childhood risk factors. Although longitudinal investigations of this length assessing the association between offending, antisocial personality and health outcomes are uncommon, these analyses can be conducted using the data from the CSDD.

**The Reliance on Self-Reported Data**

Previous work in the CSDD, and more widely, is often based on self-reported health information, which may influence the associations reported and lead to the critical question of whether inferences about the life-course of crime and health are different across different data sources. Previous criminological research on the CSDD compared self-reported convictions and official conviction data. Several studies have found that the likelihood and frequency of offending is higher according to self-reports than according to official conviction data (e.g.

Farrington, Ttofi, Crago & Coid, 2015; Kirk, 2006). For example, in one study, there were 112 self-reported offences per offender on average, compared with 3.3 convictions, a ratio of 34 to 1 (Farrington et al., 2015). However, there is also high concurrent validity of self-reported convictions in relation to recorded convictions (Auty, Farrington & Coid, 2015).

Further work by Borschman et al. (2017), using confidential interviews with 1315 adults conducted within 6 weeks of expected release from 1 of 7 prisons in Queensland, Australia, found that the agreement between self-reported and the medically verified history of self-harm was poor, with only 64 (37.6%) of 170 participants with a history of medically verified self-harm disclosing a history of self-harm at baseline. The authors concluded that a self-reported history of self-harm should not be considered a sensitive indicator of prior self-harm or of future self-harm risk in incarcerated adults. Similarly, Stogner and colleagues (Stogner, Gibson & Miller, 2014) did not find any linkages between self-reported health and crime, despite finding a relationship between violent offending and health, and suggested that this may be because the self-reported measures involved are not sufficiently objective to meaningfully measure the health-offending relationship (Stogner et al., 2014).

Furthermore, Keen and colleagues (Keen, Kinner, Borschmann & Young, 2020), investigated the concordance between self-reported non-fatal overdose (NFOD) and medically-verified histories of NFOD in individuals recently released from prison. They used pre-release baseline survey data from 1307 adults in prison surveyed from 2008 to 2010 in Queensland, Australia, linked to ambulance, emergency department, and hospital records. Keen et al. (2020) found that 224 (19 %) participants self-reported NFOD history only, 75 (5%) had medically-verified NFOD history only, and 56 (4%) had both self-reported and had medically-verified NFOD history. These researchers also concluded that relying on self-report data is likely to miss people at increased risk of future poor health, many of whom could be identified through medical records. However, in the medical literature, self-reports and medical reports are consistently found to have high concordance and validity (Gupta, Gu, Chen, Lu, Shu & Zheng, 2011; Short et al., 2009; Zhu, McKnight, Stergachis, Daling & Levine, 1999). It is therefore important to produce analyses which take into account the differing forms of reported data.

## Current Study

This Chapter has three focuses. In contrast to the conviction and risk factor analyses previously performed (Piquero, 2008), the first focus here is on temporary versus persistently antisocial

persons, defined according to Moffitt's (1993, 2006) and Jolliffe et al.'s (2017b) three offending trajectories (Life-Course-Persistent (LCP), Adolescence-Limited (AL), Late-Onset (LO) offenders, who constitute qualitatively distinct types of persons (Jolliffe et al., 2017b; McGee & Farrington, 2010; Moffitt & Caspi, 2001; Moffitt, Caspi, Rutter & Silva, 2001; Piquero, Jennings & Barnes, 2012; Zara & Farrington, 2009). These different offending pathways may bear differential risks for adult health (Jolliffe et al., 2017a; 2017b; Zara & Farrington, 2009; McGee & Farrington, 2010; Moffitt, 2006).

Secondly, no previous study has investigated the impact of antisocial personality and lifestyle factors from age 10 to 48 on health, while controlling for childhood risk factors. Although longitudinal investigations of this length assessing the association between offending, antisocial personality and health outcomes are uncommon, these analyses can be conducted in the Cambridge Study in Delinquent Development (CSDD). This provides prospective longitudinal data on injury, as well as offending, self-reported delinquency, personality and behavioural features in the definitions of conduct disorder, antisocial personality disorder and psychopathy, alongside a constellation of adverse family background features. This section of the chapter has four aims: firstly, to establish relationships between Antisocial Personality (ASP) at ages 18, 32, 48 and health outcomes up to age 48; secondly, to establish relationships between childhood risk factors at age 8-10 and health outcomes up to age 48; thirdly, to investigate whether ASP is independently related to worse health outcomes when controlling for significant childhood risk factors; and fourthly, to compare self-reported health with GP reported health outcomes in relation to ASP and childhood risk factors.

The third focus of this chapter is to investigate any differences that may exist between General Practitioner (GP) records and self-reported data, which uniquely, were all collected contemporaneously in the CSDD. This makes it possible to directly compare self-report and GP medical data longitudinally over a 48-year period for different offender trajectories. Therefore, for the first time, it possible to investigate the differences in health data between self-reports and GP reports, and to study the differences between offenders and non-offenders in health reporting of certain conditions and hospitalization records – all of which may have significant implications for research and clinical recording of health in the population.

## Methods

### Cambridge Study in Delinquent Development

Research methods used in this study are described in detail in a report of an investigation of links between offending trajectories, injuries and illness up to the age of 18 (Shepherd et al., 2002). The CSDD is a prospective longitudinal survey of the development of offending and antisocial behaviour in 411 London males. At the time they were first contacted in 1961/62, they were all living in a working-class inner-city area of South London. The sample included all the boys then aged 8-9 and on the registers of six state primary schools within a one-mile radius of a research office that had been established. Hence, the most common year of birth of these males was 1953. In nearly all cases (94%), the family breadwinner at that time, usually the father, had a working-class occupation (skilled, semi-skilled or unskilled manual worker). Most of the males were white (97%) and of British origin.

### Interviews and Tests

Details of interviews and tests involving the males, teachers, parents, and peers have been published (Shepherd et al., 2002; 2004). The tests at age 8-14 measured individual characteristics such as intelligence, attainment, personality, and psychomotor impulsivity, while the interviews collected information about such topics as living circumstances, employment histories, relationships with females, offending behaviour, and leisure activities such as drinking and fighting. The men were interviewed in a research office at ages 16, 18 and 21 and in their homes at ages 25, 32 and 48 by trained social science graduates. At all ages except 21 and 25, the aim was to interview the whole sample, and it was always possible to trace and interview a high proportion – for example, 389 out of 410 who were still alive at age 18 (95%), 378 out of 403 who were still alive at age 32 (94%) and 365 out of 394 who were still alive at age 48 (93%) (Farrington et al., 2006). Criminal records of these males have been traced up to age 61, by which time 360 males were still at risk of offending.

### Self-Report Health data

Injury and physical health data were only studied 10 years after the data collection began because, previously, no hypotheses relating to health outcomes had been considered (Shepherd et al., 2002; 2004). However, it should be emphasised that although health data were not studied for these 10 years, health data collection was prospective in every CSDD sweep. Interviewers recorded all illnesses and injuries that had occurred at ages 16-18, 27-32 and 43-48, and the number of hospital visits at ages 27-32 and 43-48. The illnesses recorded by the interviewers

were categorised as Respiratory Tract, Cardiovascular, Musculoskeletal, Skin, Allergic, Gastrointestinal and Infectious Illness at ages 18 and 32. However, at age 48 illness data was only categorised into Organic Illnesses. I therefore chose to aggregate the illness categories at ages 18 and 32 into just an 'Organic Illness' variable to allow a direct comparison across these three age groups (see Table 1 and 2 show the prevalence and ORs of each physical health category at age 18 and 32). This method ensured that data was complete for all individuals across all ages (*N*=392). Injuries were categorised according to their cause as sport injuries, assault injuries, industrial injuries, and road accident injuries.

In addition to simple Odds Ratios (OR), Adjusted Odds Ratios (AOR) are provided, based on binary logistic regressions that controlled for 5 risk factors at age 8-10, which have consistently been among the most important risk factors for convictions (Farrington et al., 2015): a convicted parent, poor parental supervision, low family income, low nonverbal IQ, and high daring. Parental convictions were obtained from criminal record searches. Poor parental supervision referred to the father not knowing where his children were when they were out. Low family income at age 8 was rated by the psychiatric social workers based on interviews with the parents. Low nonverbal IQ (90 or less) of the boy was measured by the Progressive Matrices test. High daring was rated by parents and peers and identified boys who took many risks in traffic, climbing, and exploring. Unfortunately, we could not control for drug or alcohol use, which has been robustly linked to worse health outcomes (Borschmann et al., 2020; Testa & Semenza, 2020), due to small numbers. Descriptive statistics and ORs for each offending trajectory are presented in Tables 1 and 2 in Appendix A.

**GP Health Data**

At age 48, 304 men completed a medical interview for the research (89% of the 343 who had the core face-to-face social interview) and each was asked for consent to obtain their medical records from their GPs. Data were requested from every GP surgery where an individual had been registered, and full primary care data (paper records) from birth up to age 48 were returned for *N*=264 men, 87% of those who completed the medical interview but only 77% of those with a social interview. The GP data were then coded into binary (Yes/No) variables. Physical illness categories were respiratory tract, cardiovascular, musculoskeletal, skin, allergic, gastrointestinal, and infectious illnesses. Severity was in part indicated by disabling medical conditions. Service use was indicated by having ever been hospitalized as a medical inpatient

and surgical admissions. Unfortunately, AORs could not be conducted for these GP records, due to small numbers and the limited statistical power of analyses. Tables 1-5 in Appendix B show individual risk factor logistic regressions, highlighting the limited prevalence within each category, and the subsequent inability to conduct AOR analyses. Data were analysed by means of the Statistical Package for the Social Sciences version 24.

**Antisocial Personality Scales**

West and Farrington (1977) developed a scale of "antisocial tendency" at age 18, based on an unstable job record, heavy gambling, heavy smoking, drug use, drunk driving, sexual promiscuity, spending time hanging about, antisocial group activity, violence, anti-establishment attitudes and being tattooed. Their aim was to devise a scale of deviance that was not based on types of acts (crimes of dishonesty) that usually led to convictions, and they went on to show that the males who were convicted by age 18 were antisocial in a variety of other respects according to this scale. West and Farrington (1977) concluded that a constellation of adverse family background features, including poverty, large family size, martial disharmony, harsh and erratic child-rearing techniques, and parental criminality, led to a constellation of antisocial features when sons reached the age of 18, among which criminality was again likely to be one element.

Based upon the work of West and Farrington (1977), Farrington (1991) devised scales at different ages that were the best measures available in the CSDD of the personality and behavioural features in the definitions of conduct disorder, antisocial personality disorder and psychopathy. Antisocial personality scores (ASP) were derived from interviews with the study males, parents, teachers, and official records at ages 18, 32 and 48; see Farrington (1991) and Murray, Blokland, Farrington, and Theobald (2014) for details.

*Psychosocial Risk Factors*

At ages 8-10, the aim was to measure variables that were believed (at the time) to predict delinquency. The same five risk factors, mentioned above, which have consistently been among the most important risk factors for convictions (Farrington et al., 2015) were again investigated. In many CSDD analyses, the age 8-10 variables were dichotomized into the "worst" quarter versus the remainder. This facilitated a "risk factor" approach, made all the risk factors comparable, and did not usually involve much loss of information, as many variables were

originally measured on 2-, 3-, or 4-point scales (Farrington & Loeber, 2000). They were not usually measured on normally distributed equal-interval scales.

*ASP Statistical Analysis*

The first aim of the statistical analysis was to establish the association between ASP scores and age 8-10 risk factors and worse health outcomes. The second aim was to test whether ASP scores were independently related to worse health when controlling for significant age 8-10 risk factors. The third aim was to compare results obtained with self-reported health outcomes and those obtained with outcomes recorded in GP medical records. Therefore, each stage of analysis, as described below, was carried out separately, with one set of analyses utilising self-report information and the other using data from coded GP records.

The ASP scales were divided into four quartiles and compared with health measures. The ASP scores were also dichotomised at the median. Odds ratios (ORs) with one-tailed *p*-values for health (because of directional predictions) were calculated between dichotomised ASP scores and health outcomes. Comparisons were made between ASP variables at ages 18, 32 and 48 and health outcomes up to age 48. In the second step, the association between childhood antecedents and health outcomes was tested using 2x2 ORs, identifying independently predictive childhood risk factors that were related to worse health outcomes. Partial ORs were estimated using a forward stepwise method in order to minimize problems of multicollinearity. In the third step, for ASP scales that were related to health outcomes, we entered the significant risk factors for each health outcome as a block, followed by significant dichotomised ASP scale variables at a given age, within a forward stepwise logistic regression, to see if ASP scores were related to worse health outcomes independently of these significant childhood risk factors.

## Results

### Self-Reported Physical Health and Injury Data

*Offending Trajectories*

Distinct offender groups were studied according to the taxonomy of Moffitt (1993, 2006) and Jolliffe et al. (2017b). These have been framed as life-course-persistent (LCP), adolescence-limited (AL), and late-onset (LO) offenders (Farrington, Ttofi & Coid, 2009; Jolliffe et al., 2017b; McGee & Farrington, 2010; Moffitt, 2006; 2018; Moffitt & Caspi, 2001; Piquero, et al., 2012). We also included a Non-offenders (NO) category as a comparison group (See Table 3). Moffitt's (1993) developmental taxonomy was chosen because it has been proven to be one

of the most influential theoretical models for categorizing types of offenders (e.g., Jolliffe et al., 2017b; Piquero & Chung, 2001).

LCP offenders were defined as those who committed their first offence up to age 20 and then at least another offence at age 30 or later (up to age 61) (Farrington, 2019). AL offenders were labelled as such if they committed their first offence up to age 20 and their last offence before age 30. LO offenders were classified as those who only commenced offending at age 21 or later. The OFF category included any individual with a history of offending at any age or duration. The three distinct offender trajectories were compared individually to the NO category in all analyses to generate the ORs and Adjusted ORs which were used to summarize the strength of relationships between variables.

*Self-Reported Incidence of Illness in Offender Trajectories vs. NO up to Age 48*

Table 4 presents the incidence of illnesses for each offender trajectory across the three age periods. Table 4 also presents the ORs and adjusted ORs of illnesses for each offender trajectory compared to NOs across the three age periods. The analyses are sometimes limited by small numbers. The unadjusted ORs yielded many more significant results than the adjusted ORs. Based on unadjusted ORs at age 18, the incidence of physical illness was lower among offenders. At age 32, the incidence of physical illness was lower among LCP offenders and higher among AL offenders. At age 48, the incidence of physical illness was higher among LCP and LO offenders. Based on adjusted ORs at age 48, the incidence of physical illness was higher among LCP and LO offenders and among offenders in general.

*Self-Reported Hospitalization for Offender Trajectories vs. NO up to Age 48*

Table 4 also presents the incidence and odds ratios of hospitalization for each offender trajectory at ages 32 and 48. Based on unadjusted ORs at age 32, the incidence of hospitalization was lower for LCP and LO offenders, but higher for AL offenders. Based on adjusted ORs at age 32, the incidence of hospitalizations was higher for LO offenders. Both unadjusted and adjusted ORs at age 48 showed that the incidence of hospitalizations was higher for all three offender types and offenders in general.

*Self-Reported Physical Injuries of Offender Trajectories vs. NO up to Age 48*

Table 5 presents the incidence of physical injuries in offenders across the three age periods. Table 5 also reports the ORs and Adjusted ORs for injuries across the three ages versus NO. Based on unadjusted ORs, at age 18 LCP offenders had a higher incidence of industrial injuries and road accidents, but a lower incidence of sports injuries. AL offenders had a higher incidence of industrial and assault injuries, but a lower incidence of sports injuries. LO offenders also had a higher incidence of industrial and assault injuries, but a lower incidence of sports injuries and road accidents. Offenders in general had a higher incidence of injuries, including industrial and assault injuries and road accidents. However, they had a lower incidence of sports injuries than NO.

At age 32, LCP offenders had a lower incidence of assault injuries, whereas LO offenders had a higher incidence of assault injuries. At age 48, LCP offenders had a higher incidence of industrial injuries, assault injuries and road accidents, but a lower incidence of sports injuries. AL offenders had a higher incidence of industrial injuries, but a lower incidence of assault injuries, sports injuries and road accidents. LO offenders had a higher incidence of industrial and assault injuries, and a lower incidence of sports injuries. Offenders in general had a higher incidence of industrial injuries, but a lower incidence of sports injuries.

Based on adjusted ORs, at age 18 AL offenders had a lower incidence of all injuries. Offenders in general, however, had a higher incidence of all injuries, including industrial injuries, assault injuries and road accidents. Offenders in general had a lower incidence of sports injuries. At age 48, LO offenders had a higher incidence of industrial injuries, as did offenders in general.

**GP Reported physical Health Data**

*Offending Trajectories*

Offending trajectory distribution across the sample was: life-course-persistent: *N*=54; adolescence-limited: *N*= 76; late-onset: *N*= 42; non-offenders: *N*= 222. Within our final sample, over 90% of men in each group had provided self-reported health data (LCP: 100% of LCPs; AL: 96%; LO: 100%; NO: 99%). Although a majority had GP data, this was available for fewer men in the offender and non-offender groups (LCP: 54%; AL: 72%; LO: 64%; NO: 69%).

*Associations between Health and Offending*

Table 6 shows that, according to GP records, offenders fare no worse in any health domain than non-offenders. However, LCP offenders were more likely than non-offenders to have a record of a disabling medical condition.

**ASP Findings**

*Self-Reported Health versus ASP scores at ages 18, 32 and 48*

Table 7 shows the prevalence of self-reported poorer health outcomes up to age 48 in each of the four ASP categories. Table 7 also provides Chi-Square results from 4x2 analyses and reveals that self-reported hospitalization was significantly associated with higher ASP scores at ages 18, 32 and 48. Table 7 also provides ORs for self-reported physical health and hospitalizations cumulatively reported up to age 48, versus ASP scores measured at age 18, 32 and 48, respectively. According to self-reports, having higher ASP scores at ages 18, 32 and 48 were significantly associated with an increased likelihood of hospitalization and higher ASP scores at age 32 of poorer physical health.

*GP Reported Health versus ASP scores at age 18, 32 and 48*

Table 8 shows the prevalence of GP reported poorer health outcomes in each of the four ASP categories. Table 8 also provides Chi-Square results from 4x2 analyses and reveals a significantly greater prevalence of disabling medical conditions when ASP scores were high at age 48. Table 8 also provides ORs for ASP scores, measured at age 18, 32 and 48, versus poor health. According to GP records, a higher ASP score was related to a high likelihood of poor physical health at age 32 and disabling medical conditions at age 48.

*Age 8-10 Risk Factors for Self-reported and GP-reported Health up to age 48*

Table 9 shows that having a convicted father (*OR*= 1.74, *p*= 0.04) and being daring (*OR*= 1.63, *p*= 0.04) independently predicted an increased likelihood of self-reported hospitalization. Table 9 also shows that low nonverbal IQ independently predicted worse GP-reported physical health (*OR*= 2.12, *p*= 0.02). Low family income significantly predicted GP-reported disabling medical conditions (*OR*= 2.37, *p*= 0.02).

*ASP versus Self-Reported Health up to age 48, controlling for age 8-10 risk factors*

When controlling for having a convicted father and high daring, ASP at age 18 ((*LRCS*= 3.149, *p*= 0.04, *OR*= 1.65, *p*= 0.04), age 32 (*LRCS*= 3.268, *p*= 0.04, *OR*= 1.62, *p*= 0.04) and age 48

(*LRCS*= 5.013, *p*= 0.02, *OR*= 1.87, *p*= 0.02) were predictive of an increased prevalence of hospitalizations.

*ASP versus GP-reported Health up to age 48, controlling for Age 8-10 Risk Factors*

When controlling for low non-verbal IQ, ASP at age 32 was no longer predictive of worse physical health (*LRCS*= 0.164, *p*= 0.35, *OR*= 1.15, *p*= 0.35). When controlling for low family income, ASP at ages 32 and 48 were no longer predictive of disabling medical conditions (respectively: *LRCS*= 2.109, *p*= 0.08, *OR*= 1.72, *p*= 0.08; *LRCS*= 2.058, *p*= 0.08, *OR*= 1.72, *p*= 0.08).

## Discussion

### Self-Reported Physical Health, Injury and Hospitalisation Findings

This section of the chapter categorised offenders into three trajectories: Adolescence-Limited (AL), Late-Onset (LO) and Life-Course-Persistent (LCP), and compared their respective odds of self-reported (SR) physical health, injury and hospitalization. Studies have shown that, whilst offending rates decrease after adolescence, the impact on health of an antisocial lifestyle during adolescence persists and becomes more apparent in the later decades of life. However, previous researchers have not studied distinct offending trajectories, nor have they controlled for key risk factors.

This study's findings, when considering organic illnesses (Respiratory Tract, Cardiovascular, Musculoskeletal, Skin, Allergic, Gastrointestinal and Infectious Illnesses) and hospitalizations (the number of hospital visits), confirm other work and our hypotheses (Shepherd et al., 2002; 2004; Shepherd, Shepherd, Newcombe & Farrington, 2009). They suggest that the impact of offending on self-reported health becomes more serious if offending persists beyond adolescence. Our analyses also highlight age-specific health implications related to the ages and durations at which offenders begin and end their delinquent behaviour.

The results here also provide evidence that offenders are more likely to suffer injuries than non-offenders. It is possible that getting injured is another symptom or consequence of an antisocial personality which arises in childhood and persists into adulthood. Therefore, measures that prevent or reduce offending and antisocial behaviour are likely also to reduce injuries (Shepherd & Farrington, 1993).

It is important to highlight the large impact of adjusting for our risk factors, often minimising ORs and in some cases changing the direction of the OR. Although the differences in ORs is sometimes large, this is not necessarily surprising. Firstly, the five risk factors were chosen because of their strong established association with convictions (Farrington et al., 2015). Secondly, these risk factors were measured at age 8-10, after which there were long periods of time for historical forces to shape the social trajectories of family, education, and work, which in turn influence behaviour and particular lines of development.

**General Practitioner Physical Health and Hospitalisation Findings**

This section of the chapter categorised offenders into three trajectories, and compared their respective odds of physical health, injury and hospitalization using General Practitioner (GP) records. All sources of data suggested that the life-course-persistent offenders were particularly vulnerable to problems with their health. Where general practitioner records were available, the health of adolescence-limited offenders appeared in all measures to be no different from that of healthy controls. This may suggest that intervention strategies attempting to limit offending to adolescence would be particularly effective in reducing poor health outcomes across the life course.

LCP offenders have a higher likelihood of being hospitalised according to self-reported data but not according to GP records (but overall hospitalisation rates in GP records were very high). It may be that the cohort was from a particularly disadvantaged area with respect to health and social characteristics, and findings should be viewed in this context.

The findings in this section of the chapter again indicate that exploring health and offender trajectories over the life course is valuable, in line with Moffitt's (1993) theory, providing useful temporal insights for intervention. These findings additionally highlight that it is useful to compare different data sources for health outcomes, especially when comparing hospitalization records, in the same way different sources of offending data have previously been compared (Auty et al., 2015; Borschman et al., 2017; Farrington et al., 2015; Keen et al., 2020; Kirk, 2006).

Reporting two forms of data with confirmatory and complimentary findings adds weight to the growing evidence that life-course-persistent offending, and offending that continues into later life, are likely to be risk factors for worse health outcomes. This work provides evidence that

interventions are needed to not only address antisocial behaviour at temporally sensitive periods, but that interventions which address the health ramifications of offending are also needed.

**Antisocial Personality and Psychosocial Risk Factors**

This section of the Chapter investigated the impact of ASP scores at age 18, 32, 48 and childhood risk factors at age 8-10 on health outcomes from age 18 to 48, while also comparing the differences between self-reported and GP reported health outcomes. No other study has examined the effects of antisocial personality, childhood risk factors and health outcomes over such a long period of time in a large community sample.

The results replicate the findings of previous research investigating concurrent antisocial personality and health (Shepherd et al., 2002; 2004), with non-significant results common for most health outcomes up to age 32. However, our results also echo the conclusions of Skinner, Farrington and Shepherd (2020), showing that the likelihood of worse health outcomes increases as antisocial lifestyles continue into later decades of life. It should be noted that some of the individual antisocial personality variables within the ASP composite measure used in the analyses would be expected to directly impact physical health, especially heavy smoking, drug use and drunk driving (Junger, Stroebe & Van der Laan, 2001; Shepherd & Farrington, 2003). This may have increased the likelihood of a relationship between the ASP composite measure and poor physical health over time.

This study also highlights the enduring effects of parental and environmental factors at an early age, in line with previous research investigating ASP and personality disorders in general (Compton, Conway, Stinson, Colliver & Grant, 2005; Frankenburg & Zanarini, 2006) and expanding this work to also investigate the interaction of ASP with health and health service utilization.

This study found that having a convicted parent and high daring at ages 18, 32 and 48 were related to an increased likelihood of hospitalization. Several studies have investigated risk factors for ASP, and the effects are best summarised in the National Collaborating Centre for Mental Health's meta-analysis (2010). They found six studies highlighting risk factors in early childhood (0-5 years) which increased the likelihood of ASP at a follow-up age of 18-32,

reporting that early childhood behaviour problems (*OR*= 1.92) and family factors (maternal rejection, one parent family, parent separation) were significant risk factors (*OR*= 3.47).

A further 17 studies highlighted risk factors in mid-childhood (6-11) for ASP at ages 15-32. The meta-analysis found that childhood behavioural problems increased the likelihood of ASP (*OR*= 2.56), specifically highlighting low IQ (*OR*= 2.00), ADHD (*OR*= 6.22) and family factors, such as parenting behaviour (*OR*= 2.64), parental separation and/or disharmony (*OR*= 2.23) and social factors (parent education and low income) (*OR*= 2.39) as significant risks. 10 studies identified risk factors in adolescence (ages 12-18) and found that behavioural problems (*OR*= 3.05), low IQ (*OR*= 2.12), family factors (*OR*= 2.50), family antisocial behaviour (*OR*= 2.47) and parental separation and/or disharmony (*OR*= 2.22) to be significantly related to ASP.

The age 8-10 risk factor findings have some overlap with this meta-analytic work. It is clear that risk factors are important in the development and prediction of ASP and are related to health and health service utilization across the life course. Unfortunately, no previous studies longitudinally relate ASP to health outcomes while controlling for significant childhood family and environmental risk factors, making it difficult for us to directly compare our results with prior studies.

Findings from this study are therefore important for developing intervention and risk assessment plans. If more were known about aetiological risk factors for ASP and associated factors leading to poorer health, then key priorities could be established for future research and action (Coid, 2003). The findings also highlight the importance of longitudinal and life-course approaches to investigate the interface between constructs of antisocial personality, lifestyles and health.

## Conclusion

The findings of this chapter imply that preventing individuals from offending is likely to have substantial benefits for health. This has extremely important implications for society. Antisocial behaviour, which persists from childhood into and beyond adolescence, causes a burden and cost to society (Anda et al., 2006; Cohen, Piquero & Jennings, 2010). Offenders are more likely than their non-offending peers, or, indeed, their peers with other offending trajectories, to fail to do productive work and impose long-term costs on the health and welfare services (Farrington et al., 2006).

Additionally, the findings of this Chapter, in relation to organic illness and hospitalization, suggest that addressing the predictors of chronic offending, by reducing childhood risk factors (McGee & Farrington, 2010; Piquero et al., 2012), for example, through nurse–family partnerships and child skills-training programmes, which are both known to be effective, may contribute to improving health in middle-aged men as well as reducing long-term offending (Craig, Piquero, Farrington & Ttofi, 2017; Losel & Beelman, 2003; Piquero, Farrington, Welsh, Tremblay & Jennings, 2009). This Chapter's findings also highlight the importance of preventing individuals from commencing offending at a later age, due to the increased likelihood of injury and possible disability (Farrington, 2019).

This chapter has also provided evidence that community offenders have worse health outcomes than non-offenders across the life-course. Collaborative research between clinical academics and criminologists is important in advancing knowledge about offending and about ill-health associated with offending, aiming to minimise disability of individuals and costs to society (Cohen & Piquero, 2009). At present, the prevention of offending and the prevention of injury and illness are considered and organized separately. The findings of this study suggest that a more integrated and targeted approach to prevention – in which offender rehabilitation and public health academics collaborate – would pay substantial dividends. The worst consequence of poor physical health is premature mortality, so this element of the health-crime relationship will be meta-analytically investigated in Chapter 3.

**Table 1. Prevalence of illness in Offenders up to Age 32**

| Age 16-18 | LCP | AL | LO | NO |
|---|---|---|---|---|
| Allergies | 3 (5.6%) | 6 (8.2%) | 1 (2.4%) | 11 (5.2%) |
| Gastro-Intestinal Diseases | 5 (9.3%) | 6 (8.2%) | 2 (4.8%) | 21 (10.0%) |
| Infectious Disease | 30 (55.6%) | 32 (43.8%) | 19 (45.2%) | 119 (56.4%) |
| Respiratory Disease | 25 (46.3%) | 29 (39.7%) | 18 (42.9%) | 106 (50.2%) |
| Skin Disease | 6 (11.1%) | 10 (13.7%) | *3 (7.1%)* | 16 (7.6%) |
| **Age 27-32** | **LCP** | **AL** | **LO** | **NO** |
| Allergies | 0 (0%) | 2 (2.9%) | 0 (0%) | 0 (0%) |
| Gastro-Intestinal Diseases | 3 (6.1%) | 9 (13.2%) | 1 (2.7%) | 13 (6.6%) |
| Infectious Disease | 3 (6.1%) | 13 (19.1%) | 7 (18.9%) | 32 (16.2%) |
| Respiratory Disease | 3 (6.1%) | 9 (13.2%) | 6 (16.2%) | 21 (10.6%) |
| Skin Disease | 1 (2.0%) | 1 (1.5%) | 1 (2.7%) | 5 (2.5%) |

*Note. % in Parentheses. The reported prevalence's represent the actual number of individuals within each category and exclude individuals with missing data.*

**Table 2. Odds Ratios of Illness for Offenders vs. Non-Offenders up to Age 32**

| Age 16-18 | LCP | AL | LO |
|---|---|---|---|
| Allergies | 1.07 (.73–1.59) | 1.58* (1.10–2.26) | .46* (.28–.75) |
| Gastro-Intestinal Diseases | .93 (.69–1.25) | .82 (.60–1.11) | .48* (.34–.68) |
| Infectious Disease | .99 (.85-1.14) | .78 (.67-.90) | .80 (.69-.93) |
| Respiratory Disease | .92 (.79-1.08) | .79 (.68-.93) | .85 (.73-1.00) |
| Skin Disease | 1.46 (1.08-1.98) | 1.80 (1.34-2.42) | .93 (.67-1.31) |
| **Age 27-32** | **LCP** | **AL** | **LO** |
| Allergies | 1.00+ | 1.00+ | 1.00+ |
| Gastro-Intestinal Diseases | .92 (.65–1.32) | 2.00* (1.47-2.72) | .41 (.26–.65) |
| Infectious Disease | .38 *(.28-.51) | 1.18 (.94-1.48) | 1.17 (.93-1.46) |
| Respiratory Disease | .58* (.41-.80) | 1.25 (.95-1.63) | 1.53* (1.18-1.98) |
| Skin Disease | .80 (.44-1.45) | .60* (.31-1.14) | 1.08 (.62-1.87) |

*Note. 95% Confidence Intervals are in Parentheses. * = P < 0.05. +CI's are not available because the results were constant. No LCP, AL, LO offenders or NO reported any Allergies.*

## Table 3. Descriptive frequencies

| Offender Trajectories | Number of Individuals | Cumulative Percentage | Percentage Excluding Not at Risk |
|---|---|---|---|
| Non-Offenders (NO) | *220* | 53.5 | 56.1 |
| Offenders (OFF) | 172 | 46.5 | 43.9 |
| - Late Onset (LO) | 42 | 10.2 | 10.7 |
| - Adolescence Limited (AL) | 76 | 18.5 | 19.4 |
| - Life Course Persistent (LCP) | 54 | 13.1 | 13.8 |
| Not at Risk | 19 | 4.6 | - |
| Total | 411 (392) | - | - |

*Note. The LO, AL, and LCP categories are subsets of the aggregate Offender category. LCP offenders were defined as those who committed their first offence up to age 20 and then at least another offence at age 30 or later (up to age 61)* [20]*. AL offenders were labelled as such if they committed their first offence up to age 20 and their last offence before age 30. LO offenders were classified as those who only commenced offending at age 21 or later. The 'Not at Risk' category represents individuals who are deceased or emigrated at age 30. For a detailed description of these categories please see: Jolliffe et al.,(2017b). Prevalence of life-course-persistent, adolescence-limited and late-onset offenders: A systematic review of prospective longitudinal studies. Aggression and Violent Behavior, 33, 4-14.*

**Table 4. Incidence and Odds Ratios of Illness and Hospitalization for Offenders Compared to Non-Offenders up to Age 48**

| **Age 16-18** | | **LCP** | | | ***AL*** | | | **LO** | | | **OFF** | | **NO** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***I*** | ***OR*** | ***AOR*** | ***I*** | ***OR*** | ***AOR*** | ***I*** | ***OR*** | ***AOR*** | ***I*** | ***OR*** | ***AOR*** | ***I*** |
| Organic Illness | 31 (57.4%) | .95 (.82-1.09) | 1.08 (.90-1.30) | 39 (54.2%) | .89 (.77-1.03) | .85 (.46-1.57) | 20 (47.6%) | .78 (.68-.91) | .68 (.33-1.40) | 90 (52.3%) | .86* (.74-1.00) | .90 (.56-1.43) | 128 (60.7%) |
| **Age 27-32** | | **LCP** | | | ***AL*** | | | **LO** | | | **OFF** | | **NO** |
| Organic Illness | 7 (14.3%) | .62* (.49-0.77) | .92 (.73-1.17) | 23 (33.8%) | 1.46 (1.21-1.76) | .96 (.52-1.74) | 7 (18.9%) | .81 (.66-1.01) | .72 (.29-1.81) | 37 (21.5%) | .93 (.75-1.14) | 1.01 (.59-1.76) | 46 (23.2%) |
| Hospitalized | 8 (6.1%) | .43* (.32-0.59) | 1.05 (.82-1.36) | 17 (25%) | 1.77* (1.42-2.22) | .79 (.54-1.16) | 2 (5.4%) | .38* (.28-.53) | 8.14* (1.03-64.66) | 27 (15.7%) | 1.11 (.87-1.42) | .97 (.51-1.86) | 28 (14.1%) |
| **Age 43-48** | | **LCP** | | | ***AL*** | | | **LO** | | | **OFF** | | **NO** |
| Organic Illness | 16 (30.2%) | 1.18* (.98-1.42) | 1.26* (1.02-1.55) | 16 (23.5%) | .92 (.75-1.12) | 1.31 (.90-1.92) | 11 (31.4%) | 1.23* (1.01-1.48) | 2.90* (1.23-6.83) | 43 (25%) | .98 (.80-1.19) | 2.21* (1.24-3.95) | 30 (25.6%) |
| Hospitalized | 32 (64.0%) | 2.94* (2.46-3.50) | 1.25* (1.03-1.52) | 51 (74.0%) | 3.39* (2.85-4.04) | 1.17 (.82-1.66) | 11 (32.2%) | 1.48* (1.22-1.79) | 2.45* (1.10-5.45) | 94 (54.7%) | 2.51* (2.10-3.00) | 1.82* (1.07-3.10) | 42 (21.8%) |

*Note. I = Incidence, %'s in Parenthesises. LCP = Life Course Persistent Offenders, AL = Adolescent Limited Offenders, LO = Late Onset Offenders, OFF = Offenders, NO = Non-Offenders. OR = Odds Ratio, AOR = Adjusted Odds Ratio. The reported incidence represents the actual number of individuals within each category and excludes individuals with missing data. Some numbers may not therefore directly correspond to those in Table 1. * = P < 0.05. When there were zero entries, ORs were calculated using the Haldane-Anscombe correction.*

**Table 5. Incidence and Odds Ratios of Physical Injuries for Offenders Compared to Non-Offenders up to Age 48**

| **Age 16-18** | | **LCP** | | | ***AL*** | | | **LO** | | | **OFF** | | **NO** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***I*** | ***OR*** | ***AOR*** | ***I*** | ***OR*** | ***AOR*** | ***I*** | ***OR*** | ***AOR*** | ***I*** | ***OR*** | ***AOR*** | ***I*** |
| All Injuries | 33 (64.7%) | 1.36 (1.17-1.57) | .57 (.28-1.20) | 46 (65.7%) | 1.38 (1.19-1.60) | .51* (.27-.96) | 24 (57.1%) | 1.20 (1.03-1.39) | .76 (.38-1.55) | 103 (59.9%) | 1.26* (1.08-1.46) | .61* (.38-.99) | 94 (47.7%) |
| Industrial Injuries | 12 (23.5%) | 1.99* (1.57-2.53) | .82 (.32-2.06) | 17 (24.3%) | 2.06* (1.63-2.61) | .58 (.28-1.21) | 11 (26.2%) | 2.22* (1.76-2.81) | .65 (.28-1.52) | 40 (23.3%) | 1.24* (1.00-1.53) | .69 (.39-1.22) | 37 (18.8%) |
| Assault Injury | 3 (5.9%) | 1.44 (.96-2.16) | 1.20 (.20-7.20) | 11 (15.7%) | 3.83* (2.69-5.46) | .53 (.18-1.60) | 4 (9.5%) | 2.32* (1.59-3.38) | .53 (.14-2.00) | 18 (10.5%) | 2.56* (1.77-3.71) | .60 (.23-1.58) | 8 (4.1%) |
| Sport Injury | 5 (9.8%) | .74* (.56-.98) | .97 (.32-2.95) | 5 (7.1%) | .54* (.40-.73) | 1.67 (.58-4.85) | 3 (7.1%) | .54* (.40-.73) | 1.63 (.46-5.80) | 13 (7.6%) | .58* (.43-.77) | 1.42 (.67-3.03) | 26 (13.2%) |
| Road Accident | 6 (11.1%) | 1.59* (1.16-2.17) | 1.59 (.44-5.68) | 10 (13.7%) | 1.96* (1.45-2.64) | 2.12 (.83-5.42) | 1 (2.4%) | .34* (.21-.55) | - | 17 (9.9%) | 1.41* (1.03-1.94) | 1.20 (.52-2.75) | 14 (7.0%) |
| **Age 27-32** | | ***LCP*** | | | **AL** | | | **LO** | | | ***OFF*** | | ***NO*** |
| All Injuries | 15 (30.6%) | 1.16 (.97-1.40) | .65 (.30-1.42) | 25 (36.8%) | 1.40 (1.17-1.68) | .71 (.37-1.36) | 8 (21.6%) | .82 (.67-1.00) | 1.48 (.60-3.64) | 48 (27.9%) | 1.06 (.88-1.28) | .84 (.50-1.41) | 52 (26.3%) |
| Industrial Injuries | 5 (10.2%) | .92 (.69-1.22) | .84 (.27-2.58) | 10 (14.7%) | 1.32 (1.02-1.72) | .88 (.36-2.19) | 3 (8.1%) | .73 (.54-.98) | 2.14 (.47-9.71) | 18 (10.5%) | .95 (.71-1.25) | 1.14 (.54-2.40) | 22 (11.1%) |
| Assault Injury | 0 (0.0%) | .05* (.00-.81) | - | 1 (1.5%) | 1.50 (.67-3.35) | .58 (.04-7.56) | 1 (2.7%) | 2.70* (1.30-5.61) | .29 (.02-3.72) | 2 (1.2%) | 1.20 (.52-2.79) | .64 (.08-5.10) | 2 (1.0%) |
| Sport Injury | 2 (4.1%) | .67 (.45-1.01) | 1.13 (.21-6.03) | 7 (10.3%) | 1.69 (1.22-2.35) | .56 (.18-1.75) | 3 (8.1%) | 1.33 (.94-1.87) | .53 (.13-2.10) | 12 (7.0%) | 1.15 (.81-1.64) | .76 (.30-1.93) | 12 (6.1%) |
| **Age 43-48** | | ***LCP*** | | | **AL** | | | **LO** | | | ***OFF*** | | **NO** |
| All Injuries | 7 (13.2%) | .87 (.68-1.12) | 1.06 (.84-1.34) | 8 (11.8%) | .78 (.60-1.01) | .90 (.58-1.39) | 7 (20.0%) | 1.32 (1.05-1.67) | 1.38 (.53-3.59) | 22 (12.8%) | .85 (.66-1.09) | 1.10 (.58-2.05) | 29 (15.1%) |
| Industrial Injuries | 5 (9.4%) | 1.81* (1.27-2.57) | 1.22 (.86-1.69) | 6 (8.8%) | 1.69* (1.19-2.41) | 1.31 (.73-2.34) | 6 (17.6%) | 3.38* (2.45-4.67) | 4.04* (1.28-12.72) | 17 (9.9%) | 1.90* (1.35-2.69) | 2.53* (1.03-6.17) | 10 (5.2%) |
| Assault Injury | 1 (1.9%) | 1.90* (.88-4.11) | 1.54 (.82-2.89) | 0 (0.0%) | .05* (.00-.81) | - | 1 (2.9%) | 2.90* (1.41-5.98) | 2.70 (.22-32.61) | 2 (1.2%) | 1.20 (.52-2.79) | 2.00 (.26-15.26) | 2 (1.0%) |
| Sport Injury | 1 (1.9%) | .45* (.26-.78) | .74 (.42-1.30) | 2 (2.9%) | .69* (.43-1.12) | .78 (.34-1.81) | 0 (0.0%) | .01* (.00-.19) | - | 3 (1.7%) | .40* (.23-.72) | .36 (.09-1.52) | 8 (4.2%) |
| Road Accident | 2 (4.0%) | 1.54* (.93-2.54) | 1.15 (.70-1.88) | 1 (1.5%) | .58* (.30-1.10) | .79 (.24-2.62) | 1 (2.9%) | 1.12 (.65-.19) | 1.34 (.14-12.90) | 4 (2.3%) | .88 (.50-1.56) | 1.03 (.23-4.64) | 5 (2.6%) |

*Note. I = Incidence, %'s in Parentheses. LCP = Life Course Persistent Offenders, AL = Adolescent Limited Offenders, LO = Late Onset Offenders, OFF = Offenders, NO = Non-Offenders. OR = Odds Ratios, AOR = Adjusted Odds Ratio. * = P < 0.05. The reported incidence represents the actual number of individuals within each category and excludes individuals with missing data. Some numbers may not therefore directly correspond to those in Table 1. There were no Road Accidents at 27-32. When there were zero entries, ORs were calculated using the Haldane-Anscombe correction.*

**Table 6. Prevalence and Odds Ratios of GP Reported Health in Types of Offenders Compared to Non-Offenders**

| | LCP | | AL | | LO | | N-OFF |
|---|---|---|---|---|---|---|---|
| | ***N= 29*** | ***OR*** | ***N= 55*** | ***OR*** | ***N= 27*** | ***OR*** | ***N= 153*** |
| Physical Illness (152/264) | 17 (58.6%) | 1.04 (0.90-1.21) | 33 (60.0%) | 1.07 (0.38-1.23) | 16 (59.3%) | 1.06 (0.91-1.22) | 86 (56.2%) |
| Disabling Medical Condition (64/264) | 11 (37.9%) | 1.66* (1.37-1.99) | 12 (21.8%) | 0.95 (0.78-1.17) | 6 (22.2%) | 0.97 (0.79-1.19) | 35 (22.9%) |
| Ever Hospitalized (234/264) | 26 (89.7%) | 1.04 (0.91-1.18) | 50 (90.9%) | 1.05 (0.93-1.20) | 26 (96.3%) | 1.12 (0.98-1.27) | 132 (86.3%) |
| Surgical Admission (221/264) | 26 (89.7%) | 1.12 (0.97-1.26) | 47 (85.5%) | 1.06 (0.93-1.20) | 24 (88.9%) | 1.10 (0.96-1.25) | 124 (81.0%) |

*%s in parentheses in data columns. 95% confidence intervals in parentheses. * = P < 0.05. LCP = Life-Course-Persistent Offenders, AL = Adolescence-Limited Offenders, LO = Late-Onset Offenders, N-OFF = Non-Offenders. AORs could not be reported due to small numbers.*

**Table 7. Self-Reported Poor Health up to Age 48 versus Antisocial Personality Scores at ages 18, 32 and 48**

| | Lowest 0%-25% | Low mid-range 26%-50% | High mid-range 51%-75% | Highest 76%-100% | $X^2$ | *p* | *OR* | *p* |
|---|---|---|---|---|---|---|---|---|
| **Physical Illness** | | | | | | | | |
| Age 18 | 42 (67.7%) | 98 (75.4%) | 58 (71.6%) | 76 (71.0%) | 1.354 | 0.36 | 0.90 | 0.65 |
| Age 32 | 53 (62.4%) | 78 (78.8%) | 65 (69.1%) | 78 (76.5%) | 7.592 | 0.03 | 0.95 | 0.12 |
| Age 48 | 23 (67.6%) | 72 (73.5%) | 110 (69.2%) | 69 (77.5%) | 2.403 | 0.25 | 1.05 | 0.65 |
| **Ever Hospitalized** | | | | | | | | |
| Age 18 | 31 (50.0%) | 67 (51.5%) | 48 (59.3%) | 71 (66.4%) | 6.813 | 0.04 | 1.32 | 0.01 |
| Age 32 | 37 (43.5%) | 52 (52.5%) | 62 (66.0%) | 66 (64.7%) | 12.656 | 0.01 | 1.41 | 0.01 |
| Age 48 | 5 (14.7%) | 54 (55.1%) | 97 (61.0%) | 61 (68.5%) | 30.851 | 0.01 | 1.35 | 0.01 |

*Age 18 and 32, N=380; Age 48, N= 345. One-tailed p values, because of directional predictions.*

**Table 8. GP Reported Poor Health up to Age 48 versus Antisocial Personality Scores at ages 18, 32 and 48**

| | *Lowest 0%-25%* | Low mid-range 26%-50% | High mid-range 51%-75% | *Highest 76%-100%* | $X^2$ | *p* | *OR* | *p* |
|---|---|---|---|---|---|---|---|---|
| **Physical Illness** | | | | | | | | |
| Age 18 | 23 (65.7%) | 44 (55.0%) | 27 (54.0%) | 37 (59.7%) | 1.540 | 0.67 | 0.95 | 0.83 |
| Age 32 | 21 (47.7%) | 31 (50.8%) | 39 (63.9%) | 40 (65.6%) | 5.497 | 0.14 | 2.27 | 0.01 |
| Age 48 | 38 (59.4%) | 32 (56.1%) | 7 (58.3%) | 54 (57.4%) | 0.135 | 0.99 | 1.17 | 0.55 |
| **Disabling Medical Condition** | | | | | | | | |
| Age 18 | 6 (17.1%) | 22 (27.5%) | 8 (16.0%) | 17 (27.4%) | 3.606 | 0.31 | 1.09 | 0.79 |
| Age 32 | 8 (18.2%) | 13 (21.3%) | 14 (23.0%) | 18 (29.5%) | 2.096 | 0.55 | 1.92 | 0.07 |
| Age 48 | 13 (20.3%) | 7 (12.3%) | 4 (33.3%) | 29 (12.8%) | 7.856 | 0.05 | 1.89 | 0.05 |
| **Ever Hospitalized** | | | | | | | | |
| Age 18 | 31 (88.6%) | 69 (86.3%) | 45 (90.0%) | 51 (82.3%) | 1.592 | 0.66 | 0.94 | 0.87 |
| Age 32 | 32 (72.7%) | 59 (96.7%) | 54 (88.5%) | 51 (83.6%) | 13.123 | 0.01 | 0.74 | 0.50 |
| Age 48 | 55 (85.9%) | 50 (87.7%) | 9 (75.0%) | 82 (87.2%) | 1.473 | 0.69 | 0.94 | 0.87 |

*N= 227. One-tailed p-values, because of directional predictions. $X^2$ with 3 df.*

## Table 9. Age 8-10 Risk Factors Predicting Health

| | Convicted Father | | Poor Parental Supervision | | Low Family Income | | Low Nonverbal IQ | | High Daring | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ***OR*** | ***p*** | ***OR*** | ***p*** | ***OR*** | ***p*** | ***OR*** | ***p*** | ***OR*** | ***p*** |
| **SR Health Measures** | | | | | | | | | | |
| Physical Illness | 0.76 | 0.32 | 0.88 | 0.68 | 0.86 | 0.48 | 0.70 | 0.16 | 0.66 | 0.10 |
| Hospitalization | 1.74* | 0.04 | 0.95 | 0.86 | 1.14 | 0.60 | 1.22 | 0.42 | 1.63* | 0.04 |
| **GP Health Measures** | | | | | | | | | | |
| Physical Illness | 1.10 | 0.78 | 1.22 | 0.58 | 1.50 | 0.24 | 2.12* | 0.02 | 1.35 | 0.30 |
| Disabling Medical Conditions | 1.53 | 0.24 | 1.15 | 0.74 | 2.37* | 0.02 | 1.16 | 0.68 | 0.90 | 0.78 |
| Hospitalizations | 1.10 | 0.84 | 1.07 | 0.90 | 1.17 | 0.76 | 1.39 | 0.50 | 0.60 | 0.20 |

*Note: Partial odds ratios shown, based on forward stepwise logistic regressions. 2-tailed p-values are presented due to counter-intuitive results with SR Physical Illness. Therefore, there were no clear directional predictions to permit the use of 1-tailed p-values.*

# Chapter 3: A Systematic Review and Meta-Analysis of Premature Mortality in Community Offenders[6]

## Introduction

The early death rate of offenders has been found to be considerably higher than the national average among non-offenders (Laub & Vaillant, 2000; Tremblay & Pare, 2003). Amongst all offender populations, studies of mortality have been less prevalent than work that examines their physical and mental wellbeing (for reviews, see Massoglia & Pridemore, 2015; Wildeman & Muller, 2012; Wildeman & Wang, 2017). Indeed, the weakness in research into mortality outside custodial settings can be summarised by Phillips and colleagues, who stated in 2018 that "…given that there is evidence to suggest that contact with the criminal justice system in non-custodial settings is associated with higher mortality rates than those found in the general population...", the paucity of studies "...is concerning" (Phillips et al., 2018, p. 1).

The absence of relevant data over meaningful time periods, and lack of reporting upon mortality itself, may partially explain the gap (Farrington & Hawkins, 2019; Teplin et al., 2005; Timonen et al., 2003). This Chapter aims to address gaps in the current knowledge on offending versus mortality, highlighting both the nature of samples used in previous research and the theoretical underpinnings of these findings. Furthermore, uniquely building upon Chapter 2, this chapter's analysis also focuses on community offenders.

### Offender-based samples: Adolescence

Research into death rates amongst adolescent ex-offenders has established that there are high mortality rates. In the United States, a study tracked male Connecticut teenage prisoners following release and demonstrated that 3.7% had died before the age of 25 (Yeager & Lewis, 1990). This makes the mortality rate of their sample approximately 58 times the national average for individuals in their age group. All died violent deaths, making the violent death rate of the sample approximately 76 times the national average for that age group. A larger piece of research in Australia, which had both male and female components, similarly tracked released adolescents for a median of 3.3 years for males and 1.4 years for females after

[6]Skinner, G. C. M., & Farrington, D. P. (2020a). A Systematic Review and Meta-Analysis of Premature Mortality in Offenders. *Aggression & Violent Behaviour, 53,* 1359-1789. doi 10.1016/j.avb.2020.101431.

incarceration (Coffey, Veit, Wolfe, Cini & Patton, 2003). The results revealed an average rate of death of 8.5 deaths per 1000 person-years, compared with only 1.1 per 1000 in the wider population. This rate was 9 times higher (males) and 40 times higher (females) than average age-related mortality expectations for this country and time period. In Finland, a study of 3,832 young ex-offenders revealed that more than 11% had died by the end of their 17-year follow-up period, typically from causes such as drug abuse and psychiatric conditions, though not for age-specific emotional conditions – for example, childhood onset psychiatric disorder (Sailas, Feodoroff, Lindberg, Virkkunun, Sund & Wahlbeck, 2005).

**Offender-based samples: Adulthood**

In the case of mortality research on adult offenders, most studies have concentrated on the post-parole period and such research has revealed similar results to that found for younger offenders (Binswanger et al., 2007; Stewart, Henderson, Hobbs, Ridout & Knuiman, 2004).

In America, a multi-decade study into children with a record of youth behavioural issues showed that, at 40 years old and compared with a comparison cohort, unnatural deaths were far more prevalent (Robins & O'Neal, 1958). Rates of death in a California study, following two cohorts from 1981-82 and 1986-87 until December 31, 1992, gathered from the California Vital Statistics for more than 4,000 youth paroled by the California Youth Authority, showed elevated rates of death of 5.5% and 3.5%, respectively (Lattimore et al., 1997). Studies by Laub and Vaillant (2000) and Laub and Sampson (2003, p. 72), using data from the American Glueck data source, showed significantly heightened mortality rates for previous young offenders, at ages 40 and 65, and then again at age 70. At age 40, the death rate was 100% higher than that of the control group, compared with 59% higher at age 65. By age 70, the rate of death of the non-offenders had risen to just under half of the total study group of offenders. Using the same data source, Laub and Vaillant (2000) demonstrated strong links between early death and delinquency.

The Cambridge-Somerville Youth Study is a delinquency prevention experiment and prospective longitudinal survey which involves 506 at-risk boys, ages 5–13 years, who have been followed up to age 89. In this project, Welsh and colleagues (Welsh et al., 2019; Zane et al., 2018) found that life-course–persistent offenders tended to die 7 to 8 years earlier than either adolescence-limited offenders or nonoffenders, although these group differences were

not evident until after age 50. In the Pittsburgh Youth Study, which is a prospective longitudinal study of 1517 inner-city males from age 7 to 13 years onward, 61 died up to age 29 years, and in the majority of cases (*N*= 39) the cause of death was homicide. Nearly half (44%) of those who died by homicide were convicted of crimes up to age 14 years, compared with 17% of the remainder (Loeber & Farrington, 2011).

In Europe, early research in Sweden including both males and females revealed that, 18 years after offending, males had suffered a death rate of 13% and females 10%. The great majority of these premature deaths were suicides, murders and substance abuse related (Rydelius, 1988). Also in Scandinavia, a longer term and larger study, which was focused on over 1000 previous adolescent psychiatric inpatients, once again demonstrated the existence of higher than standard mortality rates, this time linked primarily to gender, substance abuse and impulse management (Kjelsberg, Sandvik & Dahl, 1999). Most dramatically, once more in Scandinavia, a more recent study of offenders with an antisocial personality revealed a 5-9 times increase in mortality levels, rising to 6-17 times for those suffering unnatural deaths (Repo-Tiihonen, Virkkunen & Tiihonen, 2001).

In a Norwegian investigation of a specific offender cluster – a mixed-sex set of car drivers convicted of drink/drug offences during the mid-1990s – in a relatively short 6.8 year follow up period, 100 males from 598 sampled, and 29 females from 207 sampled, died (Hausken, Skurtveit & Christophersen, 2005). In another European study, this time in Italy looking at the mortality of mainly male drug users who had sought treatment, it was found that the level of mortality was 15 times higher than the overall population for males and 38 times higher for females (Bargagli, Sperati, Davoli, Forastiere & Perucci, 2001). It was also reported in Norway that those who had previously offended were twice as likely to die compared with non-offending samples (Skardhamar & Skirbekk, 2013).

In Sweden, a study surveying outcomes on homicide offenders over multiple decades established that over half of the offenders had died, with suicide being a significant cause. This was three times the rate of mortality in the wider population (Lindqvist, Lefiman & Eriksson, 2007). In a Swedish study looking at drug users based on clinic attendance data, excess mortality was present before age 50, and some predictors were found. These included mental

illness, hospitalisation for physical illness related to substance misuse, and anti-social behaviour (Samuelson, Hodgins, Larsson, Larm & Tengstrom, 2009).

Also, in Europe, the Dutch Criminal Careers and Life Course Study, which is an investigation that surveyed convicted offenders from 1977 until 2002, showed that early mortality was most acute amongst repeat offenders (Nieuwbeerta & Piquero, 2008). In America, a study of 23,510 felons, convicted on a set date (30 June 1991) and examined 15 years later, found that mortality rates were much higher after, rather than during, incarceration (Spaulding, Seals, McCallum, Perez, Brzozowski & Steenland, 2011). In the Dutch study, links between repeat offending and unnatural deaths were particularly established (Nieuwbeerta & Piquero, 2008).

In 2004, research in Australia linked both early and frequent incarcerations with enhanced risk of mortality (Coffey, Wolfe, Lovett, Moran, Cini & Patton, 2004). In a more recent Australian study, using an estimation methodology, it was argued that mortality amongst released offenders was significantly higher than deaths in custody, with the main concentration of mortality occurring in the first 28 days after release (Kinner et al., 2011). Swiss research found that unnatural mortality was widespread amongst the released offender population (Sattar & Killias, 2005).

The detailed literature review above highlights the number of ways that offending can be defined or considered, which may have an impact on the relationship between offending and mortality. Typically, offending has been based on a dichotomous Yes/No status which includes the type of offence, violent versus non-violent for example (Berg, Rostila, Arat & Hjern, 2019), and maybe the number of offences committed (Sourander et al., 2006; Elonheimo et al., 2011). But, beyond the binary relationship between mortality and offending, there is a concern that the nature and frequency of convictions is only one way, and a limited way at that, of capturing the full extent of offending behaviour. With the growing sense of a wider criminological population requiring health support, there is a requirement to encourage health services to identify all those who require support across the life course. Work on the identification of different types of offenders would assist in achieving better health outcomes for the widest possible offender-related groupings (Laub & Vaillant, 2000; Coffey et al., 2004; Chassin, Piquero, Losoya, Mansion & Schubert, 2013; Skardhamar & Skirbekk, 2013). This forms another rationale for studying community-based offenders in this thesis.

Turning to U.K. National Offender Management Service data, a study aimed to address the gap in knowledge about the lives of offenders after state custody, in this case immediately after release. It stated that a key motivation for the authors' work was that "people who die following state detention have received considerably less attention than those who die in custody" (Phillips et al., 2016, p. 9). It points out that the physical health of ex-offenders does not receive the attention that is needed, especially in terms of its potentially strong relationship with the time in prison or under police control. The study examined 3,129 offenders, previously held in custody, who died under Probation supervision within a five-year period after release. It concluded that premature death was most likely in the first eight days after release and that the principal cause of such early mortality was drug related, and that sex offenders were over-represented. The report made numerous suggestions about the injection of greater health skills within British policing and custodial services (Phillips et al., 2016).

The above research demonstrates that, amongst non-population-based samples and for categories of persons that include abusers of substances, mental health sufferers and offenders, a significant body of evidence does exist. However, these results are not be representative of all offender types in the population. Examinations of general populations in respect of mortality, which also focus on non-offenders who do not contain typical offender-researched markers, such as a high prevalence of drug use and mental health histories, are sparse. Such general population studies will be reviewed in the following section.

**Population samples**

In a 1995 study in Sweden, Stattin and Romelsjo (1995) found that, in a follow-up of 7,757 males from 18 to 33 years of age, the rate of death amongst offenders was 3% - more than double the 1.3% death rate of those not involved in criminality. The researchers stated that this disparity was partly related to the fact that some of the sample were active in substance abuse (see also Bird & Hutchinson, 2003). Also in Sweden, a direct relationship was established between the total number of convictions that individuals received and early mortality (Stenbacka & Jansson, 2014).

In Finland, a large study of over 12,000 children born in 1966, who were followed up at age 27, found that most of the deaths that occurred in the group were unnatural and, once more,

that criminality and personality disorders were risk indicators (Rasanen, Tiihonen, Isohanni, Moring & Koiranen, 1998).

Recent British research under consideration has looked to use the CSDD sample. The main aim of this article was to provide an examination of a community population in respect of mortality, which also focus on non-offenders who do not contain typical offender-researched markers, such as a high prevalence of drug use and mental health histories. This study compared early mortality with a range of criminal career features: not just prevalence (offenders versus non-offenders), but also the number of offences, the age of onset, the duration of criminal careers and types of offenders, including chronic offenders and life-course-persistent offenders.

Within this unpublished CSDD study, the average age of death was 49.84. As would be expected, the causes of death were quite variable; 36 of the 54 deaths were considered to be from natural causes. The most common of these causes were serious health problems (haemorrhage, pneumonia, pulmonary embolism), types of cancer (throat, pancreas, bone, oesophageal), blood diseases (Septicaemia) and heart attacks or strokes. One male died from Multiple Sclerosis, and another from Motor Neurone Disease. Fifteen of the 54 deaths were considered "unnatural", including five accidents, three suicides, two drug overdoses, four alcoholic liver disease, and one death while trying to escape from a penal institution. Of the 36 males whose deaths were considered "natural", 18 were convicted, compared with 9 of the 15 males whose deaths were considered "unnatural". In the other three cases, all of whom were convicted, the cause of death was not known.

This unpublished CSDD study found that of 54 early deaths, 55.6% (30) were convicted males. For non-early deaths, only 43.1% (143) were convicted males. This means that within the CSDD, convicted males tended to die significantly earlier than non-convicted males (*OR*= 1.652, *p*= .04, *d*= .307). Similarly, the early deaths included significantly more recidivists, chronic offenders, early onset offenders and incarcerated offenders, almost significantly more adolescence-limited offenders, but not significantly more one-time or life-course-persistent offenders. Effect sizes were highest for chronic and incarcerated offenders, and lowest for life-course-persistent offenders.

Males who died early also had more convictions on average than the males who did not die early (7.10 compared with 4.97; $F$= 1.098, $p$= .18, $d$= .210). Earlier death males had an earlier age of the first offence, an earlier age of the last offence, and a longer criminal career duration than Non-Early Death males, but none of these effects was statistically significant. However, incarcerated Early Death males spent much more time incarcerated than incarcerated Non-Early Death males (57.13 months compared with 8.78 months). Once time at risk was taken into account, Early Death males had significantly more offences, a longer average criminal career duration, and more time incarcerated.

This study will also show that males with a conviction had a significantly lower mean age of death than those without a conviction. One-time offenders, early onset offenders and adolescence-limited offenders were also significantly likely to have a lower mean age of death. However, possibly because of small numbers, the remaining comparisons were not statistically significant. The largest effect sizes were for convicted and adolescence-limited offenders, while the smallest effect sizes were for recidivists and life-course-persistent offenders.

In summary, the results show that convicted offenders, early onset offenders, recidivists and chronic offenders tended to die early, but there were relatively weak relationships between early death and life-course-persistent offenders and criminal career duration. Unfortunately, due to limited numbers, suicide as a cause of death could not be investigated further. These findings highlight the need to account for time at risk of offending in future studies of the early mortality of offenders.

These finding are reflected within a the recent ONS report (2020), which found that in 2019/20, within all types of community offenders (court order supervision, post release supervision), there were 865 male deaths, accounting for 86% of all deaths, with 34% self- inflicted and 32% due to natural causes. There were 137 female deaths in 2019/20, accounting for 14% of all deaths. The main cause of female deaths in 2019/20 was self-inflicted (37%), followed by deaths from natural causes (34%). At the time of death, 36% of males were aged 36-49, compared to 49% for females in 2019/20. 21% of males and 24% of females were aged 50-65. Males were more likely than females to be in the youngest and oldest age groups, with 8% of males aged 18-24 (compared with 4% of females) and 10% of males aged over 65 (compared with 1% of females).

Also in Britain, Phillips and colleagues (Phillips et al., 2018, p. 162) state that most "non-natural deaths that occur after a period of prison custody have been subject to considerably less research than similar deaths in custody." They go on to cite several pieces of research linked to the immediate period after offenders had been released from custody. These include a study in Australia (Graham, 2003) which argued that newly liberated offenders can suffer 10 times the rate of premature morality than the general population, and also research in America that showed an increased rate of early death: 2.08 times higher for white ex-prisoners (Rosen et al., 2008). The causes of such early deaths have been linked to drug use and also self-harm, with a systematic review in Britain demonstrating that self-harm culminated in a suicide rate of 6.76 times the general population (Jones & Maynard, 2013). This result has been replicated in America, where increased risks have similarly been related to factors such as drugs, suicide and homicide (Zlodre & Fazel, 2012).

In summary, from this literature review of the mortality and offending literature, it can be seen that longitudinal investigations of associations between offending and mortality in non-prison, non-correctional and non-forensic psychiatric samples, are rare (Jackson & Vaughn, 2018). There is therefore an opportunity to utilise global search strategies, across all time periods, to conduct a meta-analysis investigating this important and under-research relationship.

## Current Study

Work on mortality rates has focused largely on three main offender groups: forensic psychiatric patients (Fazel, Wolf, Palm, & Lichtenstein, 2014; Fazel, et al., 2016a; Fazel, Wolf, Fimińska & Larsson, 2016b), prison populations (Fazel & Benning, 2006), and ex-prisoners (Zlodre & Fazel, 2012). All these categories have significantly high rates of premature mortality, as the above literature review emphasises.

However, prior studies often perform comparisons with other types of offenders and do not sufficiently control for the effect mental illnesses may have on their findings. For example, mortality rates among discharged forensic patients are high in both absolute and relative terms, with the crude death rate (*CDR*) for all-cause mortality at 1538 per 100,000 patient-years (Fazel et al. 2016b). This compares with a rate of 850 in a recent review of all released prisoner studies (Zlodre & Fazel, 2012). However, the mortality rate of forensic patients is similar to that of patients with schizophrenia-spectrum disorder (*CDR* = 1417) (Chesney, Goodwin & Fazel,

2014), which "…suggests that it is the mental illness component of being in secure care, rather than anything specific to the forensic setting, that contributes to the increased mortality risk" (Fazel et al., 2016a, p. 21).

Further, prison populations are typically drawn from socioeconomically deprived backgrounds, with reduced access to health care and health-seeking behaviour when living in the community (WHO, 2014). Therefore, prison samples, or indeed other offender group comparisons, do not allow us to appreciate the real effect of offending behaviour on the health and mortality rate on individuals, compared to non-offenders within their communities who are exposed to the same risk factors, and to the general population at large.

Unlike the death of prisoners and those with histories of psychiatric illness, the death of community offenders has been largely neglected (Sattar, 2001). From the limited research that has been undertaken on deaths of community offenders from England (Sattar, 2001), Australia (Biles et al., 1999) and Finland (Joukamaa, 1998), it can be seen that community offenders also have extremely high mortality rates, ranging from double that of prisoner and local community rates, up to four times that of the general population.

This thesis chapter is therefore the first to meta-analytically investigate premature mortality in community offenders. It also seeks to identify the effect of offending and antisocial behaviour on premature mortality. It will explore three types of studies of community offenders: Non-offender based longitudinal community studies, offender based longitudinal studies which utilize whole populations as control groups, and recently released prison samples compared with the general population. These studies permit the exploration of mortality in offenders without mental health issues, where possible, to assess whether incarcerated individuals benefit from improved access to care within the prison or secure forensic hospital system (Davies, Clarke, Hollin & Duggan, 2007), and investigate how their lifestyles compare with those of individuals who have not offended in their community, and with those in the population at large.

Based upon previous research, it would be expected that community offenders would have a lower risk of premature mortality than incarcerated samples for two reasons: they do not have records of mental health problems which have been robustly linked to premature mortality, and

they tend to have committed less serious and frequent crimes. We do expect, however, that underreporting of mental illness and a reluctance of offenders to interact with the care system to impact upon mortality rates in a way that has not previously been explored (Phillips et al., 2017a; Phillips et al., 2016).

## Method

6 computer-based literature indexes were searched using a TITLE-ABSTRACT-KEYWORD strategy within Web of Science (including SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC) Australian Criminology Database, Criminal Justice Abstracts, Google Scholar, PsychInfo, and MEDLINE through all years with no language restrictions. In all databases, the same keywords were used in multiple combinations: early death OR premature mortality OR death AND offend* OR crim* OR delinquent* OR violence prison* OR incarce* OR felon*OR detain* OR jail* OR penal* OR custod* AND longitudinal OR retrospective OR prospective OR quantitative NOT Qualitative NOT cross-sectional.

Within Google Scholar the *WHO CITED* function was used on 5 key papers we had previously identified: Laub and Vaillant (2000), Laub and Sampson (2003), Piquero et al. (2014), Robins and O'Neal (1958) and Sherman and Harris (2013). 30 journals were hand searched, which are presented in Table 1. Research papers were sought on early death/premature mortality among offenders based on both prospective longitudinal studies and retrospective longitudinal studies (i.e. studies that define samples retrospectively in order to compare deaths among offenders and non-offenders). All longitudinal studies were included which reported premature mortality or early death among offenders, including those recently released from prison and those on parole or probation. Not included were Secure Forensic Psychiatric samples, samples where individuals had a clinical level of mental illness, or samples with a focus on substance misuse. This resulted in three groups of included studies: Non-offender based longitudinal community studies, offender based longitudinal studies which utilize whole populations as control groups, and recently released prison samples compared with the general population. Samples containing forensic psychiatric inpatients were excluded.

Eligible publications obtained via database, hand, author and citation searches were exported to EndNote™ (v.7.0.2) Referencing Management Software. Duplicates were removed by this software with assisted manual discretion. All unique results were screened by the abstract for general relevance to the review aims. The reliability of coding of included papers was established using an independent coder, with high levels of agreement. Inter-coder reliability for inclusion versus exclusion was $k = 0.83$. In the case of discrepancy, the full text of the paper was screened in order to make a final decision.

Premature mortality is considered by Public Health England to apply to all deaths of individuals under the age of 75 for all causes combined and the leading causes of death (Public Health England, 2021). The rate of mortality in a general population is typically calculated per 100,000 people. However, as will be clear from the preceding literature review sections, it is difficult to know whether a period of incarceration or supervision in the community is a factor in the cause of death, and so care must be taken before attributing blame or culpability. Standardized mortality rates are difficult to calculate, and comparisons are difficult to make between institutions and between deaths in the criminal justice system and allied agencies. This is partly because prison populations and offender caseloads are dynamic, which means that mortality rates are typically calculated on a per 100,000 person-years basis in criminological studies and reports.

Within this study, due to a lack of studies following individuals up to and beyond age 75, premature mortality is considered on a comparative basis between offenders and their non-offending comparison groups. Offenders are considered to have died 'prematurely' if they die at a younger age than the non-offender comparison within each study. In order to simplify the reporting of this definition of premature mortality, Odds Ratios (*OR*) were utilised as the outcome statistic.

Outcome data was extracted and calculated *OR*s for each study, which will reveal how much more or less likely an offender is of dying before their non-offender comparisons. Hazard Ratios (*HR*) and Risk Ratios (*RR*) were converted using the following formulae:

$$RR = \frac{1 - e^{HR * ln(1-r)}}{r}$$

Where r is the death rate for the reference group (Shor, Roelfs & Vang, 2017).

$$OR = \frac{(RR - P_0 * RR)}{(1 - P_0 * RR)}$$

Where $P_0$ = baseline risk or prevalence.

The standardized mean difference (*SMD*), or Cohen's *d*, was also calculated for the main result. The following formula was used:

$$SMD = In(OR) * \frac{\sqrt{3}}{\pi}$$

Where reported, data was extracted on geographical location, age (conceptualised as 'Time at Risk'), gender, race/ethnicity and data on the causes of death, which were combined into two categories; 'Unnatural' which included suicide, homicide, injury, motor vehicle/traffic injury and alcohol/drug-related causes, and 'Organic' which included cancer, cirrhosis, HIV, respiratory disease, infectious disease, endocrine disease, and neurological disorder. These causes of mortality were combined in light of the lack of consistent reporting of these variables across studies.

Random effect models were used to account for heterogeneity of study effects. Random effects meta-analyses were performed to establish whether offenders died prematurely compared to non-offenders, and whether they died more often of organic and/or unnatural causes. Further random effects meta-analyses examined differences between genders and ethnicities. Mixed effects meta-analyses were used to investigate whether different data sources and community offender types were associated with differences in effect size. Moderator analyses were run, comparing effects in different countries. Age was used as a continuous variable to measure time at risk, and meta-regressions were performed to see whether time at risk impacted mortality and the causes of death.

The moderators used were: quality of the study measures and design, sample size, age and sex of the participants. In Table 2 the 'Risk of Bias' quality assessment is presented. Criteria for rating quality of studies were based on the Cochrane Handbook for Systematic Reviews (Higgins, Altman & Sterne, 2011), and some meta-analysis papers using quality ratings (Cipriani et al., 2016; Hughes et al., 2017; Pasricha, Hayes, Kalumba & Biggs, 2013; Van IJzendoorn et al., 2020).

Reliability of the quality assessment was established at the outset of our project using an independent coder, with high levels of agreement across all categories ($N$ = 9 studies): 'Convenience Sampling', $K$ = 1.00; 'Heterogeneous Groups', $K$ = 1.00; 'Unreliable Measures', $K$ = 1.00; 'Selective Reporting', $K$ = 0.60. Overall interrater reliability at this stage was $K$ = 0.92. Midway through the quality rating, a second round of interrater reliability checks were conducted with a third independent coder ($N$ = 15). This served the purpose of ensuring that no coder drift was present, and to establish the reliability of a new category we added ('Unrepresentative Sampling').

High levels of agreement were found across almost all categories: 'Unrepresentative Sampling', $K$ = 1.00; 'Convenience Sampling', $K$ = 0.70; 'Unreliable Measures', $K$ = 0.80; and 'Selective Reporting', $K$ = 0.73. However, for the 'Heterogeneous Group' bias reliability was too low, $K$ = 0.26, and we decided to exclude this category from analyses. The overall interrater reliability was $K$ = 0.78. Pearson's correlation coefficient was used to calculate interrater reliability of continuous study characteristics between three independent coders on 15 studies. Average reliability for sample size was $r$ = .90. Average interrater reliability for age was $r$ = .79.

Meta-regression showed that quality of the measures and design of the studies did not moderate effect sizes within developmental domains. The "trim and fill" method (Duval & Tweedie, 2000a, 2000b) and Egger's regression test to explore potential publication bias also did not show large bias.

## Results

The flow diagram in Figure 1 shows that 36 studies met the inclusion criteria ($N$ = 1,116,614), and these are described in Table 3. Papers which were given substantial consideration, but were ultimately excluded, are described in Table 4. (Please see Table 2 in the Supplementary Material for excluded papers). Table 5 shows the *OR* for each study used within our analyses.

### Premature Mortality in Community Offenders

Offenders were significantly more likely to die prematurely compared to non-offenders, *OR* = 3.42 (95% CI 2.29, 5.12), *K = 36, Z* = 5.99, $p < 0.001$, with 61.8% of offenders dying prematurely compared to non-offenders, $d = 0.30$, $U_3 = 61.8\%$. Time at risk did not, however, have any significant relationship with premature mortality, $\beta = -0.01$, *SE* = 0.01 (95% CI -0.03, 0.01), $Z = -1.57$, $p = 0.12$ (See Figure 2).

In all nine different countries which were represented by this meta-analysis it was found that offenders die prematurely compared to non-offenders, with Australia having the largest effect sizes (see Table 6). Community comparisons provided the lowest level of increased likelihood of premature mortality, *OR* = 2.38 (95% CI 1.79, 3.17), *K* = 11, *Z* = 5.96, $p < 0.01$, followed by studies which used population level comparison groups (PLCG), *OR* = 2.83 (95% CI 2.00, 4.00), *K* = 9, *Z* = 5.87, $p < 0.01$, and then ex-prison samples, *OR* = 4.51 (95% CI 2.42, 8.38), *K* = 17, *Z* = 4.75, $p < 0.01$. There were also stark gender differences, with females at greater odds of premature mortality than males, respectively: *OR* = 8.58 (95% CI 4.27, 17.22), *K* = 15, *Z* = 6.04, $p < 0.01$; *OR* = 3.32 (95% CI 2.03, 5.44), *K* = 18, *Z* = 4.78, $p < 0.01$. There were also differences in the likelihood of offenders dying in relation to their race or ethnicity, and gender differences between races (see Table 7).

### Causes of Premature Mortality in Community Offenders

Compared with non-offenders, offenders were more likely to die from Organic causes, *OR* = 2.06 (95% CI 1.50, 2.83), *K* = 18, *Z* = 4.47, $p < 0.01$, and Unnatural causes, *OR* = 3.97 (95% CI 2.23, 7.07), *K* = 26, *Z* = 4.68, $p < 0.01$. Interestingly, when considering Organic causes of death, a meta-regression showed that time at risk was non-significant, $\beta = -0.01$, SE = 0.02, (95% CI -0.05, 0.03), Z = -0.46, $p = 0.64$ (see Figure 3). The greater likelihood of dying from

Organic causes did not increase with age. This was also the case for Unnatural causes of death, β = -0.01, SE = 0.01 (95% CI -0.02, 0.02), Z = -0.10, $p = 0.92$ (see Figure 4).

There were also gender differences, with females having a higher likelihood of premature mortality than males for Organic causes of mortality, respectively: $OR = 3.33$ (95% CI 2.34 4.72), $K = 5$, $Z = 6.72$, $p < 0.01$; $OR = 2.47$ (95% CI 1.82, 3.36), $K = 6$, $Z = 5.77$, $p < 0.01$, and Unnatural causes, respectively: $OR = 6.46$ (95% CI 2.35, 17.70), $K = 11$, $Z = 3.62$, $p < 0.01$; $OR = 3.26$ (95% CI 1.52, 7.00), $K = 10$, $Z = 3.03$, $p = 0.01$.

When considering Organic causes of premature mortality, there was little difference between the types of offenders and types of control groups. There were large differences, however, when considering Unnatural causes of death between types of offenders and types of control group (see Table 8). Finland had the highest likelihood of organic illness as a cause of premature mortality, whereas for Unnatural causes of death, the UK had the highest odds (see Table 6).

There was limited data on ethnicity versus causes of premature mortality in community-based offenders. Only one paper (Stewart et al. 2004) reported on the difference between White and Aboriginal ethnicities. From this individual sample, white offenders had greater chances of premature mortality from Unnatural causes, $OR = 6.82$ (95% CI 6.44, 7.23), $K = 1$, $Z = 64.96$, $p < 0.01$, compared with Australian aboriginal offenders, $OR = 2.55$ (95% CI 2.34, 2.78), $K = 1$, $Z = 21.29$, $p < 0.01$. There was also a significant difference in the odds of white female offenders dying prematurely from Organic illness, $OR = 9.70$ (95% CI 6.93, 13.56), $K = 1$, $Z = 13.27$, $p < 0.01$, compared with Aboriginal female offenders, $OR = 2.20$ (95% CI 1.61, 3.00), $K = 1$, $Z = 4.99$, $p < 0.01$.

## Discussion

The present Chapter builds on the limited literature that has examined the premature mortality of offenders who are not serving custodial sentences and who do not suffer from reported psychiatric illness. As was the case with physical health in Chapter 2, it appears that offenders in the community can again be classified as a vulnerable group in terms of their increased

likelihood of premature mortality. The results highlight that offending significantly increases the odds of premature mortality compared to the non-offender comparison group.

This study found that community offenders were more likely to die prematurely by unnatural causes (which includes suicide), but that they were also twice as likely to die from organic illness, compared with non-offenders. The results within this meta-analysis suggest that the rates of premature mortality previously found in offenders do not just reflect the of impact mental illness on these individuals, in light of the high incidence of mental illness found in offenders in general, but rather that offending as a risk factor *in itself* might have a significant physiological impact on the body (Kort-Butler, 2017; Slocum, 2010; McLeod et al., 2012).

It may also further highlight a previous lack of clarity in some studies as to whether the effect of prison on health is always negative - in some studies physical issues such as heart disease are hypothesized to result from incarceration, and yet that environment can also provide a secure environment in which health needs are promptly addressed (Bacak & Karim, 2018; Massoglia, 2008a, 2008b; Wildeman & Muller, 2012).

Furthermore, in contrast to Sattar (2001), Biles et al. (1999) and Liebling (1992), who reported that offenders in their late 20s and early 30s were at particularly high risk of death, we found that offenders were more likely to die prematurely compared to their non-offender comparisons at all durations of being at risk, from both natural and unnatural causes of death. This may reflect the effect of their antisocial lifestyle in terms of violent ends, but also the effect of offending on their physical and mental health (Elonheimo, Sillanmaki & Sourander, 2017). Additionally, the systematic review results within this chapter are in contrast to previous findings in relation to work on ex-prisoners. For example, Semenza and Link (2019) found that over time after leaving incarcerated settings, events make life "…less subjectively stressful, stigmatizing, or influential on aspects of health and resultantly have a reduced impact on that person's mental wellbeing and depressive symptoms" (p. 6). However, they themselves conclude by saying that there may be large differences of health needs within the released population (Semenza & Link, 2019).

This study provides some predictive information, but more information about causal paths from offending to poor health outcomes is still needed. Intervention studies using designs that

successfully adapt the traditional randomized controlled trial structure are necessary to clarify these results. Unfortunately, it was not possible to separate the causes of deaths further; traffic accidents and drug/alcohol abuse are widely reported as issues following release from prison, and as major causes of mortality in offender samples, but we could not study them in our analyses. Moreover, although rigorous attempts were made to exclude all reported indications of mental illness, studies often only defined an individual as having a mental health condition at a threshold of clinical diagnosis or psychiatric hospitalization. This means that anyone below these severe sub-clinical thresholds of mental illness were not excluded or differentiated within these analyses.

The present research was also based on the assumption that ex-prisoners and community offenders were similar in terms of socio-demographic and criminal history factors. We could not further differentiate between the severity of crimes committed or how prolific particular offenders may have been. Access to Offender Index data would have been helpful to make more nuanced comparisons between offenders. If it were possible to study and characterize individuals by their criminal career durations into trajectories within studies, it may have been possible to more effectively investigate how time at risk effects the morality of offenders. Investigating criminal career durations within developmental trajectories has been found to significantly impact results. For example, Trumbetta and colleagues (Trumbetta, Seltzer, Gottesman & McIntyre, 2010) found that mortality risk during a lifetime can be related to a criminal career, but only when using a 'group-based trajectory' modelling approach. When convictions were measured as binary, there was no relationship between participants with youth and adult convictions, compared to those who had no criminal history. It is important for the context of interpreting these results since, unlike other public health or medical papers investigating mortality, one cannot directly compare the rate of mortality of community offenders with the rate of mortality of non-offenders in this study. Due to the fact the *OR*s are not standardized, as rates of mortality per 100,000 persons or person-years are, you also cannot directly compare the findings of this meta-analysis with work elsewhere. It is possible, however, unlike with standardized mortality ratios, comment on the comparative likelihood, in the form of odds ratios, that community offenders will die younger than non-offenders. Again, both of the considerations within this paragraph highlight the important considerations that need to be given to the nature of the data being collected, reported, and interpreted in this health criminology field and highlights the importance of our meta-analytic approach.

It is also important to note that very different effect sizes can be generated from the same types of offenders based upon the comparison group. Our results show large differences between community comparison samples and population-based comparisons. Offenders were at greater risk of dying prematurely when compared to the general population. Differences in comparison groups are therefore likely to influence results. Furthermore, the heterogeneity in reporting of ethnicity across studies and indeed across the health criminology field similarly makes interpretation of our findings difficult (Jackson & Vaughn, 2018). These considerations should all demand attention when reviewing empirical work on the mortality of offenders, and it has significant implications for intervention strategies.

## Conclusion

A criminal career can be seen as part of a vicious cycle in which many different kinds of problems intertwine (Stattin & Magnusson, 1996). Community offenders have a heightened risk of premature death. Community offenders were more likely to die from unnatural causes and organic illnesses than their non-offender comparisons across all ages. The analyses within this Chapter therefore highlight that offending *in itself,* when investigating community-based offenders and excluding drug use/alcohol abuse and mental illness samples, may contribute to premature mortality. A particularly prevalent cause of death within this Chapter's analysis, and offender populations more broadly, is often suicide (Borschmann et al., 2020), which will be investigated in the next chapter.

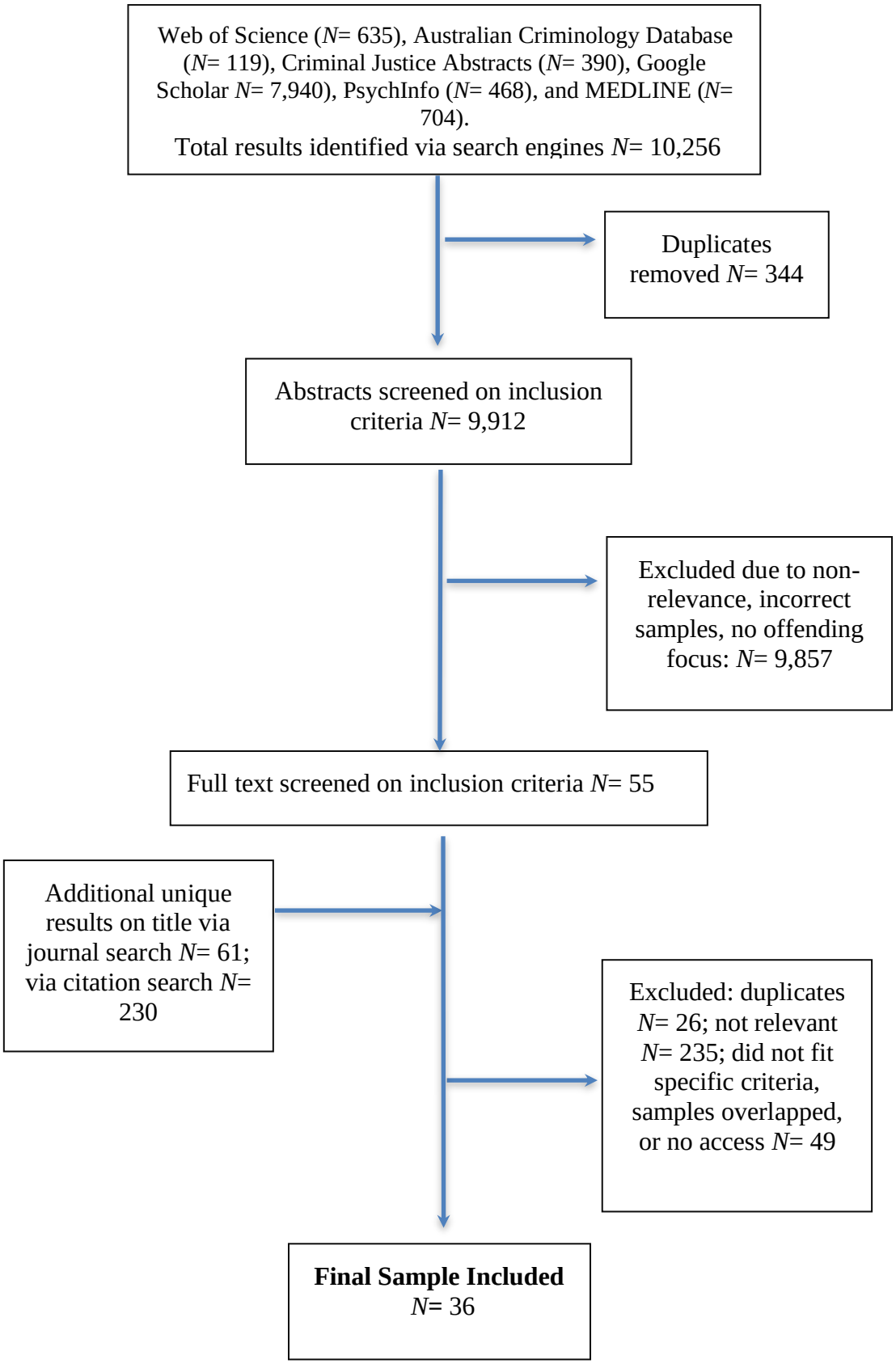


**Figure 1. PRISMA Flow Diagram of Searches.**

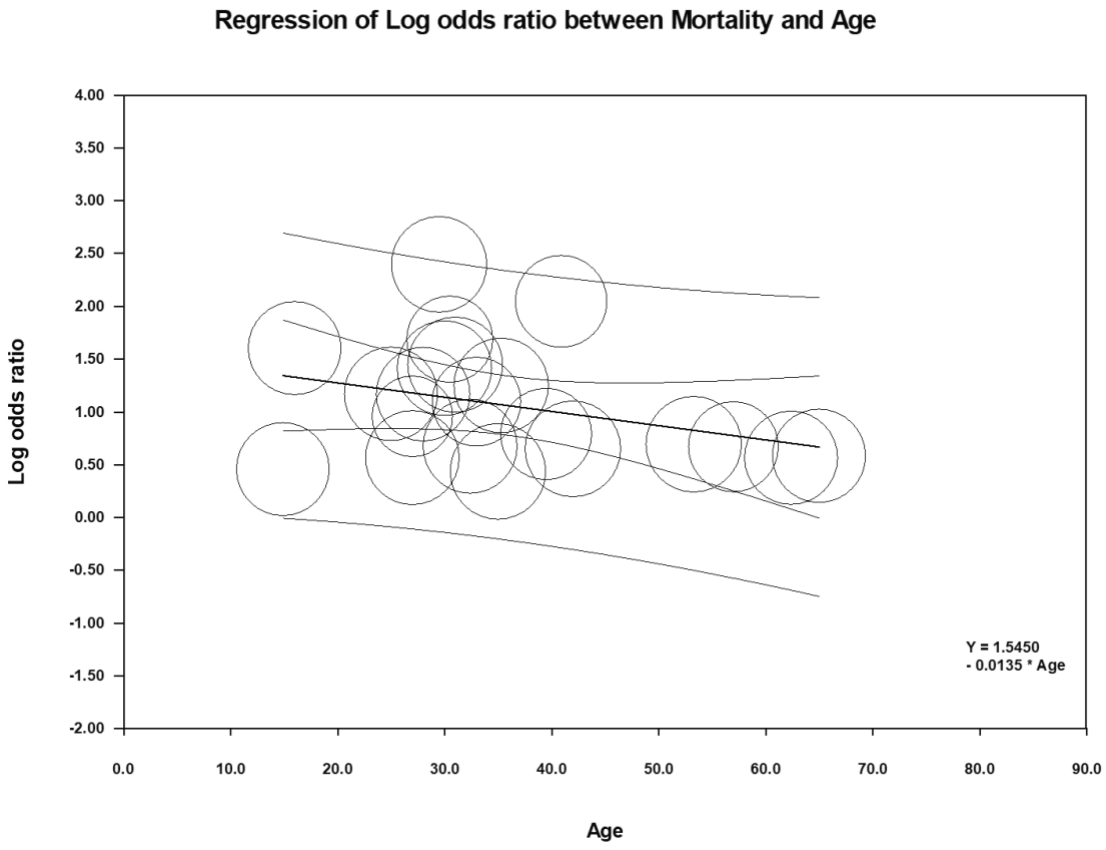


**Figure 2. Meta-Regression Between Mortality and Time at Risk.**

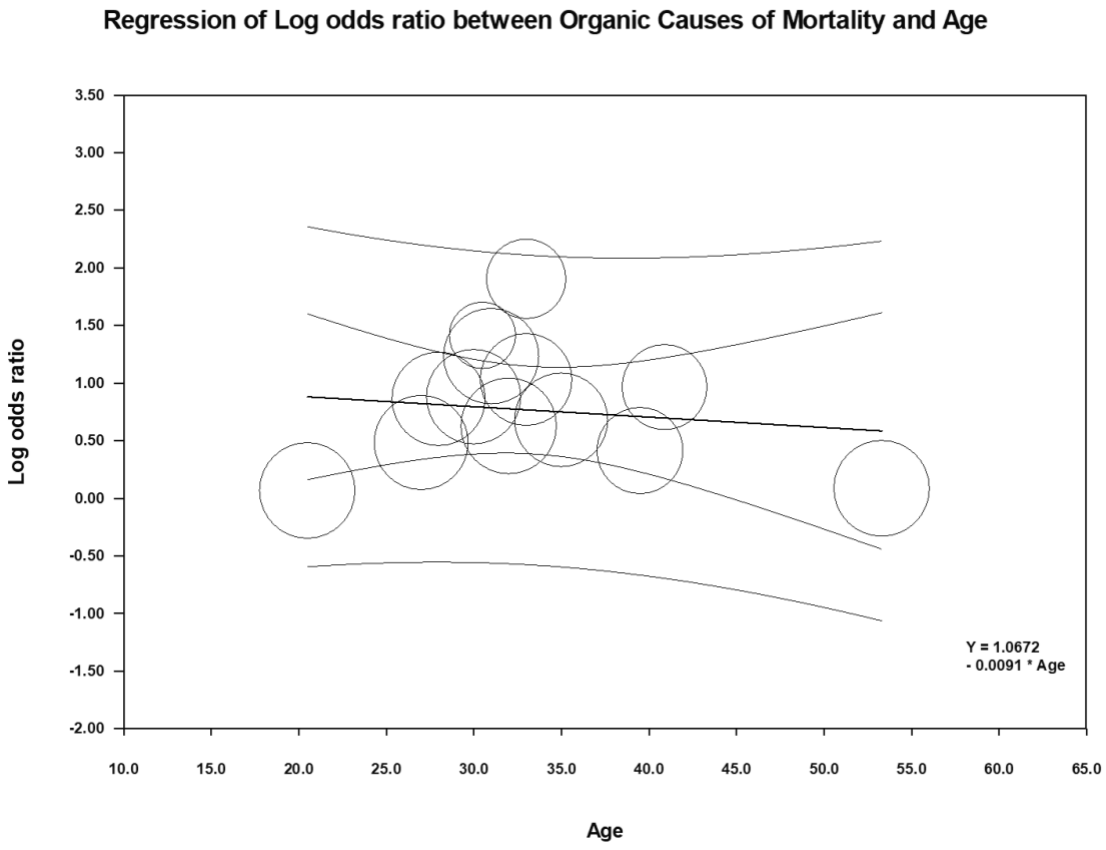


**Figure 3. Meta-Regression Between Organic Causes of Mortality and Time at Risk.**

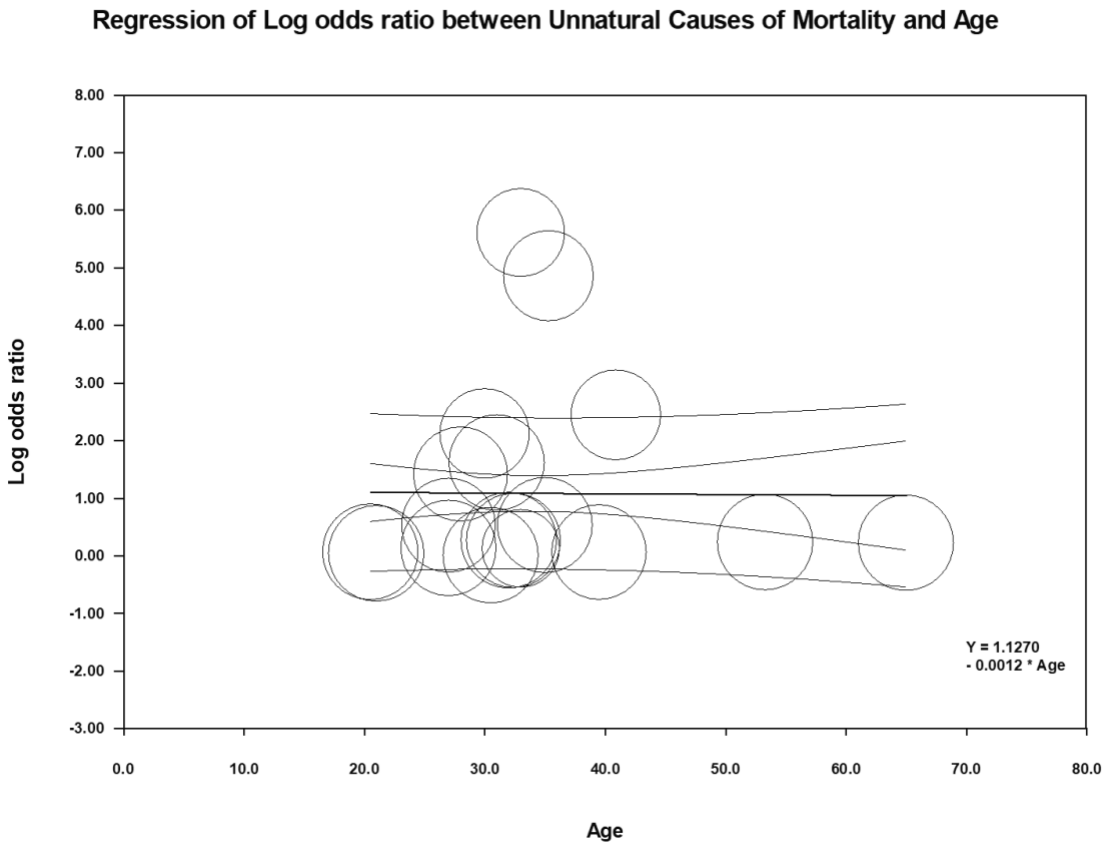


**Figure 4. Meta-Regression Between Unnatural Causes of Mortality and Time at Risk.**

**Table 1. List of Journals Searched**

| | |
|---|---|
| Aggression and Violent Behaviour | Deviant Behavior |
| Aggressive Behaviour | European Journal of Public Health |
| American Journal of Psychiatry | International Journal of Behavioral Development |
| British Journal of Clinical Psychology | Journal of the American Medical association |
| British Journal of Developmental Psychology | Journal of Child Psychology and Psychiatry |
| British Journal of Psychiatry | Journal of Experimental Criminology |
| British Medical Journal | Journal of Interpersonal Violence |
| Child Abuse & Neglect | Journal of Youth and Adolescence |
| Child Development | Justice Quarterly |
| Child Psychiatry and Human Development | Psychology, Crime, and Law |
| Clinical Psychology Review | Scandinavian Journal of Psychology |
| Criminal Justice and Behaviour | Swiss Journal of Psychology |
| Crisis – The journal of Crisis Intervention and Suicide Prevention | Trauma, Violence and Abuse |
| Developmental Psychology | Victims and Offenders |
| Developmental and Psychopathology | Violence and Victims |

**Table 2. Risk of Bias Quality Coding Table**

| Type of Bias | Description | Relevant Domains within our 'Risk of Bias' assessment |
|---|---|---|
| Selection Bias<br><br>Convenience sampling yes/no | Systematic differences between baseline characteristics of the groups that are compared. | E.g. convenience samples; random-sample; whole-population approach; self-reports; control groups; sample size – continuous variable |
| Performance Bias<br><br>Heterogeneous groups yes/no | Systematic differences between groups in terms of (assessment of) moderators, mediators and confounding exposures. | E.g. combination of different group sizes or different types of care in one effect size. |
| Attrition Bias<br><br>Systematic drop out differences (no intent to treat) yes/no | Systematic differences between groups in withdrawals from a study. | E.g., drop outs in longitudinal studies; refusal to take part in the study. |
| Detection Bias<br><br>Reliability of measures yes/no | Systematic differences between groups in terms of assessment of outcome measures. | E.g., reliability and validity of established measures used. |
| Reporting Bias<br><br>Selective reporting yes/no | Potentially systematic differences in effect sizes between reported and unreported findings. | E.g., selective reporting of outcomes (one subscale of an instrument); publication bias. |

*Note*. Quality assessment scoring: 1=bias absent; 0=bias reported or inferred. This assessment for the quality of studies was based upon the Cochrane Handbook for Systematic Reviews, and previously described methods within meta-analyses published in the Lancet.

**Table 3. Description of Studies Included in Meta-Analysis for Premature Mortality in Community Offenders (*N* = 36)[7]**

| Authors, Date, N | Description | Method |
|---|---|---|
| Aalsma et al. (2016), *N* = 49,470 | This study aimed to determine how early mortality among youth offenders varies based on race, gender, and the continuum of justice system involvement (arrest, detention, incarceration, and transfer to adult courts). | Criminal and death records of 49,479 youth offenders (ages 10-18 years at first arrest) in Marion County, Indiana, from January 1, 1999, to December 31, 2011, were examined. Statistical analyses were completed in November 2014. In order to compare the mortality rate of youth offenders to that of the general population, the total number of deaths by year, race, gender, and U.S. Census age category (10–14, 15–19, 20–24, and 25–29 years) were retrieved from Marion County Public Health Department data. As in previous work on mortality,23 youth offender deaths were subtracted from total community youth deaths. Data describing deaths of youth in the community by year, race, gender, and age category are available upon request. |
| Binswanger et al. (2007), *N* = 30,237 | This study investigated the risk of death among former inmates soon after their release from Washington State prisons. | The authors of this paper conducted a retrospective cohort study of all inmates released from the Washington State Department of Corrections from July 1999 through December 2003. Prison records were linked to the National Death Index. Data for comparison with Washington State residents were obtained from the Wide-ranging Online Data for Epidemiologic Research system of the Centers for Disease Control and Prevention. Mortality among former inmates were compared with those among other state residents with the use of indirect standardization and adjustment for age, sex, and race. |
| Coffey et al. (2003), *N* = 2,849 | The authors estimated the overall and cause specific standardised mortality ratios in young offenders. | Comparison of mortality data in a cohort of young offenders was conducted. The cohort consisted of young offenders aged 10-20 years with a first custodial sentence from 1 January 1988 to 31 December 1999. Deaths were ascertained by matching with the national death index, a database containing records of all deaths in Australia since 1980. Death rates in the reference Victorian population were used to calculate standardised mortality ratios. |

[7]This search was completed at the end of 2018. Any papers published after this date were not included in the meta-analysis, despite their relevance. Study Descriptions are verbatim in places.

| | | |
|---|---|---|
| Dirkzwager et al. (2011), *N* = 2,297 | The authors examined the effects of first-time imprisonment on post-prison mortality. | Data were used from a longitudinal study examining criminal behaviour and mortality over a 25-year period in a representative group of 2,297 Dutch offenders who had their criminal case adjudicated in 1977. Of these offenders, 597 were imprisoned for the first-time in their lives in 1977. The remaining 1,700 offenders got a noncustodial sentence. Ex-prisoners' mortality rates and causes of death are compared with those in the general population and those in a matched control group of non-imprisoned offenders. Propensity score matching is used to minimize selection bias. Odds ratios with 95% confidence intervals are used to examine whether mortality among the ex-prisoners differ significantly from the general population or from the non-imprisoned controls. |
| Elonheimo et al. (2017), *N* = 5,405 | The aim of this paper was to study the associations between investigated offending, death and causes of death in a nationally representative birth cohort. | A broad concept of offending was used such that people who had had any contact with the police because they had been suspected of crime were included. Offending data were obtained from the National Police Register for 5405 men and women born in Finland in 1981, spanning their ages 15–30 years; mortality data were received from Statistics Finland. Offending was classified into four categories by frequency: none, 1–4 different offence contacts, 5–27 and 28 or more. Causes of death were categorised into natural, accidents, suicide or homicide. Of the cohort, 2304 (43%) had offended and 57 (1.1%) had died. Associations between offending, mortality and causes of death were analysed, controlling for parental education level and family structure in childhood. |
| Farrell & Marsden (2007), *N* = 44,771 | The authors investigated drug-related deaths among newly released prisoners in England and Wales. | They used a national sample of male and female sentenced prisoners released during 1998– 2000 with all recorded deaths included to November 2003 to calculate mortality rates. |
| Graham (2003), *N* = 25,469 | This study examined the extent and nature of unnatural death among people who were released from Victorian prisons between January 1990 and December 1999. | A total of 820 men and women released during that period were identified as having died unnatural deaths while not imprisoned prior to July 2000. |
| Hobbs et al. (2006), *N* = 13,667 | This was a systematic study of general health problems in released prisoners. | They used the Western Australian Data Linkage System (WADLS) that enables data from statistical health collections, including hospital admissions, mental health services and deaths, to be linked to other administrative records. The study cohort |

| | | |
|---|---|---|
| | | consisted of 13,667 persons released from prisons in Western Australia in the six years 1995–2001 inclusive. Subjects were followed for a minimum period of two years, to the end of 2003. The average time of follow-up in the community, excluding further spells in prison, was 4.61 years. Ex-prisoners had substantially higher risks of death than the general population after adjustment for age. In those aged 20–39 years, mortality rates per 1,000 person-years were 4.5 in Indigenous female prisoners, 7.0 in non-Indigenous female prisoners, 7.9 in Indigenous male prisoners and 4.8 in non-Indigenous male prisoners. Compared with the corresponding group in the general population the relative risk of death (based on rate ratios) were 3.1 in Indigenous female prisoners, 14.0 in non-Indigenous female prisoners, 1.8 in Indigenous male prisoners and 4.0 in non-Indigenous male prisoners. These differences were particularly marked in those under 30 years of age. |
| Joukamaa (1998), *N* = 903 | This study aimed to compare the mortality of released prisoners and the general population. Method - the study forms a part of the Health Survey of Finnish Prisoners (the WATTU Project). | A sample (*N* = 5903), representing all Finnish male prisoners, underwent a thorough health survey in 1985. A 7-year follow-up study was performed by means of gathering register data (deaths, hospital care, diseases leading to working incapacity). A population-based age-selected control group was formed for comparison. |
| Kinner et al. (2011), *N* (Western Australia) = 16, 162; *N* (NSW) = 82,650 | The authors estimated the number of deaths among people released from prison in Australia in the 2007–08 financial year, within 4 weeks and 1 year of release. | Application of crude mortality rates for ex-prisoners (obtained from two independent, state-based record-linkage studies [New South Wales and Western Australia]) to a national estimate of the number and characteristics of people released from prison in 2007–08. The main outcome measure was the estimated number of deaths among adults released from Australian prisons in 2007–08, within 4 weeks and 1 year of release, classified by age, sex, Indigenous status and cause of death. |
| Laub, & Vaillant (2000), *N* = 931 | The present study examined if the increased mortality of delinquent subjects continues until age 65 years and, if so, why. | The authors followed 475 delinquent and 456 matched nondelinquent comparison boys from age 14 years until age 65 years. Thirteen percent (*N* = 62) of the delinquent and only 6% (*N* = 28) of the nondelinquent subjects died unnatural deaths. By age 65 years, 29% (*N* = 139) of the delinquent and 21% (*N* = 95) of |

| | | |
|---|---|---|
| | | the nondelinquent subjects had died from natural causes. In a univariate analysis, frequency of delinquency, abuse of alcohol, adult crime, dysfunctional home environment, and poor education were significantly related to death, especially to unnatural death. However, when delinquency and alcohol abuse were controlled by logistic regression, education, dysfunctional upbringing, and adult criminality made no further contributions to mortality. |
| Lindberg et al. (2017), *N* = 606 | The primary aim of this national register-based follow-up study was to investigate the mortality rate of Finnish delinquents who underwent a forensic psychiatric examination between 1980 and 2010. As delinquency is not a solid entity, the paper further aimed to compare the risk of premature death among different subgroups of the delinquents: violent versus non-violent offenders, offenders with alcohol use disorders versus those with no such diagnoses, offenders with schizophrenia spectrum disorders versus conduct-and personality-disordered offenders, under-aged versus young adult offenders, and, finally, boys versus girls. | The authors collected the forensic psychiatric examination reports of all 15- to 19-year-old offenders who were born in Finland and had undergone the examination between 1.1.1980 and 31.12.2010 (n = 606) from the archives of the National Institute of Health and Welfare and retrospectively reviewed them. For each delinquent, four age-, gender- and place of birth-matched controls were randomly selected from the Central Population Register (n = 2424). The delinquents and their controls were followed until the end of 2015. The median follow-up time was 23.9 years (interquartile range 15.3-29.5). They obtained the mortality data from the causes of death register. Deaths attributable to a disease or an occupational disease were considered natural, and those attributable to an accident, suicide or homicide were considered unnatural. |
| Lindqvist et al. (2007), *N* = 153 | The authors of this paper aimed to examine whether the mortality rate, as well as cause and manner of death, of homicide offenders is different from the general population. | An incidence cohort of Swedish homicide offenders from 1970 to 1980 (n = 153) was re-examined by computerized record linkage with the National Cause-of-Death Register for the period between trial and 1 October 2002, i.e. 22-32 years after the offence. Death certificates were analysed, and standard procedures for calculating Standard Mortality Rate (SMR) and survival analysis were employed. |
| Lize et al. (2015), *N* = 476 | This study investigated the risk of violent death, specifically homicide and suicide. | Data on inmates released from the North Carolina Division of Adult Corrections (*N* = 476) matched to the Violent Death Reporting System are analysed to estimate rates and demographic and criminal justice-related predictors. |
| Nieuwbeerta & Piquero (2008), *N* = 4,615 | This article examined the relationship between criminal conduct and mortality rates in the Netherlands using data from the Criminal Careers and Life Course Study. | This article traced the life course and criminal careers of 4,615 males and females convicted in 1977 up until 2002. The causes of |

| | | |
|---|---|---|
| | | deaths that occurred during this 25-year period are examined using data from the Netherlands Statistics service. |
| Piquero et al. (2014), *N* = 411 | This paper examined the risk of early death among 411 South London males in the Cambridge Study in Delinquent Development followed into their late 50s. | Attention is paid not only to differential risk of death between non-offenders and offenders, but also to the risk within the population of offenders and through consideration of theoretical frameworks and associated predictor variables. |
| Pratt et al. (2006), *N* = 244,988 | This study investigated suicide after the release from prison. | The authors undertook a population-based cohort study to investigate suicide rates in recently released prisoners in England and Wales. |
| Pridemore (2014), *N* = 1,750 | This study examined the risk of male premature mortality associated with incarceration. | Data came from the Izhevsk (Russia) Family Study, a large-scale population-based case-control design. Cases (n = 1,750) were male deaths aged 25 to 54 in Izhevsk between October 2003 and October 2005. Controls (n = 1,750) were selected at random from a city population register. The key independent variable was lifetime prevalence of incarceration. They used logistic regression to estimate mortality odds ratios, controlling for age, hazardous drinking, smoking status, marital status, and education. |
| Putkonen et al. (2001), *N* = 132 | The aim in this paper was to examine the mortality of homicidal women in Finland using representative nation-wide material. | The data consisted of all 132 women who underwent forensic psychiatric examinations after committing homicide or attempted homicide in 1982-1992. They analysed the rate and cause of death during follow-up using standardised mortality ratios (SMRs) and the official classification of death. |
| Ramchand, Morral & Becker (2009), *N* = 449 | The authors examined important life outcomes for adolescent offenders to describe how they were faring in young adulthood. | They assessed 449 adolescent offenders (aged 13–17 years) in Los Angeles, CA, whose cases had been adjudicated by the Los Angeles Superior Court and who had been referred to group homes between February 1999 and May 2000. They used the Global Appraisal of Individual Needs to interview respondents at baseline and at 3, 6, 12, 72, and 87 months after baseline. A total of 395 respondents (88%) were interviewed or confirmed as dead at the final interview. |
| Rasanen et al. (1998), *N* = 12,058 | This study investigated mortality, criminality and mental illness among young adults were studied in an unselected birth cohort of *N* = 12,058 children born live in Northern Finland during 1966. | The cohort members were followed up to the age of 27 years. The odds ratios for violent offenses and recidivism were calculated for each diagnostic group. Men who abused alcohol and were diagnosed with schizophrenia were 25.2 (95% confidence interval (CI) 6.1-97.5) times more likely to commit violent crimes than |

| | | |
|---|---|---|
| | | mentally healthy men. The risk for nonalcoholic patients with schizophrenia was 3.6 (95% CI 0.9-12.3) and for other psychoses, 7.7 (95% CI 2.2-23.9). None of the patients with schizophrenia who did not abuse alcohol were recidivists (>2 offenses), but the risk for committing more crimes among alcoholic subjects with schizophrenia was 9.5-fold (95% CI 2.7-30.0). |
| Repo-Tiihonen et al. (2001), *N* = 250 | The aim of this study was to investigate the mortality and causes of death of criminal offenders having antisocial personality disorder (ASPD) over a wide range of age groups, relative to the general population. | The death rates of 250 Finnish men with ASPD were compared with those of the general Finnish male population. |
| Robins & O'Neil (1958), *N* = 524 | These authors studied the occurrence of deviant social behaviour in adults with a history of childhood behavioural problems. The rate of occurrence of various expressions of social deviance, including not only criminal behaviour, but also failure to achieve satisfactory employment status, transiency, alcoholism, mental illness, unstable marital relations, inadequacy as parents, and social isolation, was investigated and contrasted with the rate of occurrence of these phenomena among a control group of adults without serious childhood behaviour problems. | The subjects of the study are a consecutive series of 524 persons seen as children at the St. Louis Municipal Psychiatric Clinic between 1924 and 1929. The patient group was compared with a control group, 100 subjects selected from the St. Louis Public School records, located, interviewed, and checked through the public records in the same manner as the patient group, to discover to what extent childhood behaviour problems are associated with an adult adjustment different from that found in a group without serious behaviour problems in childhood. |
| Rosen et al. (2008), *N* = 168,001 | The authors compared mortality of ex-prisoners and other state residents to identify unmet health care needs among former prisoners. | They linked North Carolina prison records with state death records for 1980 to 2005 to estimate the number of overall and cause-specific deaths among male ex-prisoners aged 20 to 69 years and used standardized mortality ratios (SMRs) to compare these observed deaths with the number of expected deaths had they experienced the same age-, race-, and cause-specific death rates as other state residents. |
| Sailas et al. (2005), *N* = 3,832 | This study investigated the nationwide mortality in Finland of young offenders sentenced to prison, with the advantage of a long-term follow-up in an unselected population. In addition, the authors aimed to clarify the relationship between psychiatric disorders requiring hospital treatment, and early death in young offenders sentenced to prison. | The study population was selected from the nationwide Finnish Prison Court Register. This register includes all young prisoners who have committed their offences while aged 15–21 years, with the exception of offenders who receive very short sentences (<3 months) or very long sentences (>4 years). Thus, the register includes ∼98% of all young offenders sentenced to prison. The study population consisted of all young offenders sentenced to prison from the Prison Court Register who were convicted during the 17-year period from 1984 to 2000. Each young prisoner was |

| | | |
|---|---|---|
| | | entered into the cohort in the year in which he or she was for the last time sentenced to prison as an adolescent prisoner, for which the age range in Finland is between 15 and 21 years. For each prisoner, the date of the prison conviction—the first prison conviction in the case of re-offenders—was obtained and recorded as the beginning of the follow-up period. Using the personal identification number that is assigned to all residents of Finland by the Finnish Population Register, a linkage was performed with Statistics Finland's Cause of Death Register. All subjects were followed until 30 July 2002, or earlier in the event of their death. The causes of death were classified according to the International Classification of Diseases, according to the eighth revision (ICD-8) until 1986, ICD-9 between 1987 and 1995, and ICD-10 from 1996 onwards. The numbers and causes of deaths were compared with age- and sex-matched mortality data for the general Finnish population, obtained from Statistics Finland. The personal identification number was also used to collect data on hospitalizations from the Finnish Health Care Register (HCR, founded in 1967). Information on hospital treatment periods for psychiatric diagnoses was collected from this register for the years 1971–2001. |
| Sattar (2001), *N* = 141,102 | This study investigated all violent deaths of offenders under the supervision of the criminal justice system, both those in custody and those under the supervision of the National Probation Service. | The raw death rates and standardised mortality ratios for over 1,250 deaths of community offenders during 1996 and 1997 were compared with the general population rates from the Office of National Statistics. |
| Skardhamar, & Skirbekk (2013), *N* = 2,900,000 | This study investigated the overall mortality rate of offenders compared to the non-criminal population, and estimated the risk of death by criminal records related to substance abuse and other types of criminal acts. | Age-adjusted relative risks of death for 2000–2008 were studied in a population-based dataset. Their dataset comprise the total Norwegian population of 2.9 million individuals aged 15–69 years old in 1999, of whom 10% had a criminal record in the 1992–1999 period. Individuals with a criminal record have twice the relative risk (RR) of death of the control group (non-offenders). Males with a record of use/possession of drugs and a prison record have an 11.9 RR (females, 15.6); males with a drug record but no prison record have a 6.9 RR (females 10.5). Males imprisoned for driving under the influence of substances have a 4.4 RR (females 5.6); |

| | | |
|---|---|---|
| | | males with a record of driving under the influence but no prison sentence have a 3.2 RR (females 6.5). Other male offenders with a prison record have a 2.8 RR (females 3.7); other male offenders with no prison record have a 1.7 RR (females 2.3). Significantly higher mortality was found for people with a criminal record, also for those without any record of drug use. Mortality is much higher for those convicted of substance-related crimes: more so for drug- than for alcohol-related crimes and for women. |
| Spaulding et al. (2011), *N* = 23,510 | The authors here sought to determine the 15.5-year survival of 23,510 persons imprisoned in the state of Georgia on June 30, 1991. | After linking prison and mortality records, they calculated standardized mortality ratios (SMRs). |
| Stattin & Romelsjo¨ (1995), *N* = 7,577 | The authors examined the mortality risk at an adult age (including sudden violent death and death due to accidents) as a consequence of adolescent behavioural problems and adverse home-upbringing conditions, and further to examine whether subjects who had a criminal conviction as an adult were over-represented among those who died prematurely. | In total, 7577 persons about to undertake compulsory military service, 18 years old in 1969–70, responded to questions about their family background and antisocial behaviour, and were followed up in registers of mortality, criminality and alcohol or drug abuse up to the age of 33. Their results revealed that early contact with the police, truancy and school misconduct, and also the home-upbringing variables, divorce and parents' nervous disorders, were significant predictors of later premature mortality. |
| Stenbacka & Jansson (2012), *N* = 49,398 | The authors investigated life course criminality in relation to unintentional injury mortality and other causes of death among 49,398 male Swedish conscripts aged 18–20 years in 1969/70 and a follow-up through 35 years. All subjects completed two questionnaires at the time of conscription concerning family, social, behavioural risk factors including alcohol and drug use. | The impacts of committed crimes, alcohol and drug use and other risk factors were estimated using proportional hazard ratios (HRs) from Cox regression analyses. |
| Stewart et al. (2004), *N* = 9,455 | This study compared the risk of death in a cohort of Western Australian released prisoners with the risk experienced by the general population of Western Australia. | This is a cohort study of prisoners in Western Australia whose last date of release ranged from 1 January 1994 to 1 January 1999. Overall mortality and cause of death were determined by data linkage to the Registrar General's record of deaths. |
| Teplin et al. (2014), *N* = 1,829 | This study utilised the Northwestern Juvenile Project as a prospective longitudinal study of health needs and outcomes of a stratified random sample of 1829 youth (657 females, 1172 males; 524 Hispanic, 1005 African American, 296 non-Hispanic white, 4 other race/ethnicity) detained between 1995 and 1998. | Data on risk factors were drawn from interviews; death records were obtained up to 16 years after detention. They compared all-cause mortality rates and causes of death with those of the general population. Survival analyses were used to examine risk factors for mortality after youth leave detention. They compared standardized all-cause mortality rates and specific causes of death |

| | | |
|---|---|---|
| | | between their study sample and the Cook County, Illinois, general population. They estimated mortality rates in our sample by calculating the deaths per 100 000 person-years lived during the intervals 15 to 19, 20 to 24, and 25 to 29 years of age. Because selected strata were oversampled, they used sampling weights to estimate mortality rates that reflect CCJTDC's population; 95% confidence intervals (CIs) were estimated by using the jackknife method. They estimated all-cause mortality rates in Cook County by using the single decrement period life table method. To make contemporaneous comparisons between our cohort data and period data from Cook County, they created 3 synthetic cohorts from the years 2000, 2005, and 2008. They standardized Cook County rates to reflect the racial/ethnic and gender distribution of the CCJTDC population; 95% Cis were based on the Poisson distribution. They used the delta method to compute rate ratios comparing mortality rates and specific causes of death. |
| Tikkanen et al. (2008), *N* = 242 | The authors examined risk factors for recidivism and mortality among non-psychotic alcoholic violent offenders, the majority having antisocial or borderline personality disorders, or both, which is a group that commits the majority of violent offences in Finland. | Criminal records and mortality data on 242 male alcoholic violent offenders were analysed after a 7- to 15-year follow-up, and compared between themselves and with those of 1210 age-, sex- and municipality-matched controls. |
| Trumbetta et al. (2010), *N* = 1,812 | This paper examined whether socioeconomic status (SES), high school (HS) completion, IQ, and personality traits that predict delinquency in adolescence also could explain men's delinquency-related (Dq-r) mortality risk across the life span. | Through a 60-year Social Security Death Index (SSDI) follow-up of 1812 men from Hathaway's adolescent normative Minnesota Multiphasic Personality Inventory (MMPI) sample, the authors examined mortality risk at various ages and at various levels of prior delinquency severity. They examined SES (using family rent level), HS completion, IQ, and MMP1 indicators simultaneously as mortality predictors and tested for SES (rent level) interactions with IQ and personality. |
| Van de Weijer, Bijleveld, & Huschek (2016), *N* = 212 | Previous research has shown that offenders are at increased risk to die prematurely, but the etiology of this association is still unknown. Moreover, most previous studies use relatively short follow-up periods and do not take into account variation within the offender population with respect to frequency, timing and types of offences. | Using conviction data for a number of families at high-risk of offending born on average in 1932, the authors studied mortality in both offenders and non-offenders, from a similar socio-economic background, until 2007. They investigated associations between mortality and offending for different types of offences: |

| | | |
|---|---|---|
| | | violent offences, property offences, weapons offences, drugs offences and driving under the influence. |
| Verger et al. (2003), *N* = 1,127 | While the poor health status of prisoners has been highlighted in Western countries, the surveillance of their mortality has been neglected. | This paper studied the mortality of 1305 prisoners released during 1997 from a French prison. Vital status after release was obtained for 86.4% of them. |

**Table 4. Studies Excluded from the Meta-Analysis of Premature Mortality in Community Offenders (*N* = 46)[8]**

| Authors, Date, N | Description | Method | Reason for Exclusion |
|---|---|---|---|
| Biles et al. (1999), *N* = 7000 | This study investigates whether offenders serving community corrections orders, particularly parole, have a higher probability of death than those in prison. | The authors analysed data from Victoria and found that, among an average of around 7000 persons serving community corrections orders on any one day, there have been between 50 and 70 deaths per year since 1991. Between 1995 and 1998, there were 198 deaths, 62 from drugs or alcohol and 29 reported suicides. This paper identifies risks faced by these offenders, and in particular high risk drug and alcohol behaviour. | Overlaps with Graham (2003). |
| Bird and Hutchinson (2003), *N* = 20,000 | This study investigated male drug-related deaths in the fortnight after release from Prison, Scotland, 1996-99. | The authors aimed to assess whether 486 15–35-year-old males released after 14+ days' imprisonment in Scotland, 1996–99, had a higher drugs-related death rate in 2 weeks after release than during subsequent 10 weeks; higher than expected death rate from other causes; and if drugs-related deaths in the first fortnight were three times as many as prison suicides. They used confidential linkage of an ex-prisoner database against deaths. They found that drugs-related mortality in 1996–99 was seven times higher (95% CI: 3.3–16.3) in the 2 weeks after release than at other times at liberty and 2.8 times higher than prison suicides (95% CI: 1.5–3.5) by males aged 15–35 years who had been incarcerated for 14+ days. The authors estimated one drugs-related death in the 2 weeks after release per 200 adult male injectors released from 14 + days' incarceration. Non-drugs-related deaths in the 12 weeks after release were 4.9 times (95% CI: 2.8–7.0) the 4.3 deaths expected. | No non-offender control group. They compare risk of death between prisons after 2 weeks and after 10 weeks. |
| Bjork & Lindqvist (2005), *N* = 46 | The authors studied mortality among mentally disorder offenders in a community-based follow-up study. | This study was undertaken to estimate the standard mortality rate (SMR) of a population-based sample of people sentenced to forensic psychiatric care. *A*ll MDOs in Orebro County, Sweden, discharged from a forensic psychiatric treatment unit between 1992 and 1999 were | Referred Sample. |

[8]This search was completed at the end of 2018. Any papers published after this date would not have been found during the systematic searches and could not be documented in this table. Study Descriptions are verbatim in places.

| | | | |
|---|---|---|---|
| | | identified (N = 46). The variables were gender, age, offence, diagnosis and duration of admission. Case linkage was made with the National Cause-of-Death register. Median follow-up time was 53 months (0-93). *T*he sample yielded a significantly elevated SMR 13.4 (95% CI 4.35-31.3) times higher than that in the general population, mostly due to suicide. | |
| Bjorkenstam et al. (2017), *N* = 476,103 | The authors studied the association of cumulative childhood adversity and adolescent violent offending with suicide in early adulthood. | This study examine*d* whether adolescent violent offending mediates the association between CA and suicide in early adulthood. This was a population-based, longitudinal cohort study with a follow-up time spanning 5 to 9 years included 476 103 individuals born in Sweden between 1984 and 1988. The study population was prospectively followed up from 20 years of age until December 31, 2013, with respect to suicide. Data analysis was performed from January 1, 1984, to December 31, 2013. *R*egister-based CAs included parental death, parental substance abuse and psychiatric disorder, parental criminal offending, parental separation, public assistance recipiency, child welfare intervention, and residential instability. Adolescent violent offending was defined as being convicted of a violent crime between the ages of 15 and 19 years. *E*stimates of risk of suicide after 20 years of age (from 2004 if born in 1984 and from 2008 if born in 1988) until the end of 2013 were calculated as incidence rate ratios (IRRs) with 95% CIs using Poisson regression analysis. Adjustments were made for demographics and psychiatric disorder. In addition, binary mediation analysis with logistic regression was used. *A* total of 476 103 individuals (231 699 [48.7%] female) were included in the study. Those with a conviction for violent offending had been exposed to all CAs to a greater extent than those with no violent offending. Cumulative CA was associated with risk of suicide in non-convicted (adjusted IRR, 2.4; 95% CI, 1.5-3.9) and convicted youths, who had a higher risk of suicide | Compares Violent offending vs non-violent offending. No non-offender comparison. |

| | | | |
|---|---|---|---|
| | | (adjusted IRR, 8.5; 95% CI, 4.6-15.7). Adolescent violent offending partly mediated the association between CA and suicide. | |
| Brezina et al. (2009), *N* = 34,780 | The authors used a multi-methods approach to anticipate early death and youth crime. | This study used the National Longitudinal Study of Adolescent Health, also known as Add Health. A total of 20,745 adolescents between grades 7 and 12 and their parents were interviewed in Wave I between April and December 1995 and 15,197 of them were interviewed again for Wave II conducted from April 1996 through August 1996. Respondents were asked in both waves whether they had committed any of the following acts in the 12 months prior to the interview date: theft, damaging property, burglary, assault, robbery, pulling a gun or knife on someone else, and shooting or stabbing someone else. We created binary variables to indicate whether respondents engaged in each of these behaviours during the previous 12 months. Questions were also posed to individuals regarding expectations about their lifespan. Interviews with young offenders in Atlanta confirmed research detailed above on the fatalism and sense of "futurelessness" experienced by many inner-city youth. | Outcome measure is anticipation of death. |
| Bullock & Gaehl (2012), *N* = 450 | This article charted the offending and mortality rates over a 25–30 year period of children admitted to care in England and Wales in 1980. | The study examines UK criminal records and the Death Index for England and Wales of two groups of children: ones that stayed in care for more than two years, and ones that stayed for less than six weeks. The study showed that all of the children experienced an increased risk of offending and premature death compared with the general population but that it is not possible to evaluate the outcomes without taking account of the their characteristics and risks these pose. The rates for the subsequent offending of children presenting delinquency and other difficult behaviour, especially irregular school attendance, and who stay long in care is 2.7 times higher than for those coming into care because of neglect and abuse and 1.6 times higher than for those coming into care due to family breakdown. | Mortality is for long stay versus short stay care duration – not for offending. |

| | | | |
|---|---|---|---|
| | | There was no evidence that being in care per se reduces or increases the risk of offending, as criminal behaviour is not constant and the risks associated with it vary over time with much depending on the child's predisposition, life events and the quality of interventions received. | |
| Chassin et al. (2013), *N* = 1,354 | This study investigated distal and proximal predictors of premature mortality among serious juvenile offenders. | This study extended previous research by testing the joint contributions of distal (historical and demographic characteristics) and proximal (closer to the time of the death) predictors of mortality. It also tested whether proximal variables were potential mediators of the effects of distal variables on mortality. Participants were 1,354 serious juvenile offenders, enrolled in the Pathways to Desistance study, a longitudinal investigation of the transition from adolescence to young adulthood in serious adolescent offenders - 45 (3.32%) of whom were deceased by the completion of the study. Data were collected through self-reports and official records. Significant distal predictors of mortality were being African-American and having a history of substance use disorder. Proximal predictors that added significantly to prediction included gun carrying, gang membership, and substance use problems. Potential mediators of the effects of substance use disorder history were continuing substance use problems and gang membership. However, proximal variables could not explain the heightened risk for African-Americans. | No non-offender comparison. |
| Christensen et al. (2006), *N* = 15,885 | This study sought to determine the mortality of drug users after release from prison in Denmark. | A cohort of drug users was identified from two national registers during 1996-2001: the drug treatment register (T) and the register of viral hepatitis (H). Incarcerations were extracted from the national penal register, vital status from the civil register, and causes of death from the death certificate register and the police register of drug-related deaths. The authors identified 15,885 drug users (T: 15,735, H: 896), 62% of the estimated drug-using population in Denmark. There were 1000 observed deaths, | Compared released drug taking offenders with drug takers within the general population. |

| | | | |
|---|---|---|---|
| | | of which 51% were classified as overdose deaths. Mortality in the treatment cohort was 2.4/100 person years (py) (95% C.I. 2.2-2.5/100 py) compared to the general population expectation of 0.2/100 py. Within the first 2 weeks after release from prison, 26 deaths were observed among 6019 released drug users corresponding to 13/100 py (95% CI 8-19/100 py). Overdose deaths accounted for 24/26 deaths (92%) in the first two weeks compared to 121/179 (68%) hereafter (p <0.001). | |
| Coffey et al. (2004), *N* = 2,849 | This study sought to examine predictors of death in young offenders who have received a custodial sentence using data routinely collected by juvenile justice services. | A retrospective cohort of 2849 (2625 male) 11-20-year-olds receiving their first custodial sentence between 1 January 1988 and 31 December 1999 was identified. Deaths, date and primary cause of death ascertained from study commencement to 1 March 2003 by data-matching with the National Death Index; measures comprising year of and age at admission, sex, offence profile, any drug offence, multiple admissions and ethnic and Indigenous status, obtained from departmental records. Results - -the overall mortality rate was 7.2 deaths per 1000 person-years of observation. Younger admission age (hazard ratio [HR], 1.4; 95% Cl, 1.0-1.9), repeat admissions (HR, 1.8; 95% Cl, 1.1-2.9) and drug offences (HR, 1.5; 95% Cl, 1.0-2.1) predicted early death.. The role of ethnicity/Aboriginality could only be assessed in cohort entrants from 1996 to 1999. The Asian sub-cohort showed higher risk of death from drug-related causes (HR, 2.5; 95% Cl, 1.1-5.5), more drug offences (relative risk ratio [RRR], 13; 95% Cl, 8.5-20.0) and older admission age (oldest group v youngest: RRR, 9.3; 95% Cl, 1.3-68.0) than non-Indigenous Australians. Although higher mortality was not identified in Indigenous Australians, this group was more likely to be admitted younger (oldest v youngest: RRR, 0.31; 95% Cl, 0.15-0.63) and experience repeat admissions (RRR, 1.6; 95% Cl, 1.0-2.4). | Overlaps with 2003, but has a prison focus. Useful for later analyses. No population comparisons provided for initial analyses. |

| | | | |
|---|---|---|---|
| Daigle & Naud (2011), *N* = 1,025 | This study investigated the risk of dying by suicide inside or outside prison. | A follow-up of 1,025 inmates over the period from 1995 to 2006 was conducted by searching the computerized records of correctional services and coroner files for data on suicidal behaviour and death. There were 47 deaths (4.59%) from all causes among the 1,025 offenders during the observation period, of which 82.98% occurred outside prison. Of the 1,025, 26 died by suicide (2.54%). Of these suicides, 76.92% occurred outside prison. | Insufficient differentiation between offenders inside or outside of prison to meaningful use the results of analysis. |
| Fazel et al. (2014), *N* = 24,297 | The authors investigated violent crime, suicide, and premature mortality in patients with schizophrenia and related disorders. | They undertook a total population cohort study in Sweden of 24 297 patients with schizophrenia and related disorders between January, 1972 and December, 2009. Patients were matched by age and sex to people from the general population (n=485 940) and also to unaffected sibling controls (n=26 357). First, the authors investigated rates of conviction of a violent offence, suicide, and premature mortality, with follow-up until conviction of a violent offence, emigration, death, or end of follow-up (Dec 31, 2009), whichever occurred first. Second, they analysed associations between these adverse outcomes and sociodemographic, individual, familial, and distal risk factors, for men and women separately, with Cox proportional hazards models. Finally, they assessed time trends in adverse outcomes between 1972 and 2009, for which we compared patients with unaffected siblings, and analysed associations with changes in the number of nights spent in inpatient beds in psychiatric facilities nationwide. Findings - within 5 years of their initial diagnosis, 13·9% of men and 4·7% of women with schizophrenia and related disorders had a major adverse outcome (10·7% of men and 2·7% of women were convicted of a violent offence, and 3·3% of men and 2·0% of women died prematurely of any cause). During the study, the adjusted odds ratio of any adverse outcomes for patients compared with general population controls was 7·5 (95% CI 7·2–7·9) in men and 11·1 (10·2–12·1) in women. Three risk factors that were | Referred Individuals. |

| | | | |
|---|---|---|---|
| | | present before diagnosis were predictive of any adverse outcome: drug use disorders, criminality, and self-harm, which were also risk factors for these outcomes in unaffected siblings and in the general population. Over the period 1973–2009, the odds of these outcomes increased in patients with schizophrenia and related disorders compared with unaffected siblings. Schizophrenia and related disorders are associated with substantially increased rates of violent crime, suicide, and premature mortality. Risk factors for these three outcomes included both those specific to individuals with schizophrenia and related disorders, and those shared with the general population. Therefore, a combination of population-based and targeted strategies might be necessary to reduce the substantial rates of adverse outcomes in patients with schizophrenia and related disorders. | |
| Fazel et al. (2016a), *N* = 12,056 | The authors investigated patient outcomes following discharge from secure psychiatric hospitals. | The authors searched for primary studies that followed patients discharged from a secure hospital, and reported mortality, readmissions or reconvictions. The authors determined crude rates for all adverse outcomes. Results - in total, 35 studies from 10 countries were included, involving 12 056 patients out of which 53% were violent offenders. The crude death rate for all-cause mortality was 1538 per 100 000 person-years (95% CI 1175-1901). For suicide, the crude death rate was 325 per 100000 person-years (95% CI 235 415). The readmission rate was 7208 per 100000 person-years (95% CI 5916-8500). Crude reoffending rates were 4484 per 100000 person-years (95% CI 3679-5287), with lower rates in more recent studies. | Meta-Analysis of Referred Individuals. |
| Fazel et al. (2016b), *N* = 6,520 | The authors investigated mortality, rehospitalisation and violent crime in forensic | The authors conducted a historical cohort study of all 6,520 psychiatric patients discharged from forensic psychiatric hospitals between 1973 and 2009 in Sweden. They calculated hazard ratios for mortality, rehospitalisation, and violent crime using Cox regression to investigate the | Referred Individuals. |

| | | | |
|---|---|---|---|
| | psychiatric patients discharged from hospital. | effect of different psychiatric diagnoses and two comorbidities (personality or substance use disorder) on outcomes. Over a mean follow-up of 15.6 years, 30% of patients died (n = 1,949) after discharge with an average age at death of 52 years. Over two-thirds were re-hospitalised (n = 4,472, 69%), and 40% violently offended after discharge (n = 2,613) with a mean time to violent crime of 4.2 years. The association between psychiatric diagnosis and outcome varied-substance use disorder as a primary diagnosis was associated with highest risk of mortality and rehospitalisation, and personality disorder was linked with the highest risk of violent offending. Furthermore comorbid substance use disorder typically increased risk of adverse outcomes. | |
| Harding-Pink (1990), *N* = 300 | This study investigated mortality following Release from Prison. | This study looked at deaths occurring after release from prison in the Canton of Geneva during the period 1982–86. The mortality rate during the first year after release was about 5 deaths/1000 person years, a rate over four times the age-adjusted rate in the general population. The majority of deaths were due to overdose by opiate drugs among young, frequently imprisoned drug abusers, and occurred within the first few weeks after release. Likely risk factors include loss of tolerance to opiates while in prison, and psychological and social stresses following release. | Drug related mortality. |
| Harding-Pink & Fryc (1988), *N* = 300 | This study investigated risk of death after release from prison. | This was a summary report and did not provide any novel analyses or figures. | A summary paper of Harding-Pink (1990). |
| Kariminia et al. (2007), *N* = 85,203 | This study investigated the risk of suicide and drug overdose death among recently released prisoners.<br>Design, setting and participants: | This study used a retrospective cohort study of *N* = 85,203 adult offenders who had spent some time in full-time custody in prisons in New South Wales between 1 January 1988 and 31 December 2002. The main outcomes measures were the association between time after release and risk of suicide and overdose death. Of 844 suicides (795 men, 49 women), 724 (86%) occurred after release. Men had a higher rate of suicide than women both in prison (129 v 56 | No non-offender comparison made. |

| | | | |
|---|---|---|---|
| | | per 100 000 person years) and after release (135 v 82 per 100 000 person-years). The suicide rate in men in the 2 weeks after release was 3.87 (95% CI, 2.26–6.65) times higher than the rate after 6 months. Male prisoners admitted to the prison psychiatric hospital had a threefold higher risk than non-admitted men both in prison and after release. No suicides among women were observed in the 2 weeks after release. No increased risk of suicide was observed among Aboriginal Australians in the first 2 weeks after release. Of 1674 deaths due to overdose, 1627 (97%) occurred after release. Drug-related mortality in men was 9.30 (95% CI, 7.80–11.10) times higher, and in women was 6.42 (95% CI, 3.88–10.62) times higher, in the 2 weeks after release than after 6 months. Conclusions - prisoners are at a heightened risk of suicide and overdose death in the immediate post-release period. After 6 months post-release, the suicide rate approaches the rate observed in custody. | |
| Kjelsberg & Laake (2010), *N* = 1,112 | This study's aim was to investigate possible predictors for over-all and cause specific mortality in a nation-wide study of convicted offenders with and without previous imprisonment. | This case-control study drew random samples of deceased and living offenders (*N* = 1,112) from four complete cohorts of convicted offenders, two male (born 1967 and 1977, respectively), and two female (born 1967-70 and 1977-80, respectively). All criminal records were systematized and information about date and cause of death was collected on those deceased. Multivariable analyses demonstrated that age at first court conviction (OR = 0.88, 95% CI = 0.84-0.93), drug related crimes (OR = 1.99, 95% CI = 1.23-3.22), and crime diversity (1.51, 95% CI = 1.07-2.13) were significant predictors of premature death in males. In females, age at first court conviction (OR = 0.92, 95% CI = 0.88-0.97), drug related crimes (OR = 2.24, 95% CI = 1.37-3.69) and belonging to the oldest cohort (OR = 2.10, 95% CI = 1.35-3.26) were significant predictors of premature death. Age at first court conviction remained a significant predictor for death in all cause specific multivariable mortality analyses. In addition, having | No non-offender control group. |

| | | | |
|---|---|---|---|
| | | committed drug related crimes and high crime diversity were strong predictors for substance related deaths. Males did more often die in accidents or commit suicide. Somatic deaths were most often encountered in the oldest cohort. Incarceration did not remain a significant predictor for premature death in any of the multivariable analyses. | |
| Lattimore et al. (1997), *N* = 4,000 | This study investigated the risk of death among serious young offenders. | Mortality data were gathered from California Vital Statistics for more than 4,000 youth paroled by the California Youth Authority during the 1980s. Exposure periods (time at risk of death), were about 11 years and 6 years for the two samples. Known deaths for two cohorts totalled 181 for the 3,995 male offenders in the two samples, including 109 for the 1,998 males in the 1981-1982 sample and 72 for the 1,997 males in the 1986-1987 sample. Homicide was the prevailing cause for both samples. Of particular note is the fact that the numbers of deaths due to causes other than homicide are roughly proportional to the length of the exposure periods for the two samples while the numbers of homicides are roughly equal despite the very different lengths of time at risk. A higher probability of death by murder was observed for black youth, those from Los Angeles, those with a history of gang involvement and institutional violence, and those with a history of drug arrests. | No meaningful comparison group. |
| Laub & Sampson (2003), *N* = 1,000 | The present study examined if the increased mortality of delinquent subjects continues until age 70 years and, if so, why. | The authors followed 500 delinquent and 500 matched nondelinquent comparison boys from age 7 to 70 years old. They used the same design as Laub & Vaillant's (2000) previous work. Deaths of delinquents have increased to 225. | No new data on the non-delinquents or estimated/expected deaths within the greater population to compare to. |
| Lewis et al. (1991), *N* = 21 | This study was a follow-up of Female Delinquents investigating maternal contributions to the perpetuation of deviance. | Twenty-one female delinquents, neuro-psychiatrically evaluated while in a juvenile correctional facility, were followed up 7 to 12 years later. The authors compared their female delinquents with a matched sample of male delinquents. Unlike the males, early biopsychosocial | Participants were neuro-psychiatrically impaired. |

| | | | |
|---|---|---|---|
| | | variables were not predictive of adult criminality: however, most females were seriously impaired neuro-psychiatrically. Mortality rates were high. Having come from abusive households, the female delinquents became suicidal, alcoholic, drug addicted, enmeshed in violent relationships, and unable to care for their children. | |
| Loeber & Farrington (2011), *N* = 1,517 | This study aimed to document the development of antisocial and delinquent behaviour from childhood to early adulthood, the risk factors that impinge on that development, and help seeking and service provision of boys' behaviour problems. Secondly, to focus on boys' development of alcohol and drug use, and internalizing problems. | This study used the Pittsburgh Youth Study. The youngest cohort (*n*=503) has been assessed a total of 18 consecutive times from middle childhood to late adolescence, the middle cohort (*N* = 508) was only assessed seven times, at half-yearly intervals from age 10-13. While the oldest cohort (*N* = 506) has been assessed a total of 16 consecutive times from early adolescence to early adulthood. Huge numbers of risk factors measured. Of the 1,517 males in the PYS, four died and one emigrated permanently by age 14. These males are considered to be not at risk of offending, leaving 1,512 males at risk at age 15. The number of males at risk then decreased because of deaths (57 males died up to age 29) and because not all males in the youngest cohort had reached their 30$^{th}$ birthday. | No non-offender comparison. |
| Mallett et al. (2012), *N* = 433 | This study investigated reported suicide attempts within a youthful offender population | In this study of court-involved youth (*N* = 433) in two Midwest counties, logistic regression analysis identified some expected and unexpected findings of important demographic, educational, mental health, child welfare, and juvenile court-related variables that were linked to reported suicide attempts. Some of the expected suicide attempt risk factors for these youth included prior psychiatric hospitalization and related mental health services, residential placement, and diagnoses of depression and alcohol dependence. However, the most unexpected finding was that a court disposition to shelter care (group home) was related to a nearly tenfold increased risk in reported suicide attempt. These findings are of importance to families, mental health professionals, and | Not longitudinal. |

| | | | |
|---|---|---|---|
| | | juvenile court personnel to identify those youth who are most at risk and subsequently provide appropriate interventions to prevent such outcomes. | |
| Maughan et al. (2014), *N* = 4,158 | This study investigated adolescent conduct problems and premature mortality. | A total of 4158 members of the Medical Research Council National Survey of Health and Development (the British 1946 birth cohort) were assessed for conduct problems at the ages of 13 and 15 years. Follow-up to the age of 65 years via the UK National Health Service Central Register provided data on date and cause of death. Dimensional measures of teacher-rated adolescent conduct problems were associated with increased hazards of death from cardiovascular disease by the age of 65 years in men [hazard ratio (HR) 1.17, 95% confidence interval (CI) 1.04-1.32], and of all-cause and cancer mortality by the age of 65 years in women (all-cause HR 1.16, 95% CI 1.07-1.25). Adjustment for childhood cognition and family social class did little to attenuate these risks. Adolescent conduct problems were not associated with increased risks of unnatural/substance-related deaths in men or women in this representative sample. | No offender categories. |
| Merrall et al. (2010), *N* = 69,093 | This study meta-analytically investigated drug-related deaths soon after release from prison | English-language studies were identified that followed up adult prisoners for mortality from time of index release for at least 12 weeks. Six studies from six prison systems met the inclusion criteria and relevant data were extracted independently. Results - these studies contributed a total of 69 093 person-years and 1033 deaths in the first 12 weeks after release, of which 612 were drug-related. A three- to eightfold increased risk of drug-related death was found when comparing weeks 1 + 2 with weeks 3–12, with notable heterogeneity between countries: United Kingdom, 7.5 (95% CI: 5.7–9.9); Australia, 4.0 (95% CI: 3.4–4.8); Washington State, USA, 8.4 (95% CI: 5.0–14.2) and New Mexico State, USA, 3.1 (95% CI: 1.3–7.1). Comparing weeks 3 + 4 with weeks 5–12, the pooled relative risk was: 1.7 (95% CI: 1.3–2.2). | Meta-analysis. |

| | | | |
|---|---|---|---|
| Ojansuu et al. (2015), *N* = 1,253 | This study investigated mortality among forensic psychiatric patients in Finland. | *A* total of 1253 patients were included, of which 153 were females and 1100 were males. The mean follow-up time in this study was 15.1 years, and 351 (28%) had died during the follow-up period. The standardized mortality rate (SMR) for the whole study group was 2.97 (95% CI 2.67-3.29). Among females the SMR was 3.62 (95% CI 2.57-5.09), and among males 2.91 (95% CI 2.61-3.25). The SMRs were higher when patients were committed to forensic treatment before the age of 40 years. | Referred Individuals. |
| Paanila et al. (1999), *N* = 102 | Mortality among habitually violent offenders | There are no published studies about mortality among habitually violent offenders, although it would be essential to take into account the possibly higher mortality rate of this population, when the incidence of committing violent offenders is calculated as a function of age. This research looked at mortality during the age range 30–50 years among 102 habitually violent male offenders, who were considered to be dangerous to the lives of other people, during the 24.5-year period 1971–1995 (in the range 3.5 months–24.5 years, the average prison time was 6 years, 7 months and 11 days). In Finland, the deathrate in the group of men aged 30–50 years is 3.7/1000/year, but among these habitually violent male criminals, the mortality rate was observed to be 18.1/1000/year. Therefore, the relative risk for dying in this age group was 4.9-fold when compared with the normal male population aged 30–50 years. A finding of this magnitude has a substantial effect, when the real incidence of committing homicides or other violent offences is calculated as a function of age. This is an important issue in forensic psychiatry, since it is generally believed that the incidence of committing violent crimes is decreased between the ages of 30 and 50 years, and age is used as one predictive factor when the risk of forthcoming violent behaviour is assessed. | The sample does not differentiate between those in prison and those released from prison. |

| | | | |
|---|---|---|---|
| Piquero (2016), *N* = 1,354 | This study investigated both the determinants of perceived age-at-death, as well as some of the mediating processes associated with the relationship between perceived age-at-death and offending. | Using data for a large sample of serious youthful offenders from two urban cities and who were followed for seven years, this study attended to these concerns. Results showed that gender, race/ethnicity, and adverse neighbourhood conditions influence the perceived age-at-death; this perception distinguishes between distinct trajectories of offending, and such perceptions also influenced both perceived risks and perceived rewards as well as one's impulse control. | Longitudinal sample, but based on perceptions of early death. |
| Pridemore, & Berg (2017), *N* = 1,750 | This study is a population-based case-control study of repeat victimization, premature mortality and homicide | The authors examined risk of male premature mortality associated with recent criminal victimization. Prior victimization is among the most consistent predictors of future risk but the explanation of repeat victimization remains elusive. Two general perspectives frame this debate. According to the state-dependence perspective, repeat victimization is forged through intervening processes connecting an initial with a subsequent violent victimization. According to the risk-heterogeneity perspective, this association is spurious because all victimization events for a person result from underlying individual traits. Research on health outcomes and premature mortality provides related, but often overlooked, conceptual assumptions about the co-occurring health burden of preventable injuries and disease. This study extended and applied each of these perspectives to assess the nature and sources of repeat violent victimization. Data were from the Izhevsk (Russia) Family Study, a large-scale population-based case-control study. Cases (n=1750) were all male deaths aged 25-54 living in Izhevsk between October 2003 and October 2005. Controls (n=1750) were randomly selected from a city population register. Key independent variables were prior year prevalence of violent, property, and residential victimization. The authors used logistic regression to estimate mortality odds ratios. Results provided evidence for state dependence. It was | This is about victimization. |

| | | | |
|---|---|---|---|
| | | found that (i) after controlling for indicators of risk heterogeneity men who had been victims of violence (but not property or residential crime) within the past year were 2.6 times more likely than those who had not to die prematurely; and (ii) the only type of death for which risk was higher was homicide. | |
| Pritchard et al. (1997), *N* = 7,456 | This study investigated suicide and 'violent' death in a six-year cohort of male probationers compared with pattern of mortality in the general population. | This study explored the mortality rates of a six-year cohort of male probationers (1990-1995) with males in the general population. Male offenders (aged 17-54) had double the death rate, five times the 'external death' rate and nine times the suicide rate of the general population. | Did not exclude mental illness. |
| Richardson et al. (2013), *N* = 15 | These authors interviewed young, black male serious violent youth offenders detained in an adult jail to understand their experience of violence. | Their narratives reveal how the code of the street, informal rules that govern interpersonal violence among poor inner-city black male youths, increases the likelihood of violent victimization. Youth offenders detained in adult jails have the lowest rate of service provision among all jail populations. The study addressed how services for youth offenders can be improved to reduce the pathways to early violent death. | Qualitative Study. |
| Rydelius (1988), *N* = 1,056 | This investigated the development of antisocial behaviour and sudden violent death. | A register was drawn up covering those young persons (1,056; 832 boys and 224 girls; mean age 16 years) who were admitted to Swedish probationary schools during the period 1 January — 31 December 1967. Using the registers of immigration and emigration and causes of death kept by SCB (Statistiska Centralbyrån), mortality occurring between 1 January 1967 — 31 December 1985 was tabulated. One hundred and ten boys (13%) and 22 girls (10%) had died. The deaths had occurred at a rate of approximately seven new deaths per observation year, the youngest being still in their teens when they died. For comparison, the criteria set up by insurance companies for life insurance premiums are based on a death expectancy for healthy Swedish boys and girls in the age groups | No meaningful comparison group. |

| | | | |
|---|---|---|---|
| | | corresponding to the subjects under observation of 1.2-3.1% for boys and 1.1-2.6% for girls. Eighty-eight percent of the dead boys and 77% of the dead girls had died "sudden violent deaths"— accidents, suicides, death from uncertain causes, murder/manslaughter, or alcohol/drug abuse. For both sexes, death from uncertain causes and suicides were the most frequent single causes of death. Death as a direct result of alcohol/drug abuse occurred only in boys. | |
| Sattar (2003), *N* = 141,102 | This study investigated the Death of Offenders in England and Wales. | This study compared the nature and extent of death among prisoners (*N*= 236) and offenders serving community sentences or ex-prisoners receiving post-custodial supervision by the Probation Service *(N* = 1,267) in England and Wales in 1996 and 1997. Information contained in death certificates was used to code for mode of death. Prisoners and community offenders were found to be reasonably similar in vulnerability to suicide/self-inflicted death; however, the risk of accidental death and homicide was greater for community offenders, and drugs and alcohol played a bigger part in their deaths. | Overlaps with Sattar 2001. |
| Sattar & Killias (2005), *N* = N/A | This study investigated the death of offenders in Switzerland. | The Swiss data presented confirmed that unnatural death is rather common among offenders outside prison. Despite some differences in frequency of suicide and other unnatural causes of death among prisoners in England and Switzerland (which may be due to differences in sentencing and other policies), the overall picture of mortality in prisons suggests many similarities between the two countries. | No non-offender comparison. |
| Shepherd et al. (2009), *N* = 411 | This study investigated the impact of antisocial lifestyle on health: chronic disability and death by middle age. | Mortality, injury and illness data were collected prospectively in the longitudinal Cambridge study in delinquent development at age 43–48. Childhood and parental predictors of offending, self-reported delinquency at age 32 and convictions were significantly associated with death and disability by age 48. | Overlap with Piquero et al. 2014 and only provides analyses under 'death and disability' – not just death. |

| | | | |
|---|---|---|---|
| Sherman & Harris (2013), *N* = 1,200 | This study investigated the increased homicide victimization of suspects for domestic assault using a 23-year follow-up of the Milwaukee Domestic Violence Experiment (MilDVE). | The Milwaukee Domestic Violence Experiment (MilDVE) employed a randomized experimental design with over 98 % treatment as assigned. In 1987–88, 1,200 cases with 1,128 suspects were randomly assigned to arrest or a warning in a 2:1 ratio. Arrested suspects were generally handcuffed and taken to a police station for about 3 to 12 h. Warned suspects were left at liberty at the scene after police read aloud a scripted statement. Death records were obtained in 2012–13 from the Wisconsin Office of Vital Statistics and the Social Security Death Index, with the support of the Milwaukee Police Department. In the first presenting case in which the 1,128 were identified as suspects, they were randomly assigned to arrest in 756 cases and to a warning in 372. No clear difference in death rates from all causes combined (d=0.04) was ever evident between the groups, or for five of the six specific categories of cause of death. However, a clear difference in homicide victimizations of the suspects emerged between those arrested and those warned. At 23 years after enrolment, suspects assigned to arrest were almost three times more likely to have died of homicide (at 2.25% of suspects) than suspects assigned to a warning (at 0.81%), a small to moderate effect size (d=0.39) with marginal significance (two-tailed p=0.096; relative risk ratio=2.79:1; 90 % CI = 1.0007 to 7.7696). Cox regressions controlling for suspects' stakes in conformity (employment and marriage) show that homicide victimization for arrested suspects is three times that of warned suspects (p=0.07), although no interactions are yet significant. Logistic regression with more covariates increases arrest effects on homicide to 3.2 times more than warnings (*p*= 0.06). | No population based non-offender comparison group. |
| Singleton et al. (2003), *N* = 12,438 | This study investigated drug-related mortality among newly released offenders. | This study provided estimates of the rates of mortality amongst recently released prisoners in England and Wales and provides some evidence of the risk factors associated with this group. The sampling exercise here was | Not comparison to non-offender population. |

| | | | |
|---|---|---|---|
| | | undertaken prior to the implementation of the revised prison service drug strategy which brought in a considerable expansion in the provision of treatment and support for drug misusers. | |
| Stenbacka et al. (2012), *N* = 48,834 | This study investigated mortality and causes of death among violent offenders and victims. | This study analysed overall and cause specific mortality among violent offenders, victims, and individuals who were both offenders and victims in a general sample of 48,834 18-20 year-old men conscripted for military service in 1969/70 in Sweden. Each person completed two non-anonymous questionnaires concerning family, psychological, and behavioral factors. The cohort was followed for 35 years through official registers regarding violent offences, victimization, and mortality. The impact of violence, victimization, early risk factors and hospitalization for psychiatric diagnosis or alcohol and drug misuse during follow up on mortality was investigated using Cox proportional hazard regression analyses. Repeat violent offences were associated with an eleven-fold higher hazard of dying from a substance-related cause and nearly fourfold higher hazard of dying from suicide. These figures remained significantly elevated also in multivariate analyses, with a 3.03 and 2.39 hazard ratio (HR), respectively. Participants with experience of violence and inpatient care for substance abuse or psychiatric disorder had about a two to threefold higher risk of dying compared to participants with no substance use or psychiatric disorder. | Overlap with Stenbacka et al 2014 – but smaller sample. |
| Stoddard-Dave et al. (2013), *N* = 999 | This study was an assessment of risk factors for early death among a sample of previously incarcerated youth. | This study extends previous research by evaluating potential factors that are associated with early death in a random sample ($N = 999$) of formerly detained youthful offenders in New York stratified by gender (50% female). Existing case records were referenced with the National Death Index to determine if the formerly detained youth were deceased by the time they would have reached age 28. Regression analyses were run to determine if any of 16 | No non-offender comparison group. |

| | | | |
|---|---|---|---|
| | | sociodemographic, offence history, weapons/gang involvement, mental health, substance use, child maltreatment, child welfare, or family environmental risk factors measured in their childhood or adolescence were associated with early death. Two additional regression analyses were run to determine if those risk factors differentially impacted early death for males vs. females. Of the variables measured, however, only gender was significantly related to early death – compared to females, males were 2.3 times more likely to have prematurely died. Additionally, in the model run separately for females, being an African-American female was protective against early death. These findings are compared to findings from the existing literature. | |
| Tabita et al. (2012), *N* = 88 | This study investigated criminal recidivism and mortality among patients discharged from a forensic medium secure hospital. | All offenders in Orebro County, Sweden, sentenced to forensic psychiatric treatment and discharged during 1992-2007 were included: 80 males and eight females. Follow-up data was retrieved from the Swedish National Council for Crime Prevention, the National Cause-of-Death register and clinical files. Mean follow-up time was 9.4 years. The mean age at discharge was 40 years. Schizophrenia, other psychoses and personality disorders were the most prevalent diagnoses. Thirty-eight percent of those still alive and still living in the country re-offended and were sentenced to a new period of forensic psychiatric treatment or incarceration during follow-up. Four male re-offenders committed serious violent crimes. Substance-related diagnosis was significantly associated with risk of recidivism and after adjustment for diagnoses, age and history of serious violent crime, the Hazard Ratio was 4.04 (95% CI 1.51-10.86, P = 0.006). Of all included patients, 23% had died at the end of follow-up (standardized mortality rate 10.4). | Psychiatric patients. |

| | | | |
|---|---|---|---|
| Teplin et al. (2005), *N* = 1,829 | This study investigated early violent death among delinquent youth. | This prospective longitudinal study examined mortality rates among 1829 youth (1172 male and 657 female) enrolled in the Northwestern Juvenile Project, a study of health needs and outcomes of delinquent youth. Participants, 10 to 18 years of age, were sampled randomly from intake at the Cook County Juvenile Temporary Detention Center in Chicago, Illinois, between 1995 and 1998. The sample was stratified according to gender, race/ethnicity (African American, non-Hispanic white, Hispanic, or other), age (10-13 or >= 14 years), and legal status (processed as a juvenile or as an adult), to obtain enough participants for examination of key subgroups. The sample included 1005 African American (54.9%), 296 non-Hispanic white (16.2%), 524 Hispanic (28.17%), and 4 other-race/ethnicity (0.2%) subjects. The mean age at enrollment was 14.9 years (median age: 15 years). The refusal rate was 4.2%. As of March 31, 2004, the authors had monitored participants for 0.5 to 8.4 years (mean: 7.1 years; median: 7.2 years; interquartile range: 6.5-7.8 years); the aggregate exposure for all participants was 12 944 person-years. Data on deaths and causes of death were obtained from family reports or records and were then verified by the local medical examiner or the National Death Index. For comparisons of mortality rates for delinquents and the general population, all data were weighted according to the racial/ethnic, gender, and age characteristics of the detention centre; these weighted standardized populations were used to calculate reported percentages and mortality ratios. They calculated mortality ratios by comparing our sample's mortality rates with those for the general population of Cook County, controlling for differences in gender, race/ethnicity, and age. *S*ixty-five youths died during the follow-up period. All deaths were from external causes. As determined by using the weighted percentages to estimate causes of death, 95.5% of deaths | Overlap with Teplin 2014. |

| | | | |
|---|---|---|---|
| | | were homicides or legal interventions (90.1% homicides and 5.4% legal interventions), 1.1% of all deaths were suicides, 1.3% were from motor vehicle accidents, 0.5% were from other accidents, and 1.6% were from other external causes. Among homicides, 93.0% were from gunshot wounds. The overall mortality rate was >4 times the general-population rate. The mortality rate among female youth was nearly 8 times the general-population rate. African American male youth had the highest mortality rate (887 deaths per 100 000 person-years). | |
| Testa et al. (2017), *N* = 21,417 | This study examined all-cause and cause-specific mortality among former prisoners in Pennsylvania. | This study used a unique set of measures obtained from administrative records from Pennsylvania to examine demographic, custodial, behavioural, and criminal history factors that impact mortality risk following release from incarceration. Moreover, this study was the first to assess whether risk factors for post-release mortality are consistent or variable across race and ethnicity. Using data from the Pennsylvania Department of Corrections and mortality records from the Pennsylvania Department of Health it can be found that several demographic, custodial, behavioural, and criminal history measures were related to post-release mortality risk. Moreover, while most risk factors for mortality are generally consistent across race and ethnicity, evidence was found that some custodial and criminal history factors vary by race and ethnicity. | No comparison to non-offenders. |
| Timonen et al. (2003), *N* = 11,017 | The aim of this study was to investigate the association between adverse physical disorders and violent/non-violent criminal behaviour. | The study material consisted of the large, prospectively followed, unselected and genetically homogenous Northern Finland 1966 Birth Cohort, the Finnish Hospital Discharge Registers and the National Crime Register (*N* = 10,934). The results of the logistic regression analyses showed that male offenders had statistically significantly more injuries (adj. OR=1.81, 95% CI=1.51–2.17), when compared with males without a criminal history. Violent male offenders exhibited greater morbidity to the diseases of the respiratory system (adj. OR=1.64, 95% CI=1.03– | No information on mortality, just increased risk of injuries and somatic illness. |

| | | | |
|---|---|---|---|
| | | 2.60) when compared with non-violent criminals. Female offenders suffered more commonly from poisonings (adj. OR=3.84, 95% CI=1.69–8.72), injuries (adj. OR=2.79, 95% CI=1.67–4.66), infections (adj. OR=1.87, 95% CI=1.16–2.99) and indefinite symptoms (adj. OR=2.02, 95% CI=1.20–3.40) than non-offending females. | |
| Tremblay, & Pare (2003), *N* = N/A | This study investigated patterns in serious offenders' mortality rates. | No novel results reported. | Review Article. |
| Yeager & Lewis (1990), *N* = 118 | This study investigated mortality in a group of formally incarcerated juvenile delinquents. | A 7-year follow-up study of formerly incarcerated delinquents revealed an extremely high mortality rate. Of 118 male and female subjects, seven had died before their 25th birthdays, making the mortality rate of the sample approximately 58 times the national average for individuals in their age group. All died violent deaths, making the violent death rate of the sample approximately 76 times the national average for that age group. Differences in mortality rates according to the race and sex of the subjects are reported, and possible clinical predictors of early death are explored. | No Access. |
| Zane et al. (2018), *N* = 253 | This study investigated criminal offending and mortality over the full life-course. | This study used the CSYS, a delinquency prevention experiment and prospective longitudinal survey of the development of offending. Begun in 1939, the study involves 506 at-risk boys, ages 5–13 years (mean birth year = 1928), from Cambridge and Somerville, Massachusetts. Following the analytic strategy of Joan McCord, participants are drawn from the study's longitudinal arm (N = 253). Data include court convictions of criminal offences collected during middle age (mean = 47) and death records collected during old age (up to age 89). Death records were collected for 216 participants or 85.4% of the sample. Results Life-course persistent offenders experience earlier mortality compared to nonoffenders (by about 7 years) and adolescent-limited offenders (by about 8 years). While life-course persistent offenders are not more likely to die early | Results are only presented within Offender Trajectory groupings. |

| | | | |
|---|---|---|---|
| | | (< 40 years) compared to other trajectory groups, they are more likely to experience premature mortality from late middle age into old age. Life-course persistent offenders are also more likely to experience unnatural deaths, with alcoholism confounding the relationship. Conclusions That group differences in mortality risk did not emerge until age 55 (while offending is in decline) suggests that the relationship between offending and mortality is not direct and may be spurious. | |
| Zlodre & Fazel (2012), *N* = 26,163 | This study investigated the all-cause and external mortality in released prisoners. | The paper searched 5 computer-based literature indexes to conduct a systematic review of studies that reported all-cause, drug-related, suicide, and homicide deaths of released prisoners. The authors extracted and meta-analysed crude death rates and standardized mortality ratios by age, gender, and race/ethnicity, where reported. Eighteen cohorts met review criteria reporting 26,163 deaths with substantial heterogeneity in rates. The all-cause crude death rates ranged from 720 to 2054 per 100,000 person-years. Male all-cause standardized mortality ratios ranged from 1.0 to 9.4 and female standardized mortality ratios from 2.6 to 41.3. There were higher standardized mortality ratios in White, female, and younger prisoners. | Review paper – individual papers within have been review separately. |

## Table 5. Odds Ratios for Premature Mortality of Community Offenders

| Authors, Date, *N* | *OR* | 95% CI Lower Limit | 95% CI Upper Limit | *Z*-value | *p*-value |
|---|---|---|---|---|---|
| Robins & O'Neil (1958), *N* = 524 | 2.30 | 2.00 | 4.46 | 5.36 | 0.01 |
| Stattin & Romelsjo¨ (1995), *N* = 7,577 | 3.23 | 2.59 | 4.00 | 10.55 | 0.01 |
| Joukamaa (1998), *N* = 903 | 1.26 | 1.10 | 1.44 | 3.29 | 0.01 |
| Rasanen et al. (1998), *N* = 12,058 | 2.6 | 1.38 | 4.8 | 2.98 | 0.01 |
| Laub, & Vaillant (2000), *N* = 931 | 1.79 | 1.41 | 2.27 | 4.84 | 0.01 |
| Putkonen et al. (2001), *N* = 132 | 38.01 | 28.27 | 51.12 | 24.08 | 0.01 |
| Repo-Tiihonen et al. (2001), *N* = 250 | 6.60 | 5.27 | 8.27 | 16.38 | 0.01 |
| Sattar (2001), *N* = 141,102 | 4.10 | 3.54 | 4.76 | 18.67 | 0.01 |
| Coffey et al. (2003), *N* = 2,849 | 10.27 | 9.17 | 11.49 | 40.63 | 0.01 |
| Graham (2003), *N* = 25,469 | 7.70 | 7.16 | 8.26 | 55.75 | 0.01 |
| Verger et al. (2003), *N* = 1,127 | 1.28 | 1.10 | 1.49 | 3.28 | 0.01 |
| Stewart et al. (2004), *N* = 9,381 | 4.24 | 3.81 | 4.72 | 26.48 | 0.01 |
| Tikkanen et al. (2004), *N* = 242 | 1.96 | 1.62 | 2.36 | 6.92 | 0.01 |
| Sailas et al. (2005), *N* = 3,832 | 2.05 | 1.71 | 2.44 | 7.91 | 0.01 |
| Hobbs et al. (2006), *N* = 13,667 | 3.96 | 3.95 | 3.97 | 956.01 | 0.01 |
| Pratt et al. (2006), *N* = 244,988 | 23.14 | 22.99 | 23.29 | 962.93 | 0.01 |
| Binswanger et al. (2007), *N* = 30,237 | 3.48 | 3.00 | 4.04 | 16.40 | 0.01 |
| Farrell & Marsden (2007), *N* = 44,771 | 7.86 | 7.38 | 8.37 | 63.72 | 0.01 |
| Lindqvist et al. (2007), *N* = 153 | 3.68 | 2.35 | 5.76 | 5.71 | 0.01 |
| Nieuwbeerta & Piquero (2008), *N* = 4,615 | 1.76 | 1.45 | 2.13 | 5.81 | 0.01 |
| Rosen et al. (2008), *N* = 168,001 | 0.76 | 0.75 | 0.76 | -56.86 | 0.01 |
| Ramchand, Morral & Becker (2009), *N* = 449 | 4.96 | 3.89 | 6.33 | 12.90 | 0.01 |
| Trumbetta et al. (2010), *N* = 1,812 | 0.99 | 0.98 | 1.00 | -1.03 | 0.30 |
| Dirkzwager et al. (2011), *N* = 2,297 | 3.21 | 2.60 | 3.96 | 10.93 | 0.01 |
| Kinner et al. (2011), *N* (Western Australia) = 16,162; *N* (NSW) = 82,650 | 10.97 | 10.25 | 11.73 | 69.26 | 0.01 |
| Spaulding et al. (2011), *N* = 23,510 | 1.54 | 1.44 | 1.65 | 12.45 | 0.01 |
| Stenbacka & Jansson (2012), *N* = 49,398 | 2.00 | 1.93 | 2.07 | 37.74 | 0.01 |
| Skardhamar, & Skirbekk (2013), *N* = 2,900,000 | 1.91 | 1.88 | 1.94 | 93.88 | 0.01 |
| Piquero et al. (2014), *N* = 411 | 1.95 | 1.36 | 2.79 | 3.66 | 0.01 |
| Pridemore (2014), *N* = 1,750 | 2.20 | 1.61 | 3.01 | 4.92 | 0.01 |
| Teplin et al. (2014), *N* = 1,829 | 3.61 | 2.75 | 4.76 | 9.17 | 0.01 |
| Lize et al. (2015), *N* = 476 | 7.80 | 6.51 | 9.34 | 22.23 | 0.01 |
| Aalsma et al. (2016), *N* = 49,470 | 1.58 | 1.24 | 2.00 | 3.72 | 0.01 |
| Van de Weijer, Bijleveld, & Huschek (2016), *N* = 212 | 1.76 | 1.39 | 2.22 | 4.68 | 0.01 |
| Elonheimo et al. (2017), *N* = 5,405 | 5.40 | 3.33 | 8.74 | 6.85 | 0.01 |
| Lindberg et al. (2017), *N* = 606 | 7.73 | 5.74 | 10.40 | 13.50 | 0.01 |
| **Main Effect** | **3.42** | **2.29** | **5.12** | **5.99** | **0.01** |

*Note. NSW = New South Wales.*

**Table 6. Premature Mortality Results by Country**

| Country | *K* | *OR* | 95% CI Lower Limit | 95% CI Upper Limit | *Z*-value | *p*-value |
|---|---|---|---|---|---|---|
| Australia | 5 | 6.80 | 4.10 | 11.26 | 7.44 | 0.01 |
| Finland | 9 | 4.38 | 2.09 | 9.20 | 3.91 | 0.01 |
| France | 1 | 1.28 | 1.11 | 1.49 | 3.28 | 0.01 |
| Netherlands | 3 | 2.15 | 1.45 | 3.20 | 3.78 | 0.01 |
| Norway | 1 | 1.91 | 1.89 | 1.94 | 93.88 | 0.01 |
| Russia | 1 | 2.20 | 1.61 | 3.01 | 4.92 | 0.01 |
| Sweden | 3 | 2.78 | 1.83 | 4.21 | 4.81 | 0.01 |
| UK | 4 | 6.26 | 2.62 | 14.96 | 4.12 | 0.01 |
| USA | 10 | 2.24 | 1.87 | 2.68 | 8.85 | 0.01 |

*Note. K = Number of Studies.*

**Table 7. Differences in Premature Mortality by Gender and Ethnicity**

| Ethnicity | Gender | *K* | *OR* | 95% CI Lower Limit | 95% CI Upper Limit | *Z*-value | *p*-value |
|---|---|---|---|---|---|---|---|
| Black | N/A | 4 | 1.29 | 0.70 | 2.35 | 0.82 | 0.41 |
| Hispanic | N/A | 1 | 5.52 | 3.86 | 7.90 | 9.35 | 0.01 |
| Indigenous | N/A | 2 | 2.74 | 1.00 | 7.50 | 1.96 | 0.05 |
| White | N/A | 5 | 3.50 | 2.42 | 5.07 | 6.66 | 0.01 |
| Black | Female | 3 | 2.25 | 1.14 | 4.43 | 2.33 | 0.02 |
| Black | Male | 4 | 1.21 | 0.68 | 2.13 | 0.65 | 0.52 |
| Hispanic | Female | 1 | 9.10 | 4.07 | 20.35 | 5.38 | 0.01 |
| Hispanic | Male | 1 | 4.88 | 3.27 | 7.28 | 7.77 | 0.01 |
| Indigenous | Female | 2 | 2.55 | 1.52 | 4.26 | 3.55 | 0.01 |
| Indigenous | Male | 2 | 2.60 | 0.72 | 9.32 | 1.47 | 0.14 |
| White | Female | 3 | 5.36 | 1.76 | 16.47 | 2.94 | 0.01 |
| White | Male | 4 | 2.22 | 1.95 | 2.53 | 11.86 | 0.01 |

*Note. K = Number of studies.*

**Table 8. Cause of Premature Mortality with Gender, Data Source and Country Comparisons**

| Cause | Gender | Data Source | Country | *K* | *OR* | 95% CI Lower Limit | 95% CI Upper Limit | *Z*-value | *p*-value |
|---|---|---|---|---|---|---|---|---|---|
| Organic | | | | 18 | 2.06 | 1.502 | 2.83 | 4.47 | 0.01 |
| Unnatural | | | | 26 | 3.97 | 2.226 | 7.07 | 4.68 | 0.01 |
| Organic | Female | | | 5 | 3.33 | 2.342 | 4.72 | 6.72 | 0.01 |
| Unnatural | Female | | | 11 | 6.46 | 2.354 | 17.70 | 3.62 | 0.01 |
| Organic | Male | | | 6 | 2.47 | 1.818 | 3.36 | 5.77 | 0.01 |
| Unnatural | Male | | | 10 | 3.26 | 1.517 | 7.00 | 3.03 | 0.01 |
| Natural | | Community | | 4 | 2.23 | 1.109 | 4.48 | 2.25 | 0.02 |
| Natural | | Ex-prison | | 10 | 2.01 | 1.391 | 2.91 | 3.72 | 0.01 |
| Natural | | PLCG | | 4 | 1.97 | 1.513 | 2.57 | 5.04 | 4.72 |
| Unnatural | | Community | | 6 | 1.62 | 1.252 | 2.10 | 3.67 | 0.01 |
| Unnatural | | Ex-prison | | 15 | 5.05 | 2.281 | 11.17 | 4.00 | 0.01 |
| Unnatural | | PLCG | | 5 | 5.22 | 1.95 | 13.96 | 3.29 | 0.01 |
| Organic | | | Australia | 3 | 2.26 | 1.02 | 5.02 | 2.01 | 0.05 |
| Organic | | | Finland | 5 | 2.43 | 1.44 | 4.09 | 3.34 | 0.01 |
| Organic | | | France | 1 | 1.11 | 0.95 | 1.30 | 1.26 | 0.21 |
| Organic | | | Netherlands | 2 | 1.95 | 1.34 | 2.82 | 3.51 | 0.01 |
| Organic | | | Russia | 1 | 1.51 | 0.92 | 2.48 | 1.63 | 0.10 |
| Organic | | | Sweden | 2 | 1.64 | 0.66 | 4.07 | 1.07 | 0.28 |
| Organic | | | UK | 1 | 2.41 | 2.01 | 2.89 | 9.49 | 0.01 |
| Organic | | | USA | 3 | 2.08 | 1.70 | 2.55 | 7.15 | 0.01 |
| Unnatural | | | Australia | 3 | 2.29 | 1.25 | 4.18 | 2.70 | 0.01 |
| Unnatural | | | Finland | 7 | 4.71 | 2.32 | 9.56 | 4.29 | 0.01 |
| Unnatural | | | France | 1 | 4.50 | 4.02 | 5.03 | 26.39 | 0.01 |
| Unnatural | | | Netherlands | 2 | 2.65 | 1.11 | 6.33 | 2.19 | 0.03 |
| Unnatural | | | Russia | 1 | 1.07 | 0.92 | 1.24 | 0.81 | 0.42 |
| Unnatural | | | Sweden | 2 | 5.01 | 0.33 | 76.33 | 1.16 | 0.25 |
| Unnatural | | | UK | 3 | 12.97 | 5.37 | 31.34 | 5.69 | 0.01 |
| Unnatural | | | USA | 7 | 3.04 | 2.18 | 4.23 | 6.58 | 0.01 |

*Note. PLCG = Population Level Control Group*.

## Chapter 4: A Systematic Review and Meta-Analysis of Offending versus Suicide in Community (Non-Psychiatric and Non-Prison) Samples[9]

### Introduction

From the preceding CSDD analyses, meta-analyses and literature reviews in Chapters 1, 2 and 3, we can see that a voluminous but still incomplete knowledge base has emerged from research investigating the inter-relationships between health, mortality, and offending. Researchers report that community offenders run a higher risk of mortality (of all causes) compared to nonoffenders. Suicide amongst non-institutional groups, has, however, to date been accorded limited attention compared to correctional sample-based studies and no systematic reviews or meta-analyses of longitudinal literature exist (Sirdifield, Brooker & Marples, 2020).

It is well-established that prisoner suicide rates are elevated compared with age-matched general populations (Fazel & Baillargeon, 2011; Fazel et al., 2011; Fazel, Ramesh & Hawton, 2017). For example, the suicide rate of male prisoners in England and Wales between 1973 and 2003 was found to be 5 times higher than that of the general population (Fazel et al., 2005) and 8 times higher in American Jails (DuRand et al., 1995) and is the second biggest cause of death (Noonan, Rohloff, & Ginder, 2015). It is also important to consider the range of behaviours that are linked to completed death by suicide, such as self-harm (with and without suicidal intent) and parasuicide (Gelsthorpe, Padfield & Phillips, 2012; Phillips et al., 2018). For example, in a recent global scoping review, Borschmann and colleagues (Borschmann et al., 2020) found the prevalence of suicidal behaviours was markedly higher among detained adolescents than among adolescents in the general population. In detained adolescents, the prevalence of suicide attempts was 1.9% - 6.6% during the past month and 13.3 – 35.0% during the past year. Lifetime prevalence in detained adolescence of death by suicide was 17.6% - 32%.

In terms of gender comparisons, both men and woman prisoners are more likely to commit suicide than the wider population, with females 20 times more likely than non-offenders in the general population (Benning & Fazel, 2009). Borschmann et al. (2020) similarly found the

[9]Skinner, G. C. M., & Farrington, D. P. (2020b). A systematic review and meta-analysis of offending versus suicide in community (non-psychiatric and non-prison) samples. *Aggression & Violent Behaviour, 52,* 1359-1789. doi: 10.1016/j.avb.2020.101421.

lifetime prevalence of suicide attempts ranged from 4.0% to 29.4% for males and from 20.8% to 51.1% for females.

There are also a significant number of studies which have examined risk factors for suicide in custody (Dooley, 1990; Fruehwald et al., 2004; Shaw et al., 2003; Shaw et al., 2004; Towl et al., 2002). For example, individual contributing factors can encompass psychiatric illness, substance misuse, and repetitive self-harm as important risk factors for suicide (Fazel, Wolf & Geddes, 2013; Hawton, Linsell, Adeniji, Sariaslan & Fazel, 2014).

As mentioned within the introduction, and reiterated here, the risk of suicide in recently discharged forensic psychiatric patients is also high, as demonstrated by Fazel et al.'s (2016a) meta-analysis, which contained 6 studies investigating suicide, finding a crude death rate of 325 per 100,000 person-years (95% CI 235–415). One study within this meta-analysis, Lund et al. (2013), reported that mentally disordered offenders sentenced to non-custodial sanctions had a crude death rate (CDR) as high as 3344 per 100,000 person-years (95% CI 1923–5754), which compares to recently released prisoners without mental health issues, who were found to have a CDR of 155 per 100,000 person-years (95% CI 140-171) (Pratt et al., 2006; Zlodre & Fazel, 2012).

Work has also investigated suicide in populations of recently released offenders. For example, Phillips and colleagues (Phillips et al., 2018) found a nearly 9 times higher rate of suicide in released offenders compared to the general population within 2016 U.K. HM Prisons and Probation service data, investigating individuals still under the supervision of a state body i.e., the Probation Service. There is further substantial evidence suggesting that experiences within jails can condition the likelihood of suicide after release (Haney, 2001). King et al. (2015) also found that 13% of suicides in the general population were, or had recently been, under some form of monitoring by the criminal justice system, stating that there was a "…significantly elevated suicide risk among individuals who had: received a police caution, recently been released from prison, recently completed a supervised community sentence, served other community disposals, been remanded as a suspect on police bail and dealt with no further action" (King et al., 2015: 175). Indeed, the most typical non-natural death in released prisoners is suicide (Binswanger et al., 2011).

Additionally, Sirdifield et al. (2020), within their review of 5125 relevant papers in the field of suicide and probation, found that that probationers were at elevated suicide risk with causes ranging from substance abuse to mental wellbeing and poor physical health. This is important because numbers of probationers in England and Wales were 261,196 as at 30 June 2018 and this was larger than those incarcerated at that time (Ministry of Justice, 2018). Sirdifield and colleagues (2020) go on to state that offenders on probation have highly complex health needs when compared to the general population, and that this can be compounded by social issues such as homelessness and unemployment (Binswanger, Stern, Yamashita, Mueller, Baggett & Blatchford, 2016; Brooker, Sirdifield, Blizard, Denney, & Pluck, 2012; Brooker, Syson-Nibbs, Barrett, & Fox, 2009; Pari, Plugge, Holland, Maxwell, & Webster, 2012). They conclude that their study indicates that there is a high risk of those on probation committing suicide, a fact that they argue has subsequently been confirmed by other studies (Philips et al., 2018). They reconfirm that causes include drugs, especially mental health, and poor physical health, but these are integrated and complex in their influences (Bertolote & Fleischmann, 2002).

The risk factors associated with suicide are wide-ranging and complex. For example, research has shown that offenders have more generally experienced poor physical and mental health, lead disrupted lives and use drugs (Mills, 2004; Brooker et al. 2009; Canton, 2008; Singleton, Pendry, Taylor, Farrell, Marsden, 2003; Brooker & Sirdifield, 2013; Denney, Tewksbury & Jones, 2014). This is relevant because this underpins poor mental wellbeing which, in turn, has been shown to be a cause of suicidal natures (Arsenault-Lapierre, Kim & Turecki, 2004). Indeed, Bertolote and Fleischmann (2002) estimated that 90% of all suicides had a diagnosable mental health disorder, most commonly depression, psychosis, and substance misuse (depression combined with alcohol misuse is the most common diagnoses of all). The range of factors that potentially raise the risk of suicide is vast, and includes coping skills, psychiatric treatment/medication, attitude to self, accidental traumatic injury, childhood abuse/trauma, current psychological problems, depression, and a history of close relationship difficulties (Borril, Cook & Beck, 2017; Cook & Borrill, 2015; King, 2011; Phillips et al., (2016) also make clear that factors beyond mental wellbeing – including life history, despair and inequalities – play their role in creating a heightened risk of serious self-harm (Jones & Maynard, 2013; Byng et al, 2015).

However, findings within the current literature are often subject to variations within the groups in respect of other factors, including mental health issues and early-life suicide attempts which

have not been controlled for, and may create a pertinent stimulus for suicide, which draw into question the causality of suicide in offender populations (Powis, 2002).

Powis (2002) goes on to question some of the assumptions that often underpins the assertion that mental health alone increases the suicide risk in prisoners (Towl & Crighton, 2000). She cites the definitional difficulties of comparing incarcerated people with the general population, and the potentially inaccurate diagnosis of mental conditions which makes comparisons unreliable (Sattar, 2001; Towl & Crighton, 2000). In a similar criticism of being too ready to adopt obvious explanations, Powis (2002) says that, while substance abuse in prisons has often been linked to suicide, the sheer prevalence of this behaviour calls into question its specificity in respect of suicide (Haycock, 1989; Karp, Whitman & Convit, 1991; Wilkins & Coid, 1991). In a sign of the importance of individual factors in the analysis of suicide causation, Crighton (2000) points to concerns that such headings may in fact have a large number of constituent 'interacting and intervening variables'. These may include separation from mothers, prior physical and sexual abuse (Rieger, 1971; Liebling, 1991; Wilkins & Coid, 1991).

It is therefore important in future work to disentangle the impact reported histories mental health have, where possible, and control for these factors on suicide in community offenders. As noted in Chapter 3 by Phillips and colleagues (2018, p.1) the paucity of studies "is concerning" (Phillips et al., 2018, p. 1) and evidence specifically "…concerning community-based offenders' suicide risk is sparse" (King et al., 2015, p. 175).

Of the little research conducted on suicide within community offenders, it seems likely that offenders in the community are at least as high risk of self-harm or suicide as those in prison (Bluck & Brooker, 2014). There is therefore a need for a systematic investigation of suicide in community offenders, controlling for mental illness, drug use and violence.

## Current Study

Suicide amongst non-institutional groups to date, as highlighted above, has been accorded comparatively less investigation than correctional and psychiatric secure sample-based studies. It is clear that offenders with a history of mental health issues have a higher likelihood of suicide than controls without mental illness. What is less known, is the risk of suicide for community (non-institutional) offenders without psychiatric histories, compared with non-offender comparisons (Elonheimo, Sillanmaki & Sourander, 2017; Nieuwbeerta & Piquero,

2008). As offender populations are largely drawn from socio-economically deprived backgrounds, with reduced access to health care and possible avoidance-based health-seeking behaviour when living in the community, community offenders may be at heightened risk of death by suicide. This thesis is the first research to systematically and meta-analytically analyse the risk of suicide in offenders who are not, or who are no longer, incarcerated, and who do not have a recorded history of psychiatric disturbance.

## Method

In line with PRISMA guidelines, 6 computer-based literature indexes were searched using a TITLE-ABSTRACT-KEYWORD strategy within Web of Science (including SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC), Criminal Justice Abstracts, Google Scholar, PsychInfo, and MEDLINE through all years with no language restrictions. In all databases, the same keywords were used in multiple combinations: Suicide AND offend* AND OR crim* OR delinquen* OR violence OR prison* OR incarce* OR felon*OR detain* OR jail* OR penal* OR custod*. 32 journals were hand searched, which are presented in Table 1.

The inclusion criteria for studies were (1) a sample of offenders who were not incarcerated at the time of measurement, (2) a comparison of offenders with non-offenders, (3) data reporting cause-specific deaths, or mortality rates as a result of suicide, for the whole sample, or for a subset selected according to age, gender, or race/ethnicity. Studies were excluded if samples were selected by a variable (e.g., substance misuse) other than age, gender, ethnicity, or geographical area. Secure Forensic Psychiatric samples, samples where individuals had a clinical level of mental illness, and samples with a focus on substance misuse were not included.

Eligible publications obtained via database, hand, author and citation searches were exported to EndNote™ (v.7.0.2) Referencing Management Software. Duplicates were removed by this software with assisted manual discretion. All unique results were screened according to the abstract for general relevance to the review aims. The reliability of coding of included papers was established using an independent coder, with high levels of agreement. Inter-coder reliability for inclusion versus exclusion was $k = 0.88$. In the case of discrepancy, the full text of the paper was screened in order to make a final decision.

Outcome data was extracted or Odds Ratios (*OR*) calculated for each study, which will tell us how much more or less likely an offender is of dying before their non-offender comparisons. Hazard Ratios (*HR*) and Risk Ratios (*RR*) were converted using the following formulae:

$$RR = \frac{1 - e^{HR*ln(1-r)}}{r}$$

Where r is the rate for the reference group (Shor et al., 2017*).*

$$OR = \frac{(RR - P_0 * RR)}{(1 - P_0 * RR)}$$

Where $P_0$ = baseline risk or prevalence.

The standardized mean difference (*SMD*), or Cohen's *d*, was also calculated for the main results. The following formula was used:

$$SMD = ln(OR) * \frac{\sqrt{3}}{\pi}$$

Where reported, data was extracted on geographical location, age (to be conceptualised as 'Time at Risk'), sample and comparison group types. Random effect models were used to account for heterogeneity of study effects. Random effects meta-analyses were performed to establish whether offenders were more likely to commit suicide compared to non-offenders. Mixed effects analyses were used to investigate whether different data sources and community offender types result in differences in effect size. Moderator analyses across levels of country were run, comparing effects for different countries. Age was used as a continuous variable and meta-regressions were performed to see whether age impacted the odds of suicide.

The following moderators were used: quality of the study measures and design, sample size, and age and sex of the participants. In Table 2 the 'Risk of Bias' quality assessment is presented. Criteria for rating quality of studies were based on the Cochrane Handbook for

Systematic Reviews (Higgins, Altman & Sterne, 2011), and some meta-analysis papers using quality ratings (Hughes et al., 2017; Pasricha et al., 2013; Cipriani et al., 2016; Van IJzendoorn et al., 2020).

Reliability of the quality assessment was established at the outset of the project using an independent coder, with high levels of agreement across all categories ($N$ = 10 studies): 'Convenience Sampling', $K$ = 0.98; 'Heterogeneous Groups', $K$ = 0.78; 'Unreliable Measures', $K$ = 1.00; 'Selective Reporting', $K$ = 0.71. Overall interrater reliability at this stage was $K$ = 0.84. Midway through the quality rating, a second round of interrater reliability checks were conducted with a third independent coder ($N$ = 20). This served the purpose of ensuring that no coder drift was present, and to establish the reliability of a new category we added ('Unrepresentative Sampling').

High levels of agreement were found across almost all categories: 'Unrepresentative Sampling', $K$ = 1.00; 'Convenience Sampling', $K$ = 0.77; 'Unreliable Measures', $K$ = 0.74; and 'Selective Reporting', $K$ = 0.63. The overall interrater reliability was $K$ = 0.77. Pearson's correlation coefficient was used to calculate interrater reliability of continuous study characteristics between three independent coders on 20 studies. Average reliability for sample size was $r$ = .92. Average interrater reliability for age was $r$ = .84. Meta-regression showed that quality of the measures and design of the studies did not moderate effect sizes within developmental domains. The "trim and fill" method (Duval & Tweedie, 2000a, 2000b) and Egger's regression test to explore potential publication bias also did not show large bias.

## Results

15 studies met our review criteria, reporting on $N$ = 602,347 persons. Figure 1 shows a flow diagram of the searches. Table 3 provides a description of included studies and Table 4 provides descriptions of studies which were excluded.

Table 5 shows that community offenders were significantly more likely to commit suicide compared with non-offenders ($OR$ = 4.54, $Z$ = 3.89, $p$ < 0.01, $d$ = *0.36,* $U_3$ = 64.06%). Figure 2 shows that time at risk was not significantly related suicide in offenders (β = 0.07, $SE$ = 0.05, $Z$ = 1.53, $p$ = 0.13).

The type of community offender and sample group used also created significantly diverging effect sizes**.** Table 6 shows that only one study utilizing a longitudinal **c**ommunity sample was found, and offenders in this sample had the lowest likelihood of committing suicide (*OR* = 2.90). When comparing offenders with general population samples, dramatically higher odds of suicide were found (*OR* = 7.62). Ex-prisoners, when also compared to the general population, also had extremely high odds of suicide (*OR* = 4.18). Table 7 shows that offenders in different countries also had differing likelihoods of suicide, with Swedish offenders having the highest likelihood of suicide (*OR* = 25.06).

## Discussion

The prevalence of suicide in the general population across the world is high, accounting for 800,000 deaths each year, representing 1.4% of all deaths worldwide, making it the 18th leading cause of death in 2016 and the 2nd leading cause of death for 15-29 year olds (WHO, 2018). With this in mind, the fact that our results show that offenders are over four times the odds of committing suicide than non-offenders is significant.

The results in this Chapter show, compared to the general population, that community offenders in general have a significantly elevated likelihood of suicide at any function of time at risk. Ex-prisoner samples, which also utilize general population comparisons, have as high odds of suicide as expected, but significantly less than offenders who have not been incarcerated when compared with the general population. Interestingly, similar findings relating to ex-prison samples have been reported. For example, King and colleagues (King et al., 2015) found that suicide risk was highest for those who had avoided prosecution - although King et al. (2015) did not control for mental health histories in the same way the study in this Chapter did.

Elonheimo et al. (2009) has theorized that ex-prisoners in particular have such a high likelihood of mortality by suicide compared to non-offenders due to their lack of willingness to engage with the health and social care system for assistance. For example, Lund et al. (2013) also found differences between groups in their sample, with the CDR of mentally disordered offenders sentenced to prison being 1274 per 100,000 person-years (95% CI 746-2168), and a CDR of 3344 per 100,000 person-years (95% CI 1923-5754) for mentally disordered offenders sentenced to non-custodial sanctions.

Furthermore, as discussed previously, Tremblay and Pare (2003) present a 'strain-hazard' model. This formulation is proposed by the authors to cover that percentage of the criminal population who have poorer health and die prematurely "…because they want to" (p. 313), conceptualising crime, in itself, as a cause of severe strain and even of making life "not worth living any more" (Lemert, 1967, p. 131). Such theoretical considerations, in addition to cumulative reintegration barriers for ex-prisoners, could be used to explain our findings in this Chapter, where offenders were more likely to commit suicide, even when mental illness histories were excluded. Tremblay and Pare (2003) argue that this characteristic is evidenced in Lattimore et al.'s (1997) mortality study of long-term inmates compared to young males in the general population. Early death was found, both self-inflicted and accidental, far more often in the former group. The findings in this Chapter extend these theorizations, suggesting that offending *in itself*, even when individuals are not incarcerated, may act as a similar stressor to induce feelings of despair which ultimately leads to the higher likelihood of suicide than their non-offending general population and community comparisons.

It may well be that offenders who are incarcerated receive higher levels of mental health treatment, and offenders within forensic psychiatric inpatient services, despite their higher risks, have far greater safeguards, monitoring and risk assessments put in place. Indeed, Fazel et al. (2016a), found within their meta-analysis of patients following discharge from secure psychiatric hospitals, that 39% of all deaths were due to suicide; the total number of deaths was 368, of which 143 were suicides. Based on the $U_3$ value, 64.06% of our total sample of community offenders were at a high likelihood of death by suicide. Those leaving prison, or community offenders who live antisocial lifestyles and commit lower-level offenses, may slip through the net of mental health services. Interestingly, time at risk was not significant within the meta-regression, highlighting the risk of premature mortality due to suicide *at any age* and length of offending history or interaction with the criminal justice system.

The fact that one community longitudinal study produced an odds ratio that was so much lower than studies which used population wide control groups does not necessarily mean that there were fewer absolute numbers of suicides. Rather, this may mean that all individuals are more predisposed to committing suicide within certain communities. Environmental factors, and socioeconomic status in particular, are well established as associated with increased levels of premature mortality (Cohen, Mason, Bedimo, Scribner, Basolo & Farley, 2003; Melchior et

al., 2006; Stringhini et al., 2017) may also contribute to suicide – although there is mixed evidence to support this expectation (Rehkopf & Buka, 2006).

This study sought only to address the likelihood of suicide in individuals with no recorded histories of mental illness, deliberately excluding psychiatric samples which have been robustly linked to premature mortality, especially by suicide. As noted in Chapter 3, although every effort was made, including contacting authors for clarification, individuals who were not held in forensic or secure hospitals or who had sub-clinical levels of mental illness, such as individuals with antisocial personality disorder and conduct disorder, are likely to have been included in some studies and categorised as 'not having a mental health illness'. Therefore, it is not guaranteed that our samples of community offenders had no mental health problems. Mental illness in general is chronically underreported and is likely to be an acute issue in community offenders, who often do not seek help or engage with healthcare services (Elonheimo et al., 2009).

These results must be interpreted cautiously in the light of the small number of studies informing our analysis and conclusions. For example, we only have one longitudinal community sample and our analysis of differences between countries also tend to come from single studies which differ greatly in their scale (see Table 3 for a full description). Our results are also likely to provide an underestimate of suicide risk, with many studies not specifically reporting on suicide as a cause of death, and those that did report not including open verdicts. The present study could not compare ex-prisoners and community offenders on criminal histories and socio-demographic or other risk factors. Therefore, we do not know why community offenders and non-offenders differ in their likelihood of suicide, or why community offenders have a greater likelihood of suicide than ex-prisoners. Offenders Index data would have been helpful to make more nuanced comparisons between offenders.

Unfortunately, too few studies contained mortality data split by gender for analysis. It would have been interesting to see whether community offender statistics regarding suicide match non-offender gender differences in suicide prevalence, with males at greater risk (Moller-Leimkuhler, 2003), or whether they would agree with previous offender mortality research which highlights the enhanced risk of females (Elonheimo et al., 2017).

Comparing results to worldwide suicide data must also be considered carefully. This sample was predominantly from high-income countries. Suicide is particularly prevalent in low- and middle-income countries, with 79% of suicides worldwide in 2016 occurring in this category (WHO, 2018). Future work needs to utilize low- and middle-income countries to assess the mortality and suicide risk of offenders, which we expect to be considerably higher. Similar to the discussion given above in Chapter 3, there seems to be multiple theories interpreting premature mortality, and suicide as a cause of mortality, which may be useful in explaining why this relationship exists. However, as concluded in Chapter 3, these theories do not form a coherent picture as of yet.

## Conclusion

This study highlights that community offenders, especially those who do not have the monitoring networks put in place following prison, and compared to the general population, are at extremely high risk of suicide and represent an extremely under-researched sub-group of offenders. Further research needs to be conducted to investigate the mediating factors between offending and suicide, and to explore gender, ethnic, offender type differences and risk factors within the community.

Community offenders form a vulnerable group which require targeted intervention to reduce their incidence of suicide across the lifespan. The anti-social lifestyles that offenders often lead, when out of secure environments, pose a significant risk to health, and preventing this 'delinquent way of life' should be viewed as a future public health challenge (West & Farrington, 1977). A shared responsibility lies with the prison, probation, health and social services to develop more collaborative practices in providing services for this high-risk group.

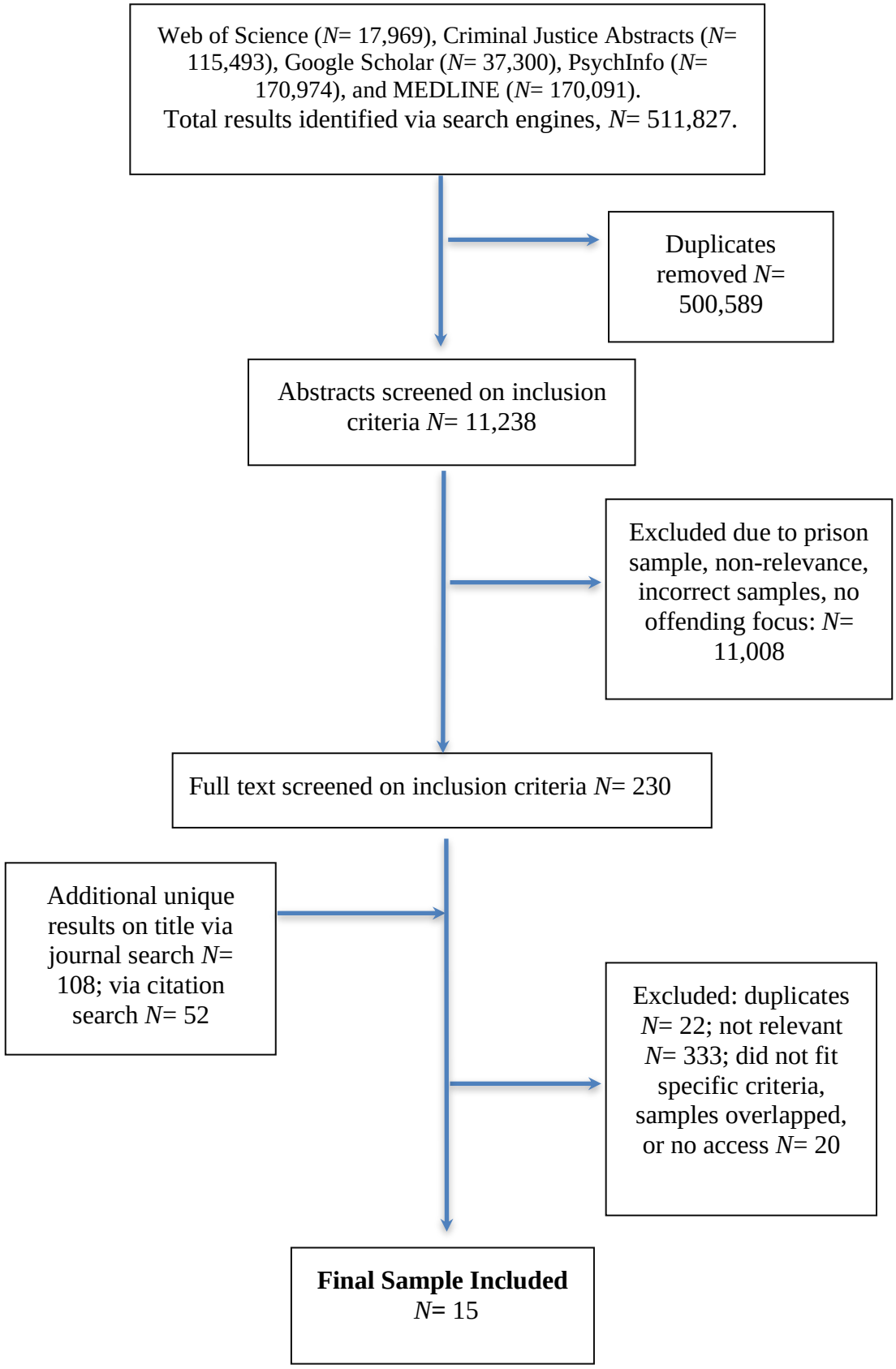


**Figure 1. PRISMA Flow Diagram of Searches.**

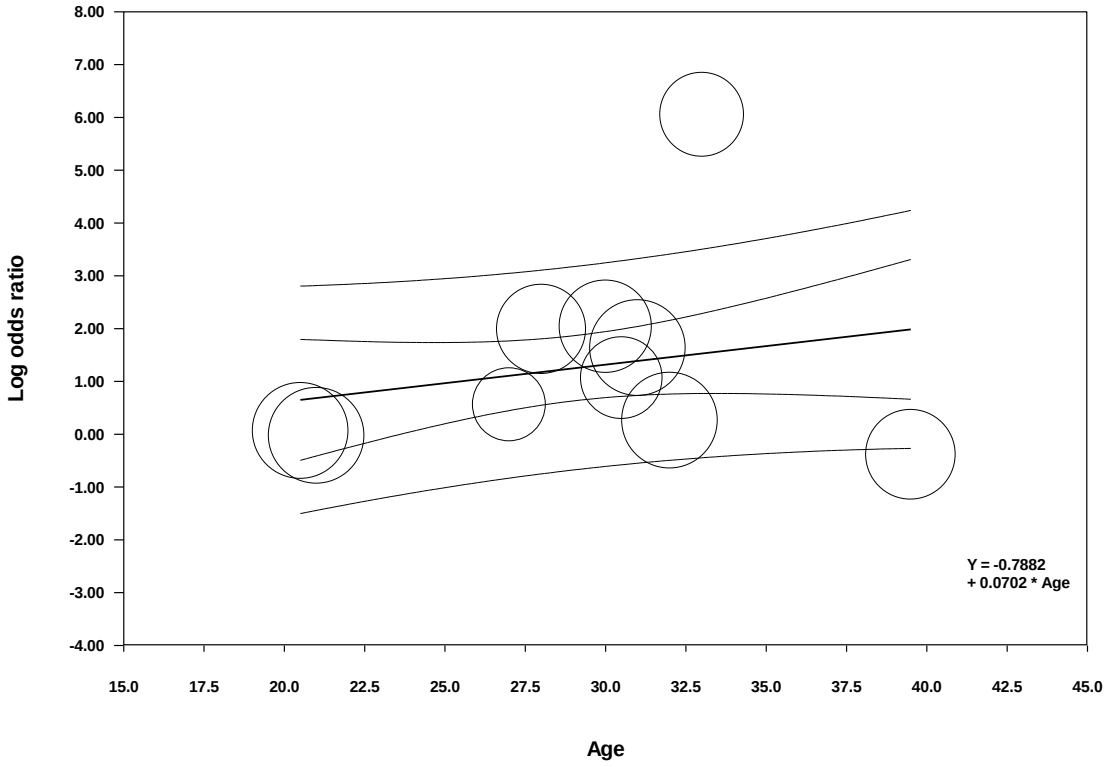


**Figure 2. Meta-Regression of Log odds ratio of Suicide in Relation to Time at Risk.**

**Table 1. List of Journals Searched**

| | |
|---|---|
| Aggression and Violent Behaviour | Deviant Behavior |
| Aggressive Behaviour | European Journal of Public Health |
| American Journal of Psychiatry | International Journal of Behavioral Development |
| British Journal of Clinical Psychology | Journal of the American Medical association |
| British Journal of Developmental Psychology | Journal of Child Psychology and Psychiatry |
| British Journal of Psychiatry | Journal of Experimental Criminology |
| British Medical Journal | Journal of Interpersonal Violence |
| Child Abuse & Neglect | Journal of Youth and Adolescence |
| Child Development | Justice Quarterly |
| Child Psychiatry and Human Development | Psychology, Crime, and Law |
| Clinical Psychology Review | Scandinavian Journal of Psychology |
| Criminal Justice and Behaviour | Archives of Suicide Research |
| Crisis – The journal of Crisis Intervention and Suicide Prevention | Trauma, Violence and Abuse |
| Developmental Psychology | Victims and Offenders |
| Developmental and Psychopathology | Violence and Victims |
| Suicide and Life-Threatening Behavior | Psychological Medicine |

**Table 2. Risk of Bias Quality Coding Table**

| Type of Bias | Description | Relevant Domains within our 'Risk of Bias' assessment |
|---|---|---|
| Selection Bias<br><br>Convenience sampling yes/no | Systematic differences between baseline characteristics of the groups that are compared. | E.g. convenience samples; random-sample; whole-population approach; self-reports; control groups; sample size – continuous variable |
| Performance Bias<br><br>Heterogeneous groups yes/no | Systematic differences between groups in terms of (assessment of) moderators, mediators and confounding exposures. | E.g. combination of different group sizes or different types of care in one effect size. |
| Attrition Bias<br><br>Systematic drop out differences (no intent to treat) yes/no | Systematic differences between groups in withdrawals from a study. | E.g., drop outs in longitudinal studies; refusal to take part in the study. |
| Detection Bias<br><br>Reliability of measures yes/no | Systematic differences between groups in terms of assessment of outcome measures. | E.g., reliability and validity of established measures used. |
| Reporting Bias<br><br>Selective reporting yes/no | Potentially systematic differences in effect sizes between reported and unreported findings. | E.g., selective reporting of outcomes (one subscale of an instrument); publication bias. |

*Note*. Quality assessment scoring: 1=bias absent; 0=bias reported or inferred. This assessment for the quality of studies was based upon the Cochrane Handbook for Systematic Reviews, and previously described methods within meta-analyses published in the Lancet.

**Table 3. Description of Studies Included in Meta-Analysis of Suicide by Community Offenders (*N* = 15)[10]**

| Authors, Date, *N* | Description | Method |
|---|---|---|
| Coffey et al. (2003), *N* = 2,849 | The authors estimated the overall and cause-specific standardized mortality ratios in young offenders. | Comparison of mortality data in cohort of young offenders. The cohort contained young offenders aged 10-20 years with a first custodial sentence from 1 January 1988 to 31 December 1999. Deaths were ascertained by matching with the national death index, a database containing records of all deaths in Australia since 1980. Death rates in the reference Victorian population were used to calculate standardized mortality ratios. |
| Dirkzwager et al. (2011), *N* = 597 | The authors examined the effects of first-time imprisonment on post-prison mortality. | Data was used from a longitudinal study examining criminal behaviour and mortality over a 25-year period in a representative group of 2,297 Dutch offenders. Of these offenders, 597 were imprisoned for the first-time in their lives in 1977. The remaining 1,700 offenders received a noncustodial sentence. Ex-prisoners' mortality rates and causes of death are compared with those in the general population and those in a matched control group of non-imprisoned offenders. Propensity score matching is used to minimize selection bias. Odds ratios with 95% confidence intervals are used to examine whether mortality among the ex-prisoners differed significantly from the general population or from the non-imprisoned controls. |
| Elonheimo et al. (2017), *N* = 2,304 | This paper studied the associations between investigated offending, death, and causes of death in a nationally representative birth cohort. | A broad concept of offending was used such that people who had had any contact with the police because they had been suspected of crime were included. Offending data was obtained from the National Police Register for 5405 men and women born in Finland in 1981, spanning the ages 15–30 years. Mortality data was received from Statistics Finland. Offending was classified into four categories by frequency: none, 1–4 different offence contacts, 5–27 and 28 or more. Causes of death were categorized into natural, accidents, suicide or homicide. Of the cohort, 2304 (43%) had offended and 57 (1.1%) had died. Associations between offending, mortality and causes of death were analysed, |

[10]This search was completed at the end of 2018. Any papers published after this date would not have been found during the systematic searches and could not be documented in this table. Study Descriptions are verbatim in places.

| | | |
|---|---|---|
| | | controlling for parental education level and family structure in childhood. |
| Graham (2003), *N* = 25,469 | The extent and nature of unnatural death among people who were released from Victorian prisons between January 1990 and December 1999 was examined. | A total of 820 men and women released during January 1990 and December 1999 in Australia were identified as having died unnatural deaths while not imprisoned prior to July 2000. |
| Joukamaa (1998), *N* = 903 | This paper compared the mortality of released prisoners and the general population. The study forms a part of the Health Survey of Finnish Prisoners (the WATTU Project). | A sample of 5903 males, representing all Finnish male prisoners, underwent a thorough health survey in 1985. A 7-year follow-up study was performed by means of gathering register data (deaths, hospital care, diseases leading to working incapacity). A population-based age-selected control group was formed for comparison. |
| Lindqvist et al. (2007), *N* = 146 | The authors examined whether the mortality rate, as well as cause and manner of death, of homicide offenders is different from the general population. | An incidence cohort of Swedish homicide offenders from 1970 to 1980 (*N* = 153) was re-examined by computerized record linkage with the National Cause-of-Death Register for the period between trial and 1 October 2002, i.e. 22-32 years after the offence. Death certificates were analysed, and standard procedures for calculating Standard Mortality Rate (SMR) and survival analysis were employed. |
| Lize et al. (2015), *N* = 88 | The risk of violent death, specifically homicide and suicide, was investigated within this study (USA). | Data on inmates released from the North Carolina Division of Adult Corrections (*N* = 476) matched to the Violent Death Reporting System were analysed to estimate rates and demographic and criminal justice-related predictors. |
| Nieuwbeerta & Piquero (2008), *N* = 4,109 | This article examined the relation between criminal conduct and mortality rates in the Netherlands using data from the Criminal Careers and Life Course Study (Netherlands). | It traced the life course and criminal careers of 4,615 males and females convicted in 1977 up until 2002. The causes of deaths that occurred during this 25-year period were examined using data from the Netherlands Statistics. |
| Pratt et al. (2006), *N* = 244,988 | The authors undertook a population-based cohort study to investigate suicide rates in recently released prisoners in England and Wales. | They used the database of the National Confidential Inquiry into Suicide and Homicide by People with Mental Illness for England and Wales to identify all individuals who died by suicide or who received an open verdict at the coroner's inquest between 2000 and 2002. These records were linked to a Home Office register to identify all such deaths in people within 1 year of release from prison in England and Wales. They compared suicide rates per 100,000 person-years in these released prisoners with rates in the |

| | | |
|---|---|---|
| | | general population by using the indirectly age-standardized mortality ratio. |
| Pridemore (2014), *N* = 375 | This study examined the risk of male premature mortality associated with incarceration. | Data came from the Izhevsk (Russia) Family Study, a large-scale population-based case-control design. Cases (*N* = 1,750) were male deaths aged 25 to 54 in Izhevsk between October 2003 and October 2005. Controls (*N* = 1,750) were selected at random from a city population register. The key independent variable was lifetime prevalence of incarceration. They used logistic regression to estimate mortality odds ratios, controlling for age, hazardous drinking, smoking status, marital status, and education. |
| Putkonen et al. (2001), *N* = 132 | The mortality of female homicidal offenders has scarcely been studied. The aim of this study was to examine the mortality of homicidal women in Finland using a representative nation-wide material. | Their data consisted of all 132 Finish women who underwent forensic psychiatric examinations after committing homicide or attempted homicide in 1982-1992. They analysed their rate and cause of death during follow-up using standardized mortality ratios (SMRs) and the official classification of death. |
| Rosen et al. (2008), *N* = 168,001 | The authors compared mortality of ex-prisoners and other state residents to identify unmet health care needs among former prisoners. | They linked North Carolina prison records with state death records for 1980 to 2005 to estimate the number of overall and cause-specific deaths among male ex-prisoners aged 20 to 69 years and used standardized mortality ratios (SMRs) to compare these observed deaths with the number of expected deaths if they had experienced the same age-, race-, and cause-specific death rates as other state residents. |
| Sattar (2001), *N* = 141,102 | Previous studies of deaths of offenders have usually focussed on deaths in prisons. This study investigated all violent deaths of offenders under the supervision of the criminal justice system, both those in custody and those under the supervision of the National Probation Service. | The raw death rates and standardized mortality ratios for over 1,250 deaths of UK community offenders during 1996 and 1997 were compared with the general population rates from the Office of National Statistics. |
| Stewart et al. (2004), *N* = 9,455 | The authors compared the risk of death in a cohort of Western Australian released prisoners with the risk experienced by the general population of Western Australia. | A cohort study of prisoners in Western Australia whose last date of release ranged from 1 January 1994 to 1 January 1999. Overall mortality and cause of death were determined by data linkage to the Registrar General's record of deaths. |
| Teplin et al. (2014), *N* = 1829 | This study utilized the Northwestern Juvenile Project, a prospective longitudinal study of health needs and outcomes of a stratified random sample of 1829 youth (657 females, 1172 males; 524 Hispanic, 1005 African American, 296 non-Hispanic white, 4 other | Data on risk factors were drawn from interviews; death records were obtained up to 16 years after detention. The authors compared all-cause mortality rates and causes of death with those of the general population. Survival analyses were used to examine |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | race/ethnicity) | detained | between | 1995 | and | 1998. | risk factors for mortality after youth leave detention. They compared standardized all-cause mortality rates and specific causes of death between their study sample and the Cook County, Illinois, general population. They estimated mortality rates in their sample by calculating the deaths per 100 000 person-years lived during the intervals 15 to 19, 20 to 24, and 25 to 29 years of age. Because selected strata were oversampled, they used sampling weights to estimate mortality rates that reflect CCJTDC's population; 95% confidence intervals (CIs) were estimated by using the jack-knife method. They estimated all-cause mortality rates in Cook County by using the single decrement period life table method. To make contemporaneous comparisons between their cohort data and period data from Cook County, they created 3 synthetic cohorts from the years 2000, 2005, and 2008. They standardized Cook County rates to reflect the racial/ethnic and gender distribution of the CCJTDC population; 95% CIs were based on the Poisson distribution. They used the delta method to compute rate ratios comparing mortality rates and specific causes of death. |

**Table 4. Studies Excluded in the Meta-Analysis of Suicide by Community Offenders (*N* = 69)[11]**

| Authors, Date, N | Description | Method | Reason for Exclusion |
|---|---|---|---|
| Aalsma et al. (2016), *N* = 49,470 | This study aimed to determine how early mortality among youth offenders varies based on race; gender; and the continuum of justice system involvement: arrest, detention, incarceration, and transfer to adult courts. | Criminal and death records of 49,479 youth offenders (ages 10-18 years at first arrest) in Marion County, Indiana, from January 1, 1999, to December 31, 2011, were examined. Statistical analyses were completed in November 2014. In order to compare the mortality rate of youth offenders to that of the general population, the total number of deaths by year, race, gender, and U.S. Census age category (10–14, 15–19, 20–24, and 25–29 years) were retrieved from Marion County Public Health Department data. As in previous work on mortality, 23 youth offender deaths were subtracted from total community youth deaths. | No specific information of suicide. |
| Biles et al. (1999), *N* = 7000 | The Deaths of Offenders Serving Community Corrections Orders. | This study finds that offenders serving community corrections orders, particularly parole, have an even higher probability of death than those in prison. The authors analysed data from Victoria and found that, among an average of around 7000 persons serving community corrections orders on any one day, there have been between 50 and 70 deaths per year since 1991. Between 1995 and 1998, there were 198 deaths, 62 from drugs or alcohol and 29 reported suicides. This paper identifies risks faced by these offenders, and in particular high-risk drug and alcohol behaviour. But whose responsibility is the appropriate care? There are significant issues related to duty of care, given that one-third have orders requiring no supervision. The study focuses in detail on Victoria but points out that we know very little about the issue, or about the situation in other States and Territories. A case is made for further research in other jurisdictions. | Overlaps with Graham (2003). |
| Binswanger et al. (2007), *N* = 30,237 | The authors studied the risk of death among | They conducted a retrospective cohort study of all inmates released from the Washington State Department of | No specific information of suicide. |

[11]This search was completed at the end of 2018. Any papers published after this date would not have been found during the systematic searches and could not be documented in this table. Study Descriptions are verbatim in places.

| | | | |
|---|---|---|---|
| | former inmates soon after their release from Washington State prisons. | Corrections from July 1999 through December 2003. Prison records were linked to the National Death Index. Data for comparison with Washington State residents were obtained from the Wide-ranging OnLine Data for Epidemiologic Research system of the Centers for Disease Control and Prevention. Mortality rates among former inmates were compared with those among other state residents with the use of indirect standardization and adjustment for age, sex, and race. | |
| Bird and Hutchinson (2003), *N* = 20,000 | This study investigated male drug-related deaths in the fortnight after release from Prison, Scotland, 1996-99. | The authors aimed to assess whether 486 15–35-year-old males released after 14+ days' imprisonment in Scotland, 1996–99, had a higher drugs-related death rate in 2 weeks after release than during subsequent 10 weeks; higher than expected death rate from other causes; and if drugs-related deaths in the first fortnight were three times as many as prison suicides. They used confidential linkage of an ex-prisoner database against deaths. They found that drugs-related mortality in 1996–99 was seven times higher (95% CI: 3.3–16.3) in the 2 weeks after release than at other times at liberty and 2.8 times higher than prison suicides (95% CI: 1.5–3.5) by males aged 15–35 years who had been incarcerated for 14+ days. The authors estimated one drugs-related death in the 2 weeks after release per 200 adult male injectors released from 14 + days' incarceration. Non-drugs-related deaths in the 12 weeks after release were 4.9 times (95% CI: 2.8–7.0) the 4.3 deaths expected. | No non-offender control group. They compare risk of death between prisons after 2 weeks and after 10 weeks, using drug-related deaths. |
| Bjork & Lindqvist (2005), *N* = 46 | The authors studied mortality among mentally disorder offenders in a community-based follow-up study. | This study was undertaken to estimate the standard mortality rate (SMR) of a population-based sample of people sentenced to forensic psychiatric care. All MDOs in Orebro County, Sweden, discharged from a forensic psychiatric treatment unit between 1992 and 1999 were identified (N = 46). The variables were gender, age, offence, diagnosis and duration of admission. Case linkage was made with the National Cause-of-Death register. Median follow-up time was 53 months (0-93). The sample | Referred Sample. |

| | | | |
|---|---|---|---|
| | | yielded a significantly elevated SMR 13.4 (95% CI 4.35-31.3) times higher than that in the general population, mostly due to suicide. | |
| Bjorkenstam et al. (2017), *N* = 476,103 | The authors studied the association of cumulative childhood adversity and adolescent violent offending with suicide in early adulthood. | This study examined whether adolescent violent offending mediates the association between CA and suicide in early adulthood. This was a population-based, longitudinal cohort study with a follow-up time spanning 5 to 9 years included 476 103 individuals born in Sweden between 1984 and 1988. The study population was prospectively followed up from 20 years of age until December 31, 2013, with respect to suicide. Data analysis was performed from January 1, 1984, to December 31, 2013. Register-based CAs included parental death, parental substance abuse and psychiatric disorder, parental criminal offending, parental separation, public assistance recipiency, child welfare intervention, and residential instability. Adolescent violent offending was defined as being convicted of a violent crime between the ages of 15 and 19 years. Estimates of risk of suicide after 20 years of age (from 2004 if born in 1984 and from 2008 if born in 1988) until the end of 2013 were calculated as incidence rate ratios (IRRs) with 95% CIs using Poisson regression analysis. Adjustments were made for demographics and psychiatric disorder. In addition, binary mediation analysis with logistic regression was used. A total of 476 103 individuals (231 699 [48.7%] female) were included in the study. Those with a conviction for violent offending had been exposed to all CAs to a greater extent than those with no violent offending. Cumulative CA was associated with risk of suicide in non-convicted (adjusted IRR, 2.4; 95% CI, 1.5-3.9) and convicted youths, who had a higher risk of suicide (adjusted IRR, 8.5; 95% CI, 4.6-15.7). Adolescent violent offending partly mediated the association between CA and suicide. | Compares violent offending vs non-violent offending. No non-offender comparison. |

| | | | |
|---|---|---|---|
| Brezina et al. (2009), *N* = 20,745 | The authors used a multi-methods approach to anticipate early death and youth crime. | This study used the National Longitudinal Study of Adolescent Health, also known as Add Health. A total of 20,745 adolescents between grades 7 and 12 and their parents were interviewed in Wave I between April and December 1995 and 15,197 of them were interviewed again for Wave II conducted from April 1996 through August 1996. Respondents were asked in both waves whether they had committed any of the following acts in the 12 months prior to the interview date: theft, damaging property, burglary, assault, robbery, pulling a gun or knife on someone else, and shooting or stabbing someone else. We created binary variables to indicate whether respondents engaged in each of these behaviours during the previous 12 months. Questions were also posed to individuals regarding expectations about their lifespan. Interviews with young offenders in Atlanta confirmed research detailed above on the fatalism and sense of "futurelessness" experienced by many inner-city youth. | Outcome measure is anticipation of death. |
| Bullock & Gaehl (2012), *N* = 450 | This study investigated children in care, using a long-term follow up of criminality and mortality. | This article charted the offending and mortality rates over a 25–30 year period of children admitted to care in England and Wales in 1980. The study examines UK criminal records and the Death Index for England and Wales of two groups of children: ones that stayed in care for more than two years, and ones that stayed for less than six weeks. The study showed that all of the children experienced an increased risk of offending and premature death compared with the general population but that it is not possible to evaluate the outcomes without taking account of the their characteristics and risks these pose. The rates for the subsequent offending of children presenting delinquency and other difficult behaviour, especially irregular school attendance, and who stay long in care is 2.7 times higher than for those coming into care because of neglect and abuse and 1.6 times higher than for those coming into care due to family breakdown. There was no evidence that being | Mortality is for long stay versus short stay care duration – not for offending. |

| | | | |
|---|---|---|---|
| | | in care per se reduces or increases the risk of offending, as criminal behaviour is not constant and the risks associated with it vary over time with much depending on the child's predisposition, life events and the quality of interventions received. | |
| Chassin et al. (2013), *N* = 1,354 | This study investigated distal and proximal predictors of premature mortality among serious juvenile offenders. | This study extended previous research by testing the joint contributions of distal (historical and demographic characteristics) and proximal (closer to the time of the death) predictors of mortality. It also tested whether proximal variables were potential mediators of the effects of distal variables on mortality. Participants were 1,354 serious juvenile offenders, enrolled in the Pathways to Desistance study, a longitudinal investigation of the transition from adolescence to young adulthood in serious adolescent offenders - 45 (3.32%) of whom were deceased by the completion of the study. Data were collected through self-reports and official records. Significant distal predictors of mortality were being African-American and having a history of substance use disorder. Proximal predictors that added significantly to prediction included gun carrying, gang membership, and substance use problems. Potential mediators of the effects of substance use disorder history were continuing substance use problems and gang membership. However, proximal variables could not explain the heightened risk for African-Americans. | No non-offender comparison. |
| Christensen et al. (2006), *N* = 15,885 | This study investigated mortality among Danish Drug Users released from Prison. | In order to determine the mortality of drug users after release from prison in Denmark, a cohort of drug users was identified from two national registers during 1996-2001: the drug treatment register (T) and the register of viral hepatitis (H). Incarcerations were extracted from the national penal register, vital status from the civil register, and causes of death from the death certificate register and the police register of drug-related deaths. This study then identified 15,885 drug users (T: 15,735, | Compared released drug taking offenders with drug takers within the general population. |

| | | | |
|---|---|---|---|
| | | H: 896), 62% of the estimated drug-using population in Denmark. There were 1000 observed deaths, of which 51% were classified as overdose deaths. Mortality in the treatment cohort was 2.4/100 person years (py) (95% C.I. 2.2-2.5/100 py) compared to the general population expectation of 0.2/100 py. Within the first 2 weeks after release from prison, 26 deaths were observed among 6019 released drug users corresponding to 13/100 py (95% CI 8-19/100 py). Overdose deaths accounted for 24/26 deaths (92%) in the first two weeks compared to 121/179 (68%) hereafter (p <0.001). | |
| Coffey et al. (2004), *N* = 2,849 | This study utilised a retrospective cohort study to predicting death in young offenders. | A retrospective cohort of 2849 (2625 male) 11-20-year-olds receiving their first custodial sentence between 1 January 1988 and 31 December 1999 was identified. Deaths, date and primary cause of death ascertained from study commencement to 1 March 2003 by data-matching with the National Death Index; measures comprising year of and age at admission, sex, offence profile, any drug offence, multiple admissions and ethnic and Indigenous status, obtained from departmental records. The overall mortality rate was 7.2 deaths per 1000 person-years of observation. Younger admission age (hazard ratio [HR], 1.4; 95% Cl, 1.0-1.9), repeat admissions (HR, 1.8; 95% Cl, 1.1-2.9) and drug offences (HR, 1.5; 95% Cl, 1.0-2.1) predicted early death. The role of ethnicity/Aboriginality could only be assessed in cohort entrants from 1996 to 1999. The Asian subcohort showed higher risk of death from drug-related causes (HR, 2.5; 95% Cl, 1.1-5.5), more drug offences (relative risk ratio [RRR], 13; 95% Cl, 8.5-20.0) and older admission age (oldest group v youngest: RRR, 9.3; 95% Cl, 1.3-68.0) than non-Indigenous Australians. Although higher mortality was not identified in Indigenous Australians, this group was more likely to be admitted younger (oldest v youngest: RRR, 0.31; 95% Cl, | Overlaps with 2003, but has a prison focus. No population comparisons provided for initial analyses. |

| | | | |
|---|---|---|---|
| | | 0.15-0.63) and experience repeat admissions (RRR, 1.6; 95% Cl, 1.0-2.4). | |
| Daigle & Naud (2011), *N* = 1,025 | This study investigated the risk of dying by suicide inside or outside prison. | A follow-up of 1,025 inmates over the period from 1995 to 2006 was conducted by searching the computerized records of correctional services and coroner files for data on suicidal behaviour and death. There were 47 deaths (4.59%) from all causes among the 1,025 offenders during the observation period, of which 82.98% occurred outside prison. Of the 1,025, 26 died by suicide (2.54%). Of these suicides, 76.92% occurred outside prison. | Insufficient differentiation between offenders inside or outside of prison to meaningful use the results of analysis. |
| Farrell & Marsden (2007), *N* = 44,771 | The authors investigated drug-related deaths among newly released prisoners in England and Wales. | They used a national sample of male and female sentenced prisoners released during 1998– 2000 with all recorded deaths included to November 2003 to calculate mortality rates. | No specific information of suicide, and drug-related deaths. |
| Fazel et al. (2014), *N* = 24,297 | The authors investigated violent crime, suicide, and premature mortality in patients with schizophrenia and related disorders. | They undertook a total population cohort study in Sweden of 24 297 patients with schizophrenia and related disorders between January, 1972 and December, 2009. Patients were matched by age and sex to people from the general population (*N* = 485 940) and also to unaffected sibling controls (*N* = 26 357). First, the authors investigated rates of conviction of a violent offence, suicide, and premature mortality, with follow-up until conviction of a violent offence, emigration, death, or end of follow-up (Dec 31, 2009), whichever occurred first. Second, they analysed associations between these adverse outcomes and sociodemographic, individual, familial, and distal risk factors, for men and women separately, with Cox proportional hazards models. Finally, they assessed time trends in adverse outcomes between 1972 and 2009, for which we compared patients with unaffected siblings, and analysed associations with changes in the number of nights spent in inpatient beds in psychiatric facilities nationwide. Findings - within 5 years of their initial diagnosis, 13·9% of men and 4·7% of women with schizophrenia and related disorders had a major adverse outcome (10·7% of men and | Referred Individuals. |

| | | | |
|---|---|---|---|
| | | 2·7% of women were convicted of a violent offence, and 3·3% of men and 2·0% of women died prematurely of any cause). During the study, the adjusted odds ratio of any adverse outcomes for patients compared with general population controls was 7·5 (95% CI 7·2–7·9) in men and 11·1 (10·2–12·1) in women. Three risk factors that were present before diagnosis were predictive of any adverse outcome: drug use disorders, criminality, and self-harm, which were also risk factors for these outcomes in unaffected siblings and in the general population. Over the period 1973–2009, the odds of these outcomes increased in patients with schizophrenia and related disorders compared with unaffected siblings. Schizophrenia and related disorders are associated with substantially increased rates of violent crime, suicide, and premature mortality. Risk factors for these three outcomes included both those specific to individuals with schizophrenia and related disorders, and those shared with the general population. Therefore, a combination of population-based and targeted strategies might be necessary to reduce the substantial rates of adverse outcomes in patients with schizophrenia and related disorders. | |
| Fazel et al. (2016a), *N* = 12,056 | The authors investigated patient outcomes following discharge from secure psychiatric hospitals. | The authors searched for primary studies that followed patients discharged from a secure hospital, and reported mortality, readmissions or reconvictions. The authors determined crude rates for all adverse outcomes. Results - in total, 35 studies from 10 countries were included, involving 12 056 patients out of which 53% were violent offenders. The crude death rate for all-cause mortality was 1538 per 100 000 person-years (95% CI 1175-1901). For suicide, the crude death rate was 325 per 100000 person-years (95% CI 235 415). The readmission rate was 7208 per 100000 person-years (95% CI 5916-8500). Crude reoffending rates were 4484 per 100000 | Meta-Analysis of Referred Individuals. |

| | | | |
|---|---|---|---|
| | | person-years (95% CI 3679-5287), with lower rates in more recent studies. | |
| Fazel et al. (2016b), *N* = 6,520 | The authors investigated mortality, rehospitalisation and violent crime in forensic psychiatric patients discharged from hospital. | The authors conducted a historical cohort study of all 6,520 psychiatric patients discharged from forensic psychiatric hospitals between 1973 and 2009 in Sweden. They calculated hazard ratios for mortality, rehospitalisation, and violent crime using Cox regression to investigate the effect of different psychiatric diagnoses and two comorbidities (personality or substance use disorder) on outcomes. Over a mean follow-up of 15.6 years, 30% of patients died (*N* = 1,949) after discharge with an average age at death of 52 years. Over two-thirds were re-hospitalised (*N* = 4,472, 69%), and 40% violently offended after discharge (*N* = 2,613) with a mean time to violent crime of 4.2 years. The association between psychiatric diagnosis and outcome varied-substance use disorder as a primary diagnosis was associated with highest risk of mortality and rehospitalisation, and personality disorder was linked with the highest risk of violent offending. Furthermore comorbid substance use disorder typically increased risk of adverse outcomes. | Referred Individuals. |
| Flannery et al. (2001), *N* = 484 | This study examined violence exposure, violent behaviours, psychological trauma, and suicide risk in a community sample of dangerously violent adolescents by comparison with a matched community sample of nonviolent adolescents. | Anonymous self-report questionnaires were administered in the 1992–1993 school year to students in grades 9 through 12, in six public high schools located in Ohio and Colorado (*N* = 3,735). From this sample, 484 adolescents (349 males, 135 females) who reported attacking someone with a knife or shooting at someone within the past year (i.e., dangerously violent adolescents) were drawn. Four hundred eighty-four controls were also selected and matched on gender, age in years, ethnicity, area of residence, and family structure. Dangerously violent adolescents reported higher levels of exposure to violence and victimization than did matched controls. Dangerously violent females were more likely to score in the clinical range of depression, anxiety, posttraumatic stress, anger, | Dangerously violent sub-category of offenders and focused on risk of suicide. |

| | | | |
|---|---|---|---|
| | | and dissociation than were control females and violent males; they also had significantly higher levels of suicide potential. | |
| Harding-Pink (1990), *N* = 300 | This study investigated mortality following Release from Prison. | This study looked at deaths occurring after release from prison in the Canton of Geneva during the period 1982–86. The mortality rate during the first year after release was about 5 deaths/1000 person years, a rate over four times the age-adjusted rate in the general population. The majority of deaths were due to overdose by opiate drugs among young, frequently imprisoned drug abusers, and occurred within the first few weeks after release. Likely risk factors include loss of tolerance to opiates while in prison, and psychological and social stresses following release. | Drug related mortality. |
| Harding-Pink & Fryc (1988), *N* = 300 | This study investigated risk of death after release from prison. | This was a summary report and did not provide any novel analyses or figures. | A summary paper of Harding-Pink (1990). |
| Hobbs et al. (2006), *N* = 13,667 | This was a systematic study of general health problems in released prisoners. | They used the Western Australian Data Linkage System (WADLS) that enables data from statistical health collections, including hospital admissions, mental health services and deaths, to be linked to other administrative records. The study cohort consisted of 13,667 persons released from prisons in Western Australia in the six years 1995–2001 inclusive. Subjects were followed for a minimum period of two years, to the end of 2003. The average time of follow-up in the community, excluding further spells in prison, was 4.61 years. Ex-prisoners had substantially higher risks of death than the general population after adjustment for age. In those aged 20–39 years, mortality rates per 1,000 person-years were 4.5 in Indigenous female prisoners, 7.0 in non-Indigenous female prisoners, 7.9 in Indigenous male prisoners and 4.8 in non-Indigenous male prisoners. Compared with the corresponding group in the general population the relative risk of death (based on rate ratios) were 3.1 in Indigenous female prisoners, 14.0 in non-Indigenous female prisoners, | No specific information of suicide. |

| | | | |
|---|---|---|---|
| | | 1.8 in Indigenous male prisoners and 4.0 in non-Indigenous male prisoners. These differences were particularly marked in those under 30 years of age. | |
| Kariminia et al. (2007), *N* = 85,203 | This study investigated the suicide risk among recently released prisoners in New South Wales, Australia | A retrospective cohort study of 85 203 adult offenders who had spent some time in full-time custody in prisons in New South Wales between 1 January 1988 and 31 December 2002 were investigated. The main outcome measure was the association between time after release and risk of suicide and overdose death. Of 844 suicides (795 men, 49 women), 724 (86%) occurred after release. Men had a higher rate of suicide than women both in prison (129 v 56 per 100 000 person years) and after release (135 v 82 per 100,000 person-years). The suicide rate in men in the 2 weeks after release was 3.87 (95% CI, 2.26–6.65) times higher than the rate after 6 months. Male prisoners admitted to the prison psychiatric hospital had a threefold higher risk than non-admitted men both in prison and after release. No suicides among women were observed in the 2 weeks after release. No increased risk of suicide was observed among Aboriginal Australians in the first 2 weeks after release. Of 1674 deaths due to overdose, 1627 (97%) occurred after release. Drug-related mortality in men was 9.30 (95% CI, 7.80–11.10) times higher, and in women was 6.42 (95% CI, 3.88–10.62) times higher, in the 2 weeks after release than after 6 months. | No non-offender comparison made. |
| Kinner et al. (2011), *N* (Western Australia) = 16, 162; *N* (NSW) = 82,650 | This study estimated the number of deaths among people released from prison in Australia in the 2007–08 financial year, within 4 weeks and 1 year of release. | Application of crude mortality rates for ex-prisoners (obtained from two independent, state-based record-linkage studies [New South Wales and Western Australia]) to a national estimate of the number and characteristics of people released from prison in 2007–08. Main outcome measures estimated number of deaths among adults released from Australian prisons in 2007–08, within 4 weeks and 1 year of release, classified by age, sex, Indigenous status and cause of death. | No specific information of suicide. |

| | | | |
|---|---|---|---|
| Kjelsberg & Laake (2010), *N* = 1,112 | This study investigated whether the high mortality risk in sentenced offenders was or is independent of previous imprisonment. | The authors' investigated possible predictors for over-all and cause specific mortality in a nation-wide study of convicted offenders with and without previous imprisonment. This case-control study drew random samples of deceased and living offenders (N = 1,112) from four complete cohorts of convicted offenders, two male (born 1967 and 1977, respectively), and two female (born 1967-70 and 1977-80, respectively). All criminal records were systematized and information about date and cause of death was collected on those deceased. Multivariable analyses demonstrated that age at first court conviction (OR = 0.88, 95% CI = 0.84-0.93), drug related crimes (OR = 1.99, 95% CI = 1.23-3.22), and crime diversity (1.51, 95% CI = 1.07-2.13) were significant predictors of premature death in males. In females, age at first court conviction (OR = 0.92, 95% CI = 0.88-0.97), drug related crimes (OR = 2.24, 95% CI = 1.37-3.69) and belonging to the oldest cohort (OR = 2.10, 95% CI = 1.35-3.26) were significant predictors of premature death. Age at first court conviction remained a significant predictor for death in all cause specific multivariable mortality analyses. In addition, having committed drug related crimes and high crime diversity were strong predictors for substance related deaths. Males did more often die in accidents or commit suicide. Somatic deaths were most often encountered in the oldest cohort. Incarceration did not remain a significant predictor for premature death in any of the multivariable analyses. Measures intended to prevent premature death in convicted offenders should target wider populations than hitherto acknowledged. | No non-offender control group. |
| Lattimore et al. (1997), *N* = 4,000 | This study investigated the risk of death among serious young offenders. | Mortality data were gathered from California Vital Statistics for more than 4,000 youth paroled by the California Youth Authority during the 1980s. Exposure periods (time at risk of death), were about 11 years and 6 years for the two samples. Known deaths for two cohorts | No meaningful comparison group. |

| | | | |
|---|---|---|---|
| | | totalled 181 for the 3,995 male offenders in the two samples, including 109 for the 1,998 males in the 1981-1982 sample and 72 for the 1,997 males in the 1986-1987 sample. Homicide was the prevailing cause for both samples. Of particular note is the fact that the numbers of deaths due to causes other than homicide are roughly proportional to the length of the exposure periods for the two samples while the numbers of homicides are roughly equal despite the very different lengths of time at risk. A higher probability of death by murder was observed for Black youth, those from Los Angeles, those with a history of gang involvement and institutional violence, and those with a history of drug arrests. | |
| Laub & Sampson (2003), *N* = 1,000 | The present study examined if the increased mortality of delinquent subjects continues until age 70 years and, if so, why. | The authors followed 500 delinquent and 500 matched nondelinquent comparison boys from age 7 to 70 years old. They used the same design as Laub & Vaillant's (2000) previous work. Deaths of delinquents have increased to 225. | No new data on the non-delinquents or estimated/expected deaths within the greater population to compare to. |
| Laub, & Vaillant (2000), *N* = 931 | The present study examined if the increased mortality of delinquent subjects continues until age 65 years and, if so, why. | The authors followed 475 delinquent and 456 matched nondelinquent comparison boys from age 14 years until age 65 years. Thirteen percent (*N* = 62) of the delinquent and only 6% (*N* = 28) of the nondelinquent subjects died unnatural deaths. By age 65 years, 29% (*N* = 139) of the delinquent and 21% (*N* = 95) of the nondelinquent subjects had died from natural causes. In a univariate analysis, frequency of delinquency, abuse of alcohol, adult crime, dysfunctional home environment, and poor education were significantly related to death, especially to unnatural death. However, when delinquency and alcohol abuse were controlled by logistic regression, education, dysfunctional upbringing, and adult criminality made no further contributions to mortality. | No specific information of suicide. |

| | | | |
|---|---|---|---|
| Lewis et al. (1991), *N* = 21 | This study was a follow-up of Female Delinquents investigating maternal contributions to the perpetuation of deviance. | Twenty-one female delinquents, neuro-psychiatrically evaluated while in a juvenile correctional facility, were followed up 7 to 12 years later. The authors compared their female delinquents with a matched sample of male delinquents. Unlike the males, early biopsychosocial variables were not predictive of adult criminality: however, most females were seriously impaired neuro-psychiatrically. Mortality rates were high. Having come from abusive households, the female delinquents became suicidal, alcoholic, drug addicted, enmeshed in violent relationships, and unable to care for their children. | Participants were neuro-psychiatrically impaired. |
| Lindberg et al. (2017), *N* = 606 | The primary aim of this national register-based follow-up study was to investigate the mortality rate of Finnish delinquents who underwent a forensic psychiatric examination between 1980 and 2010. As delinquency is not a solid entity, the authors further aimed to compare the risk of premature death among different subgroups of the delinquents; violent versus non-violent offenders, offenders with alcohol use disorders versus those with no such diagnoses, offenders with schizophrenia spectrum disorders versus conduct- and personality-disordered offenders, | They collected the forensic psychiatric examination reports of all 15- to 19-year-old offenders who were born in Finland and had undergone the examination between 1.1.1980 and 31.12.2010 (*N* = 606) from the archives of the National Institute of Health and Welfare and retrospectively reviewed them. For each delinquent, four age-, gender- and place of birth-matched controls were randomly selected from the Central Population Register (*N* = 2424). The delinquents and their controls were followed until the end of 2015. The median follow-up time was 23.9 years (interquartile range 15.3-29.5). The authors obtained the mortality data from the causes of death register. Deaths attributable to a disease or an occupational disease were considered natural, and those attributable to an accident, suicide or homicide were considered unnatural. | No specific information of suicide. |

| | | | |
|---|---|---|---|
| | under-aged versus young adult offenders, and, finally, boys versus girls. | | |
| Loeber & Farrington (2011), *N* = 1,517 | This study focused on young homicide offenders and victims, investigating risk factors, prediction, and prevention from childhood. | The authors used the Pittsburgh Youth Study. The youngest cohort (*N* = 503) has been assessed a total of 18 consecutive times from middle childhood to late adolescence, the middle cohort (*N* = 508) was only assessed seven times, at half-yearly intervals from age 10-13. While the oldest cohort (*N* = 506) has been assessed a total of 16 consecutive times from early adolescence to early adulthood. Huge numbers of risk factors measured. Of the 1,517 males in the PYS, four died and one emigrated permanently by age 14. These males are considered to be not at risk of offending, leaving 1,512 males at risk at age 15. The number of males at risk then decreased because of deaths (57 males died up to age 29) and because not all males in the youngest cohort had reached their 30th Birthday. | No non-offender comparison. |
| Mallett et al. (2012), *N* = 433 | This study investigated reported suicide attempts within a youthful offender population | In this study of court-involved youth (*N* = 433) in two Midwest counties, logistic regression analysis identified some expected and unexpected findings of important demographic, educational, mental health, child welfare, and juvenile court-related variables that were linked to reported suicide attempts. Some of the expected suicide attempt risk factors for these youth included prior psychiatric hospitalization and related mental health services, residential placement, and diagnoses of depression and alcohol dependence. However, the most unexpected finding was that a court disposition to shelter care (group home) was related to a nearly tenfold increased risk in reported suicide attempt. These findings are of importance to families, mental health professionals, and juvenile court personnel to identify those youth who are most at risk and subsequently provide appropriate interventions to prevent such outcomes. | Not longitudinal and concerned only attempts of suicide. |

| | | | |
|---|---|---|---|
| Maughan et al. (2014), *N* = 4,158 | This study investigated adolescent conduct problems and premature mortality. | A total of 4158 members of the Medical Research Council National Survey of Health and Development (the British 1946 birth cohort) were assessed for conduct problems at the ages of 13 and 15 years. Follow-up to the age of 65 years via the UK National Health Service Central Register provided data on date and cause of death. Dimensional measures of teacher-rated adolescent conduct problems were associated with increased hazards of death from cardiovascular disease by the age of 65 years in men [hazard ratio (HR) 1.17, 95% confidence interval (CI) 1.04-1.32], and of all-cause and cancer mortality by the age of 65 years in women (all-cause HR 1.16, 95% CI 1.07-1.25). Adjustment for childhood cognition and family social class did little to attenuate these risks. Adolescent conduct problems were not associated with increased risks of unnatural/substance-related deaths in men or women in this representative sample. | No offender categories. |
| Merrall et al. (2010), *N* = 69,093 | This study meta-analytically investigated drug-related deaths soon after release from prison | English-language studies were identified that followed up adult prisoners for mortality from time of index release for at least 12 weeks. Six studies from six prison systems met the inclusion criteria and relevant data were extracted independently. Results - these studies contributed a total of 69 093 person-years and 1033 deaths in the first 12 weeks after release, of which 612 were drug-related. A three- to eightfold increased risk of drug-related death was found when comparing weeks 1 + 2 with weeks 3–12, with notable heterogeneity between countries: United Kingdom, 7.5 (95% CI: 5.7–9.9); Australia, 4.0 (95% CI: 3.4–4.8); Washington State, USA, 8.4 (95% CI: 5.0–14.2) and New Mexico State, USA, 3.1 (95% CI: 1.3–7.1). Comparing weeks 3 + 4 with weeks 5–12, the pooled relative risk was: 1.7 (95% CI: 1.3–2.2). | Meta-analysis. |
| Ojansuu et al. (2015), *N* = 1,253 | This study investigated mortality among forensic | A total of 1253 patients were included, of which 153 were females and 1100 were males. The mean follow-up time in this study was 15.1 years, and 351 (28%) had died during | Referred Individuals. |

| | | | |
|---|---|---|---|
| | psychiatric patients in Finland. | the follow-up period. The standardized mortality rate (SMR) for the whole study group was 2.97 (95% CI 2.67-3.29). Among females the SMR was 3.62 (95% CI 2.57-5.09), and among males 2.91 (95% CI 2.61-3.25). The SMRs were higher when patients were committed to forensic treatment before the age of 40 years. | |
| Paanila et al. (1999), *N* = 102 | Mortality among habitually violent offenders | There are no published studies about mortality among habitually violent offenders, although it would be essential to take into account the possibly higher mortality rate of this population, when the incidence of committing violent offenders is calculated as a function of age. This research looked at mortality during the age range 30–50 years among 102 habitually violent male offenders, who were considered to be dangerous to the lives of other people, during the 24.5-year period 1971–1995 (in the range 3.5 months–24.5 years, the average prison time was 6 years, 7 months and 11 days). In Finland, the deathrate in the group of men aged 30–50 years is 3.7/1000/year, but among these habitually violent male criminals, the mortality rate was observed to be 18.1/1000/year. Therefore, the relative risk for dying in this age group was 4.9-fold when compared with the normal male population aged 30–50 years. A finding of this magnitude has a substantial effect, when the real incidence of committing homicides or other violent offences is calculated as a function of age. This is an important issue in forensic psychiatry, since it is generally believed that the incidence of committing violent crimes is decreased between the ages of 30 and 50 years, and age is used as one predictive factor when the risk of forthcoming violent behaviour is assessed. | The sample does not differentiate between those in prison and those released from prison. |
| Piquero (2016), *N* = 1,354 | This study investigated both the determinants of perceived age-at-death, as well as some of the mediating processes | Using data for a large sample of serious youthful offenders from two urban cities and who were followed for seven years, this study attended to these concerns. Results showed that gender, race/ethnicity, and adverse neighbourhood conditions influence the perceived age-at- | Longitudinal sample, but based on perceptions of early death. |

| | | | |
|---|---|---|---|
| | associated with the relationship between perceived age-at-death and offending. | death; this perception distinguishes between distinct trajectories of offending, and such perceptions also influenced both perceived risks and perceived rewards as well as one's impulse control. | |
| Piquero et al. (2014), *N* = 411 | This paper examined the risk of early death among 411 South London males in the Cambridge Study in Delinquent Development followed into their late 50s. | Attention is paid not only to differential risk of death between nonoffenders and offenders, but also to the risk within the population of offenders and through consideration of theoretical frameworks and associated predictor variables. Results show that high-rate chronic offenders evince the highest risk of death, an effect that continues even after controlling for childhood individual and environmental risk factors as well as participation in a range of analogous behaviours. | No specific information of suicide. |
| Pluck & Brooker (2014), *N* = 88 | The authors conducted an epidemiological survey of suicide ideation and acts and other deliberate self-harm among offenders in the community under supervision of the Probation Service in England and Wales. | One hundred and seventy-three randomly selected offenders under supervision by the probation service in one county in England were screened for mental illness. All 88 screened cases and a one-in-five sample of non-cases were interviewed according to the Mini International Neuropsychiatric Inventory Module-B. False negatives (*N* = 17) were used to weight calculations and estimate prevalence for the whole group. A third of the interviewed sample (*N* = 56) had a lifetime history of suicide attempts, and 9 (5%) had self-harmed in the month prior to interview. Lifetime suicide history was associated with suicidal ideation and deliberate self-harm in the prior month. | Self-report survey design. |
| Pridemore, & Berg (2017), *N* = 1,750 | This study is a population-based case-control study of repeat victimization, premature mortality and homicide | The authors examined risk of male premature mortality associated with recent criminal victimization. Prior victimization is among the most consistent predictors of future risk but the explanation of repeat victimization remains elusive. Two general perspectives frame this debate. According to the state-dependence perspective, repeat victimization is forged through intervening processes connecting an initial with a subsequent violent victimization. According to the risk-heterogeneity perspective, this association is spurious because all | This is about victimization. |

| | | | |
|---|---|---|---|
| | | victimization events for a person result from underlying individual traits. Research on health outcomes and premature mortality provides related, but often overlooked, conceptual assumptions about the co-occurring health burden of preventable injuries and disease. This study extended and applied each of these perspectives to assess the nature and sources of repeat violent victimization. Data were from the Izhevsk (Russia) Family Study, a large-scale population-based case-control study. Cases ($N$ = 1750) were all male deaths aged 25-54 living in Izhevsk between October 2003 and October 2005. Controls ($N$ = 1750) were randomly selected from a city population register. Key independent variables were prior year prevalence of violent, property, and residential victimization. The authors used logistic regression to estimate mortality odds ratios. Results provided evidence for state dependence. It was found that (i) after controlling for indicators of risk heterogeneity men who had been victims of violence (but not property or residential crime) within the past year were 2.6 times more likely than those who had not to die prematurely; and (ii) the only type of death for which risk was higher was homicide. | |
| Pritchard et al. (1997), $N$ = 7,456 | This study investigated suicide and 'violent' death in a six-year cohort of male probationers compared with pattern of mortality in the general population. | This study explored the mortality rates of a six-year cohort of male probationers (1990-1995) with males in the general population. Male offenders (aged 17-54) had double the death rate, five times the 'external death' rate and nine times the suicide rate of the general population. | Did not exclude mental illness. |
| Ramchand, Morral & Becker (2009), $N$ = 449 | This study examined important life outcomes for adolescent offenders to describe how they were faring in young adulthood. | The authors assessed 449 adolescent offenders (aged 13–17 years) in Los Angeles, CA, whose cases had been adjudicated by the Los Angeles Superior Court and who had been referred to group homes between February 1999 and May 2000. They used the Global Appraisal of Individual Needs to interview respondents at baseline and | No specific information of suicide. |

| | | | |
|---|---|---|---|
| | | at 3, 6, 12, 72, and 87 months after baseline. A total of 395 respondents (88%) were interviewed or confirmed as dead at the final interview. | |
| Rasanen et al. (1998), *N* = 12,058 | This study investigated mortality, criminality and mental illness among young adults were studied in an unselected birth cohort of *N* = 12,058 children born live in Northern Finland during 1966. | The cohort members were followed up to the age of 27 years. The odds ratios for violent offenses and recidivism were calculated for each diagnostic group. Men who abused alcohol and were diagnosed with schizophrenia were 25.2 (95% confidence interval (CI) 6.1-97.5) times more likely to commit violent crimes than mentally healthy men. The risk for nonalcoholic patients with schizophrenia was 3.6 (95% CI 0.9-12.3) and for other psychoses, 7.7 (95% CI 2.2-23.9). None of the patients with schizophrenia who did not abuse alcohol were recidivists (>2 offenses), but the risk for committing more crimes among alcoholic subjects with schizophrenia was 9.5-fold (95% CI 2.7-30.0). | No specific information of suicide. |
| Repo-Tiihonen et al. (2001), *N* = 250 | The aim of this study was to investigate the mortality and causes of death of criminal offenders having antisocial personality disorder (ASPD) over a wide range of age groups, relative to the general population. | The death rates of 250 Finnish men with ASPD were compared with those of the general Finnish male population. Among those having ASPD in younger age groups, up to 50, the overall mortality rate showed from a fivefold to a ninefold increase. The mortality rate for other than natural causes (suicide, accident, homicide) showed from a sixfold increase to a seventeen-fold increase. | No specific information of suicide. |
| Richardson et al. (2013), *N* = 15 | This study investigated pathways to early violent death. | The authors interviewed young Black male serious violent youth offenders detained in an adult jail to understand their experience of violence. Their narratives revealed how the code of the street, informal rules that govern interpersonal violence among poor inner-city Black male youths, increases the likelihood of violent victimization. Youth offenders detained in adult jails have the lowest rate of service provision among all jail populations. The study | Qualitative Study. |

| | | | |
|---|---|---|---|
| | | addressed how services for youth offenders can be improved to reduce the pathways to early violent death. | |
| Robins & O'Neil (1958), *N* = 524 | This research looked at the occurrence of deviant social behaviour in adults with a history of childhood behaviour problems. The rate of occurrence of various expressions of social deviance, including not only criminal behaviour, but also failure to achieve satisfactory employment status, transiency, alcoholism, mental illness, unstable marital relations, inadequacy as parents, and social isolation, was investigated and contrasted with the rate of occurrence of these phenomena among a control group of adults without serious childhood behaviour problems. | The subjects of the study reported in part in this paper are, first, the patient group, a consecutive series of 524 persons seen as children at the St. Louis Municipal Psychiatric Clinic between 1924 and 1929. At the same time, the patient group was compared with a control group, 100 subjects selected from the St. Louis Public School records, located, interviewed, and checked through the public records in the same manner as the patient group, to discover to what extent childhood behaviour problems are associated with an adult adjustment different from that found in a group without serious behaviour problems in childhood. | No specific information of suicide. |
| Rydelius (1988), *N* = 1,056 | This investigated the development of antisocial behaviour and sudden violent death. | A register was drawn up covering those young persons (1,056; 832 boys and 224 girls; mean age 16 years) who were admitted to Swedish probationary schools during the period 1 January — 31 December 1967. Using the registers of immigration and emigration and causes of death kept by SCB (Statistiska Centralbyrån), mortality occurring between 1 January 1967 — 31 December 1985 was tabulated. One hundred and ten boys (13%) and 22 girls (10%) had died. The deaths had occurred at a rate of | No meaningful comparison group. |

| | | | |
|---|---|---|---|
| | | approximately seven new deaths per observation year, the youngest being still in their teens when they died. For comparison, the criteria set up by insurance companies for life insurance premiums are based on a death expectancy for healthy Swedish boys and girls in the age groups corresponding to the subjects under observation of 1.2-3.1% for boys and 1.1-2.6% for girls. Eighty-eight percent of the dead boys and 77% of the dead girls had died "sudden violent deaths"— accidents, suicides, death from uncertain causes, murder/manslaughter, or alcohol/drug abuse. For both sexes, death from uncertain causes and suicides were the most frequent single causes of death. Death as a direct result of alcohol/drug abuse occurred only in boys. | |
| Sailas et al. (2005), *N* = 3,832 | This research studied the nationwide mortality in Finland of young offenders sentenced to prison, with the advantage of a long-term follow-up in an unselected population. In addition, the authors aimed to clarify the relationship between psychiatric disorders requiring hospital treatment and early death in young offenders sentenced to prison. | The study population was selected from the nationwide Prison Court Register. This register included all young prisoners who have committed their offences while aged 15–21 years, with the exception of offenders who receive very short sentences (<3 months) or very long sentences (>4 years). Thus, the register included ~98% of all young offenders sentenced to prison. The study population consists of all young offenders sentenced to prison from the Prison Court Register who were convicted during the 17-year period from 1984 to 2000. Each young prisoner was entered into the cohort in the year in which he or she was for the last time sentenced to prison as an adolescent prisoner, for which the age range in Finland is between 15 and 21 years. For each prisoner, the date of the prison conviction—the first prison conviction in the case of re-offenders—was obtained and recorded as the beginning of the follow-up period. Using the personal identification number that is assigned to all residents of Finland by the Finnish Population Register, linkage was performed with Statistics Finland's Cause of Death Register. All subjects were followed until 30 July 2002, or earlier in the event of | No specific information of suicide. |

| | | | |
|---|---|---|---|
| | | their death. The causes of death were classified according to the International Classification of Diseases, according to the eighth revision (ICD-8) until 1986, ICD-9 between 1987 and 1995, and ICD-10 from 1996 onwards. The numbers and causes of deaths were compared with age- and sex-matched mortality data for the general Finnish population, obtained from Statistics Finland. The personal identification number was also used to collect data on hospitalizations from the Finnish Health Care Register (HCR, founded in 1967). Information on hospital treatment periods for psychiatric diagnoses was collected from this register for the years 1971–2001. The study population consisted of 3743 young male and 89 young female offenders. Of these, 435 (11.4%) had died by the end of the follow-up period, including 3 girls. The standardized mortality ratio for young male prisoners was 7.4 (95% confidence interval 6.7–8.1). There was a higher mortality rate among young offenders convicted in the later years of the study period. The causes of death were mostly unnatural and often violent. | |
| Sattar (2003), *N* = 141,102 | This study investigated the Death of Offenders in England and Wales. | This study compared the nature and extent of death among prisoners (*N* = 236) and offenders serving community sentences or ex-prisoners receiving post-custodial supervision by the Probation Service *(N* = 1,267) in England and Wales in 1996 and 1997. Information contained in death certificates was used to code for mode of death. Prisoners and community offenders were found to be reasonably similar in vulnerability to suicide/self-inflicted death; however, the risk of accidental death and homicide was greater for community offenders, and drugs and alcohol played a bigger part in their deaths. | Overlaps with Sattar 2001. |
| Sattar & Killias (2005), *N* = N/A | This study investigated the death of offenders in Switzerland. | The Swiss data presented confirmed that unnatural death is rather common among offenders outside prison. Despite some differences in frequency of suicide and other unnatural causes of death among prisoners in England and | No non-offender comparison and lack of specific numerical reporting. |

| | | | |
|---|---|---|---|
| | | Switzerland (which may be due to differences in sentencing and other policies), the overall picture of mortality in prisons suggests many similarities between the two countries. | |
| Shepherd et al. (2009), *N* = 411 | This study investigated the impact of antisocial lifestyle on health: chronic disability and death by middle age. | Mortality, injury and illness data were collected prospectively in the longitudinal Cambridge study in delinquent development at age 43–48. Childhood and parental predictors of offending, self-reported delinquency at age 32 and convictions were significantly associated with death and disability by age 48. | Overlap with Piquero et al. 2014 and only provides analyses under 'death and disability' – not just death. |
| Sherman & Harris (2013), *N* = 1,200 | This study investigated the increased homicide victimization of suspects for domestic assault using a 23-year follow-up of the Milwaukee Domestic Violence Experiment (MilDVE). | The Milwaukee Domestic Violence Experiment (MilDVE) employed a randomized experimental design with over 98 % treatment as assigned. In 1987–88, 1,200 cases with 1,128 suspects were randomly assigned to arrest or a warning in a 2:1 ratio. Arrested suspects were generally handcuffed and taken to a police station for about 3 to 12 h. Warned suspects were left at liberty at the scene after police read aloud a scripted statement. Death records were obtained in 2012–13 from the Wisconsin Office of Vital Statistics and the Social Security Death Index, with the support of the Milwaukee Police Department. In the first presenting case in which the 1,128 were identified as suspects, they were randomly assigned to arrest in 756 cases and to a warning in 372. No clear difference in death rates from all causes combined (d=0.04) was ever evident between the groups, or for five of the six specific categories of cause of death. However, a clear difference in homicide victimizations of the suspects emerged between those arrested and those warned. At 23 years after enrolment, suspects assigned to arrest were almost three times more likely to have died of homicide (at 2.25% of suspects) than suspects assigned to a warning (at 0.81%), a small to moderate effect size (d=0.39) with marginal significance (two-tailed p=0.096; relative risk ratio=2.79:1; 90 % CI = 1.0007 to 7.7696). Cox regressions controlling for | No population based non-offender comparison group. |

| | | | |
|---|---|---|---|
| | | suspects' stakes in conformity (employment and marriage) show that homicide victimization for arrested suspects is three times that of warned suspects (p=0.07), although no interactions are yet significant. Logistic regression with more covariates increases arrest effects on homicide to 3.2 times more than warnings (p=0.06). | |
| Singleton et al. (2003), *N* = 12,438 | This study investigated drug-related mortality among newly released offenders. | This study provided estimates of the rates of mortality amongst recently released prisoners in England and Wales and provides some evidence of the risk factors associated with this group. The sampling exercise here was undertaken prior to the implementation of the revised prison service drug strategy which brought in a considerable expansion in the provision of treatment and support for drug misusers. | Not comparison to non-offender population and a focus on drug-related mortality. |
| Skardhamar, & Skirbekk (2013), *N* = 2,900,000 | This study investigated the overall mortality rate of offenders compared to the non-criminal population, and estimated the risk of death by criminal records related to substance abuse and other types of criminal acts. | Age-adjusted relative risks of death for 2000–2008 were studied in a population-based dataset. Their dataset comprise the total Norwegian population of 2.9 million individuals aged 15–69 years old in 1999, of whom 10% had a criminal record in the 1992–1999 period. Individuals with a criminal record have twice the relative risk (RR) of death of the control group (non-offenders). Males with a record of use/possession of drugs and a prison record have an 11.9 RR (females, 15.6); males with a drug record but no prison record have a 6.9 RR (females 10.5). Males imprisoned for driving under the influence of substances have a 4.4 RR (females 5.6); males with a record of driving under the influence but no prison sentence have a 3.2 RR (females 6.5). Other male offenders with a prison record have a 2.8 RR (females 3.7); other male offenders with no prison record have a 1.7 RR (females 2.3). Significantly higher mortality was found for people with a criminal record, also for those without any record of drug use. Mortality is much higher for those convicted of substance-related crimes: more so for drug- than for alcohol-related crimes and for women. | No specific information of suicide. |

| | | | |
|---|---|---|---|
| Spaulding et al. (2011), *N* = 23,510 | The authors sought to determine the 15.5-year survival of 23,510 persons imprisoned in the state of Georgia on June 30, 1991. | After linking prison and mortality records, they calculated standardized mortality ratios (SMRs). The cohort experienced 2,650 deaths during follow-up, which were 799 more than expected (SMR = 1.43, 95% confidence interval (CI): 1.38, 1.49). Mortality during incarceration was low (SMR = 0.85, 95% CI: 0.77, 0.94), while postrelease mortality was high (SMR = 1.54, 95% CI: 1.48, 1.61). SMRs varied by race, with black men exhibiting lower relative mortality than white men. Black men were the only demographic subgroup to experience significantly lower mortality while incarcerated (SMR = 0.66, 95% CI: 0.58, 0.76), while white men experienced elevated mortality while incarcerated (SMR = 1.28, 95% CI: 1.10, 1.48). Four causes of death (homicide, transportation, accidental poisoning, and suicide) accounted for 74% of the decreased mortality during incarceration, while 6 causes (human immunodeficiency virus infection, cancer, cirrhosis, homicide, transportation, and accidental poisoning) accounted for 62% of the excess mortality following release. Adjustment for compassionate releases eliminated the protective effect of incarceration on mortality. | No specific information of suicide and prison sample. |
| Stattin & Romelsjo¨ (1995), *N* = 7,577 | The authors examined the mortality risk at an adult age (including sudden violent death and death due to accidents) as a consequence of adolescent behavioural problems and adverse home-upbringing conditions, and further to examine whether subjects who had a criminal conviction as an adult were over-represented | In total, 7577 persons about to undertake compulsory military service, 18 years old in 1969–70, responded to questions about their family background and antisocial behaviour, and were followed up in registers of mortality, criminality and alcohol or drug abuse up to the age of 33. Their results revealed that early contact with the police, truancy and school misconduct, and also the home-upbringing variables, divorce and parents' nervous disorders, were significant predictors of later premature mortality. | No specific information of suicide. |

| | | | |
|---|---|---|---|
| | among those who died prematurely. | | |
| Stenbacka & Jansson (2012), *N* = 49,398 | The authors investigated life course criminality in relation to unintentional injury mortality and other causes of death. | The authors' sample included 49,398 male Swedish conscripts aged 18–20 years in 1969/70 and a follow-up through 35 years. All subjects completed two questionnaires at the time of conscription concerning family, social, behavioural risk factors including alcohol and drug use. The impacts of committed crimes, alcohol and drug use and other risk factors were estimated using proportional hazard ratios (HRs) from Cox Regression analyses. Many adolescent offences entailed a nearly six-fold higher injury mortality risk (HR = 5.64) and a four-fold higher risk (HR = 3.93) for all other causes vs. no convictions. In multivariate analyses, adolescent criminality was still found to be significantly associated with time to unintentional injury mortality, while criminality limited to adulthood had a moderately higher risk for all other causes of deaths. Individuals with both adolescence and adult criminality showed elevated mortality from especially unintentional injury (HR = 5.06), with the hazards remaining elevated, even after adjustment for other behavioural risk factors. Men with behavioural risk factors including alcohol and/or drug misuse in combination with frequent criminality seem to be a vulnerable group of both unintentional and other causes of deaths. | No specific information of suicide. |
| Stenbacka et al. (2012), *N* = 48,834 | This study investigated mortality and causes of death among violent offenders and victims. | This study analysed overall and cause specific mortality among violent offenders, victims, and individuals who were both offenders and victims in a general sample of 48,834 18-20 year-old men conscripted for military service in 1969/70 in Sweden. Each person completed two non-anonymous questionnaires concerning family, psychological, and behavioral factors. The cohort was followed for 35 years through official registers regarding violent offences, victimization, and mortality. The impact | Overlap with Stenbacka et al 2014 – but smaller sample. |

| | | | |
|---|---|---|---|
| | | of violence, victimization, early risk factors and hospitalization for psychiatric diagnosis or alcohol and drug misuse during follow up on mortality was investigated using Cox proportional hazard regression analyses. Repeat violent offences were associated with an eleven fold higher hazard of dying from a substance-related cause and nearly fourfold higher hazard of dying from suicide. These figures remained significantly elevated also in multivariate analyses, with a 3.03 and 2.39 hazard ratio (HR), respectively. Participants with experience of violence and inpatient care for substance abuse or psychiatric disorder had about a two to threefold higher risk of dying compared to participants with no substance use or psychiatric disorder. | |
| Stoddard-Dave et al. (2013), *N* = 999 | This study was an assessment of risk factors for early death among a sample of previously incarcerated youth. | This study extends previous research by evaluating potential factors that are associated with early death in a random sample (*N* = 999) of formerly detained youthful offenders in New York stratified by gender (50% female). Existing case records were referenced with the National Death Index to determine if the formerly detained youth were deceased by the time they would have reached age 28. Regression analyses were run to determine if any of 16 sociodemographic, offence history, weapons/gang involvement, mental health, substance use, child maltreatment, child welfare, or family environmental risk factors measured in their childhood or adolescence were associated with early death. Two additional regression analyses were run to determine if those risk factors differentially impacted early death for males vs. females. Of the variables measured, however, only gender was significantly related to early death – compared to females, males were 2.3 times more likely to have prematurely died. Additionally, in the model run separately for females, being an African-American female was protective against early | No non-offender comparison group. |

| | | | |
|---|---|---|---|
| | | death. These findings are compared to findings from the existing literature. | |
| Tabita et al. (2012), *N* = 88 | This study investigated criminal recidivism and mortality among patients discharged from a forensic medium secure hospital. | All offenders in Orebro County, Sweden, sentenced to forensic psychiatric treatment and discharged during 1992-2007 were included: 80 males and eight females. Follow-up data was retrieved from the Swedish National Council for Crime Prevention, the National Cause-of-Death register and clinical files. Mean follow-up time was 9.4 years. The mean age at discharge was 40 years. Schizophrenia, other psychoses and personality disorders were the most prevalent diagnoses. Thirty-eight percent of those still alive and still living in the country re-offended and were sentenced to a new period of forensic psychiatric treatment or incarceration during follow-up. Four male re-offenders committed serious violent crimes. Substance-related diagnosis was significantly associated with risk of recidivism and after adjustment for diagnoses, age and history of serious violent crime, the Hazard Ratio was 4.04 (95% CI 1.51-10.86, P = 0.006). Of all included patients, 23% had died at the end of follow-up (standardized mortality rate 10.4). | Psychiatric patients. |
| Teplin et al. (2005), *N* = 1,829 | This study investigated early violent death among delinquent youth. | This prospective longitudinal study examined mortality rates among 1829 youth (1172 male and 657 female) enrolled in the Northwestern Juvenile Project, a study of health needs and outcomes of delinquent youth. Participants, 10 to 18 years of age, were sampled randomly from intake at the Cook County Juvenile Temporary Detention Center in Chicago, Illinois, between 1995 and 1998. The sample was stratified according to gender, race/ethnicity (African American, non-Hispanic white, Hispanic, or other), age (10-13 or >= 14 years), and legal status (processed as a juvenile or as an adult), to obtain enough participants for examination of key subgroups. The sample included 1005 African American (54.9%), 296 non-Hispanic white (16.2%), 524 Hispanic (28.17%), and 4 | Overlaps with Teplin 2014. |

| | | | |
|---|---|---|---|
| | | other-race/ethnicity (0.2%) subjects. The mean age at enrollment was 14.9 years (median age: 15 years). The refusal rate was 4.2%. As of March 31, 2004, the authors had monitored participants for 0.5 to 8.4 years (mean: 7.1 years; median: 7.2 years; interquartile range: 6.5-7.8 years); the aggregate exposure for all participants was 12 944 person-years. Data on deaths and causes of death were obtained from family reports or records and were then verified by the local medical examiner or the National Death Index. For comparisons of mortality rates for delinquents and the general population, all data were weighted according to the racial/ethnic, gender, and age characteristics of the detention centre; these weighted standardized populations were used to calculate reported percentages and mortality ratios. They calculated mortality ratios by comparing our sample's mortality rates with those for the general population of Cook County, controlling for differences in gender, race/ethnicity, and age. Sixty-five youths died during the follow-up period. All deaths were from external causes. As determined by using the weighted percentages to estimate causes of death, 95.5% of deaths were homicides or legal interventions (90.1% homicides and 5.4% legal interventions), 1.1% of all deaths were suicides, 1.3% were from motor vehicle accidents, 0.5% were from other accidents, and 1.6% were from other external causes. Among homicides, 93.0% were from gunshot wounds. The overall mortality rate was >4 times the general-population rate. The mortality rate among female youth was nearly 8 times the general-population rate. African American male youth had the highest mortality rate (887 deaths per 100 000 person-years). | |
| Testa et al. (2017), *N* = 21,417 | This study examined all-cause and cause-specific mortality among former prisoners in Pennsylvania. | This study used a unique set of measures obtained from administrative records from Pennsylvania to examine demographic, custodial, behavioural, and criminal history factors that impact mortality risk following release from | No comparison to non-offenders. |

| | | | |
|---|---|---|---|
| | | incarceration. Moreover, this study was the first to assess whether risk factors for post-release mortality are consistent or variable across race and ethnicity. Using data from the Pennsylvania Department of Corrections and mortality records from the Pennsylvania Department of Health it can be found that several demographic, custodial, behavioural, and criminal history measures were related to post-release mortality risk. Moreover, while most risk factors for mortality are generally consistent across race and ethnicity, evidence was found that some custodial and criminal history factors vary by race and ethnicity. | |
| Tikkanen et al. (2008), *N* = 242 | This study examined risk factors for recidivism and mortality among non-psychotic alcoholic violent offenders, the majority having antisocial or borderline personality disorders, or both, which is a group that commits the majority of violent offences in Finland. | Criminal records and mortality data on 242 male alcoholic violent offenders were analysed after a 7- to 15-year follow-up and compared between themselves and with those of 1210 age-, sex- and municipality-matched controls. The prevalence of recidivistic acts of violence (32%) and mortality (16%) was high among the offenders. Severe personality disorders and childhood adversities increased the risk for recidivism and mortality both among offenders (OR 2.0–10.4) and in comparison between offenders and controls (RR 4.3–53.0). | No specific information of suicide. |
| Timonen et al. (2003), *N* = 11,017 | The aim of this study was to investigate the association between adverse physical disorders and violent/non-violent criminal behaviour. | The study material consisted of the large, prospectively followed, unselected and genetically homogenous Northern Finland 1966 Birth Cohort, the Finnish Hospital Discharge Registers and the National Crime Register (*n*=10,934). Logistic regression analyses showed that male offenders had statistically significantly more injuries (adj. OR=1.81, 95% CI=1.51–2.17), when compared with males without a criminal history. Violent male offenders exhibited greater morbidity to the diseases of the respiratory system (adj. OR=1.64, 95% CI=1.03–2.60) when compared with non-violent criminals. Female offenders suffered more commonly from poisonings (adj. | No information on mortality, just increased risk of injuries and somatic illness. |

| | | | |
|---|---|---|---|
| | | OR=3.84, 95% CI=1.69–8.72), injuries (adj. OR=2.79, 95% CI=1.67–4.66), infections (adj. OR=1.87, 95% CI=1.16–2.99) and indefinite symptoms (adj. OR=2.02, 95% CI=1.20–3.40) than non-offending females. | |
| Tremblay, & Pare (2003), *N* = N/A | This study investigated patterns in serious offenders' mortality rates. | No novel results reported. | Review Article. |
| Trumbetta et al. (2010), *N* = 1,812 | The authors examined whether socioeconomic status (SES), high school (HS) completion, IQ, and personality traits that predict delinquency in adolescence also could explain men's delinquency-related (Dq-r) mortality risk across the life span. | Through a 60-year Social Security Death Index (SSDI) follow-up of 1812 men from Hathaway's adolescent normative Minnesota Multiphasic Personality Inventory (MMPI) sample, they examined mortality risk at various ages and at various levels of prior delinquency severity. The authors examined SES (using family rent level), HS completion, IQ, and MMP1 indicators simultaneously as mortality predictors and tested for SES (rent level) interactions with IQ and personality. They ascertained 418 decedents. Dq-r mortality peaked between ages 45 years to 64 years and continued through age 75 years, with high delinquency severity showing earlier and higher mortality risk. IQ and rent level failed to explain Dq-r mortality. HS completion robustly conferred mortality protection through ages 55 years and 75 years, explained IQ and rent level-related risk, but did not fully explain Dq-r risk. Dq-r MMPI scales, Psychopathic Deviate, and Social Introversion, respectively, predicted risk for and protection from mortality by age 75 years, explaining mortality risk otherwise attributable to delinquency. Wiggins' scales also explained Dq-r mortality risk, as Authority Conflict conferred risk for and Social Maladjustment and Hypomania conferred protection from mortality by age 75 years. | No specific information of suicide. |
| Van de Weijer, Bijleveld, & Huschek (2016), *N* = 212 | This study investigated associations between mortality and offending for different types of | Using conviction data for a number of families at high-risk of offending born on average in 1932, this research studied mortality in both offenders and non-offenders, from a similar socio-economic background, until 2007. In general, | No specific information of suicide. |

| | | | |
|---|---|---|---|
| | offences: violent offences, property offences, weapons offences, drugs offences and driving under the influence. | offending sample members were not significantly more likely to have died than non-offending sample members. Compared to the general population, however, both the offending and non-offending sample members were at increased risk to die. Sample members who were convicted for driving under the influence of alcohol or weapons offenses were at increased risk to die prematurely compared to non-offending sample members. | |
| Verger et al. (2003), *N* = 1,127 | This study investigated the mortality of 1305 prisoners released during 1997 from a French prison | Compared with the general population, ex-prisoners non-natural mortality rates were significantly increased both in the 15–34 and 35–54 age categories (3.5-fold and 10.6-fold respectively) and the risk of death due to overdose was 124 and 274 times higher in the same categories respectively. | No specific information of suicide. |
| Yeager & Lewis (1990), *N* = 118 | This study investigated mortality in a group of formally incarcerated juvenile delinquents. | A 7-year follow-up study of formerly incarcerated delinquents revealed an extremely high mortality rate. Of 118 male and female subjects, seven had died before their 25th birthdays, making the mortality rate of the sample approximately 58 times the national average for individuals in their age group. All died violent deaths, making the violent death rate of the sample approximately 76 times the national average for that age group. Differences in mortality rates according to the race and sex of the subjects are reported, and possible clinical predictors of early death are explored. | No Access. |
| Zane et al. (2018), *N* = 253 | This study investigated criminal offending and mortality over the full life-course. | This study used the CSYS, a delinquency prevention experiment and prospective longitudinal survey of the development of offending. Begun in 1939, the study involves 506 at-risk boys, ages 5–13 years (mean birth year = 1928), from Cambridge and Somerville, Massachusetts. Following the analytic strategy of Joan McCord, participants are drawn from the study's longitudinal arm (N = 253). Data include court convictions of criminal offences collected during middle age (mean = 47) and death records collected during old age (up to age 89). Death records were collected for 216 participants or 85.4% of the sample. | Results are only presented within offender trajectory groupings. |

| | | | |
|---|---|---|---|
| | | Results Life-course persistent offenders experience earlier mortality compared to nonoffenders (by about 7 years) and adolescent-limited offenders (by about 8 years). While life-course persistent offenders are not more likely to die early (< 40 years) compared to other trajectory groups, they are more likely to experience premature mortality from late middle age into old age. Life-course persistent offenders are also more likely to experience unnatural deaths, with alcoholism confounding the relationship. Conclusions That group differences in mortality risk did not emerge until age 55 (while offending is in decline) suggests that the relationship between offending and mortality is not direct and may be spurious. | |
| Zlodre & Fazel (2012), *N* = 26,163 | This study investigated the all-cause and external mortality in released prisoners. | The paper searched 5 computer-based literature indexes to conduct a systematic review of studies that reported all-cause, drug-related, suicide, and homicide deaths of released prisoners. The authors extracted and meta-analysed crude death rates and standardized mortality ratios by age, gender, and race/ethnicity, where reported. Eighteen cohorts met review criteria reporting 26,163 deaths with substantial heterogeneity in rates. The all-cause crude death rates ranged from 720 to 2054 per 100,000 person-years. Male all-cause standardized mortality ratios ranged from 1.0 to 9.4 and female standardized mortality ratios from 2.6 to 41.3. There were higher standardized mortality ratios in White, female, and younger prisoners. | Review paper – individual papers within have been review separately. |

**Table 5. Summary Effect Sizes for Suicide of Community Offenders vs Non-Offenders**

| Study name | Odds ratio | Lower limit | Upper limit | *Z*-Value | *p*-Value |
|---|---|---|---|---|---|
| Coffey et al. (2003) | 1.07 | 1.03 | 1.11 | 3.89 | 0.01 |
| Dirkzwager et al. (2011) | 7.30 | 4.12 | 12.93 | 6.81 | 0.01 |
| Elonheimo et al. (2017) | 2.90 | 1.19 | 7.05 | 2.35 | 0.02 |
| Graham (2003) | 3.20 | 3.20 | 3.21 | 2733.15 | 0.01 |
| Joukamaa (1998) | 1.17 | 1.02 | 1.34 | 2.31 | 0.02 |
| Lindqvist et al. (2007) | 25.06 | 11.32 | 55.51 | 7.94 | 0.01 |
| Lize et al. (2015) | 6.01 | 4.73 | 7.65 | 14.61 | 0.01 |
| Nieuwbeerta & Piquero (2008) | 1.75 | 0.51 | 6.00 | 0.89 | 0.37 |
| Pratt et al. (2006) | 27.54 | 27.35 | 27.73 | 939.55 | 0.01 |
| Pridemore (2014) | 0.68 | 0.39 | 1.18 | -1.37 | 0.17 |
| Putkonen et al. (2001) | 424.80 | 190.87 | 945.44 | 14.83 | 0.01 |
| Rosen et al. (2008) | 1.30 | 1.20 | 1.40 | 6.77 | 0.01 |
| Sattar (2001) | 7.68 | 5.14 | 11.47 | 9.96 | 0.01 |
| Stewart et al. (2004) | 5.12 | 4.72 | 5.55 | 39.55 | 0.01 |
| Teplin et al. (2014) | 0.97 | 0.90 | 1.06 | -0.64 | 0.52 |
| **Main Effect** | **4.54** | **2.12** | **9.74** | **3.89** | **0.01** |

**Table 6. Effect Size Data on Suicide of Offenders versus Different Comparison Groups**

| Sample type | *K* | Odds ratio | Lower limit | Upper limit | *Z*-Value | *p*-Value |
|---|---|---|---|---|---|---|
| LCS | 1 | 2.90 | 1.19 | 7.05 | 2.35 | 0.02 |
| Ex-prison | 11 | 4.18 | 1.73 | 10.11 | 3.18 | 0.01 |
| GPC | 3 | 7.62 | 2.40 | 24.14 | 3.45 | 0.01 |

*Note: LCS = Longitudinal Community Sample; GPC = General Population Comparison. K = Number of studies.*

**Table 7. Effect Size Data on Suicide versus Offenders in Different Countries**

| Country | *K* | Odds ratio | Lower limit | Upper limit | *Z*-Value | *p*-Value |
|---|---|---|---|---|---|---|
| Australia | 3 | 2.60 | 1.14 | 5.92 | 2.27 | 0.02 |
| Finland | 3 | 11.19 | 0.32 | 388.96 | 1.33 | 0.18 |
| Netherlands | 2 | 3.98 | 1.00 | 15.89 | 1.96 | 0.05 |
| Russia | 1 | 0.68 | 0.39 | 1.18 | -1.37 | 0.17 |
| Sweden | 1 | 25.06 | 11.32 | 55.51 | 7.94 | 0.01 |
| UK | 2 | 14.78 | 4.23 | 51.66 | 4.22 | 0.01 |
| USA | 3 | 1.93 | 1.06 | 3.53 | 2.13 | 0.03 |

*Note. K = Number of studies.*

## Chapter 5: Limitations and Future directions

A number of limitations concerning the three studies of this thesis will be set out below. These limitations will also be discussed in connection with directions for future work. Such work may be able to then address the drawbacks of current studies and solidify our understanding of the health-crime relationship.

An important issue from the outset is the term 'Community Offender'. This term is subject to substantial heterogeneity (Phillips, Gelsthorpe & Padfield, 2017). Community offenders may include individuals who have been released from police custody or prison, who are currently under community supervision and those who are no longer under supervision. Supervision can include both community sentences and supervision following custody. There is also likely to be heterogeneity in both the length of time that individuals were on supervision, and the quality/depth of that supervision. Furthermore, there is also often a lack of clear distinction between those on supervision following custody who are still in the community and those who have been recalled to prison or arrested for allegations of further offending. These factors need to be taken into consideration when interpreting and applying the findings of this thesis to particular groups of offenders.

In isolation, the CSDD work to date provides insightful and useful 'additive' empirical work to the knowledge base of criminology and health. The CSDD has many advantages, providing a wealth of detailed information about criminal careers and its association to health, with over a 50 year follow up period and high retention of the original participants.

Yet, there are several limitations of the current CSDD work. Results from these CSDD longitudinal analyses are limited by the fact that this longitudinal cohort contains data on mainly British white, working class, inner city males born around 1953. Therefore, results may not be generalisable to women, Black, Asian, suburban, rural, middle- or upper-class people, people born more recently than the 1950s, or those who spent their childhood in other countries.

Future research should investigate the offending-health relationship across demographic groups. Indeed, current evidence indicates that there is minority over-representation in physical health and premature mortality (Williams & Collins, 1995) and minority over-representation in criminal offending (due to differential offending and, in part, due to system processing

biases) (Piquero, 2008; Piquero & Brame, 2008). Sykes and Piquero (2009), for example, used evidence from the 2002 Survey of Inmates in Local Jails and the 2004 Survey of Inmates in State and Federal Prisons to evaluate the disjuncture between institutional policies and possible community outcomes by examining health evaluations of inmates before and after prison admission to determine the disjuncture between institutional policies and potential community outcomes.

Sykes and Piquero (2009) found significant racial, educational, and marital disparities in health testing and outcomes, with later cohorts receiving fewer HIV tests and future release cohorts being more likely to be HIV positive. As a result, Sykes and Piquero concluded that institutionalization can create health inequalities (as in marital groups) where none previously existed. Beyond this particular study, however, the interrelationships between race, health, and crime have not received sufficient attention (Massoglia, 2008a; 2008b). Further investigation is needed to examine whether similar structural and barriers exist within community settings, and how best these can be addressed to minimise health disparities.

Due to the limited CSDD sample and incidence of reported poor health, in the CSDD analyses conducted within this thesis, it was not able to split physical health into more nuanced categories across all the age groups. Furthermore, although attempts were made to control for key risk factors using Adjusted Odds Ratios (AOR), psychosocial risk factors at age 8-10 and a composite antisocial personality (ASP) variable, when considering other key risk factors such as drug and alcohol use (Borschmann et al., 2020; Testa & Semenza, 2020), the limited prevalence and numbers within the CSDD sample and health categories made the likelihood of results being Type 1 errors and statistical artefacts high[12]. Therefore, further individual parental and environmental logistic regression analyses were deemed not to be suitable for inclusion within this thesis.

Further research needs to consider how individual, parental, environmental and lifestyles potentially mediate the offending-health relationship. For example, what differences do these risk factors have on the offending-health relationship? Are there differences between offender types who share similar individual characteristics? These concepts are related to the state dependency/persistent heterogeneity concept (Nagin & Farrington, 1992), which situates these

[12]See Tables 1 and 2 in Appendix A and Tables 1-5 in Appendix B as examples.

two perspectives within the offender population, highlighting the possibility that there may be differential susceptibility to either state dependence or persistent heterogeneity between different types of offenders. It is possible that there is an element of active decision-making operating with respect to poor behavioural choices (persistent heterogeneity argument), but also that engaging in harmful and antisocial lifestyles also has ensnaring implications for future behaviour and outcomes (state dependence argument). Continued empirical investigation between the association between offending, poor physical health and mortality will critically allow more theoretical meat to be put on these theoretical bones (Vaughn et al., 2020a).

In order to effectively investigate these mediators and moderators, Individual Participant Data (IPD) meta-analyses could be used. IPD meta-analyses are a specific type of systematic review. Rather than extracting summary (aggregate) data from study publications or from investigators, the original research data are sought directly from the researchers responsible for each study (Tierney, Stewart, Clarke, 2021). These data can then be re-analysed centrally and combined, if appropriate, in meta-analyses. IPD meta-analyses can improve the quality of data and the type of analyses that can be done and produce more reliable results (Stewart & Tierney, 2002). For this reason, they are considered to be a 'gold standard' type of systematic review.

To date, published studies in Criminology often contain only sample aggregates of moderating factors (e.g., parental and child age, socioeconomic status). Within studies where this is the case, when studying moderator effects in meta-analysis, the entire study would be perceived as reflecting a certain age or socioeconomic status, thereby disregarding any within-sample variation. Using aggregate scores may therefore bias moderator effects (Lau, Ioannidis & Schmid, 1998; Stewart & Tierney, 2002). IPD meta-analyses have the potential to decrease such bias by examining these relations at the individual level instead of the group level. Furthermore, IPD Meta-analyses facilitate the use of multivariate models and the exploration of cross-level interactions between participant/individual characteristics and study characteristics, which could not previously be studied. Thus, in using IPD, the power of moderator and mediator analyses is substantially enhanced.

Secondly, papers do not necessarily include all the existing information about all variables. Furthermore, due to the tradition of statistical significance being a prerequisite for publication, reported data and results might be selected on the basis of statistical significance, increasing

the risk of publication bias and within-study selective reporting. Conducting an IPD meta-analysis would facilitate standardization of analyses across studies and direct derivation of the information desired, independent of significance or how it was reported. An IPD meta-analysis may also provide more outcomes than were considered within the original reports of the studies. Thus, an IPD meta-analysis can provide a fuller account of all study details collected, enhancing our ability to address important research questions - leading to more robust and replicable findings. Moreover, traditional meta-analyses are ill-suited for testing mediating experimental effects. IPD meta-analyses can easily accommodate and test multivariate models, allowing testing of hypotheses of crucial theoretical interest. Such approaches are beginning to emerge, such as the Mortality After Release from Incarceration Consortium (MARIC) (Borschmann et al., 2020), and should continue to be embraced.

For further investigations were there is not already a body of knowledge from which to conduct an IPD meta-analysis, the proliferation and development of comprehensive data linkage packages holds promise. One such example is the Clinical Record Interactive Search (CRIS) database, commissioned by the NIHR to permit research on the clinical records from the South London and Maudsley Foundation Trust (2007-present, PubMed ID 19674459) and Cambridge and Peterborough Foundation Trust (2012-present, PubMed ID 28441940). These archives, together holding c.350,000 consenting participants, represent the UK's flagship for the secure use of public sector records for research, with extensive measures to ensure participant anonymity. 99% of patients in the two Trusts have given consent for their data to be used for research. For South London and Maudsley there is unprecedented data linkage in place, including for education data (National Pupil Database), family welfare benefits data, offending histories and social work records. The CRIS records archive could therefore, for example, allow researchers to explore relationships across health, offending, social care and welfare services; and then, if desired, to examine factors such as economic deprivation or ethnicity as moderators.

CRIS archives also include the special function of Google-style free-text searchability from referral, assessments, professional correspondence about symptoms and treatments, and progress notes, which could be related to offending behaviour. Though potentially identifying details are redacted, it is possible to subject the free text to qualitative analysis. This can be combined with quantitative analyses. For instance, the application of natural language

processing tools (Generalised Architecture for Text Engineering is already set up on the system), permits identification of cases where specific language sees use in assessment and case notes – e.g., types of health conditions or types of antisocial behaviours. Matched comparisons may then be used to examine potential differences in service provision associated with the language used in the case notes.

Conducting analyses within this combined, multifaceted, perspective would offer a unique lens through which to view the offending-health relationship and provide opportunities for further ancillary investigations (Akers & Lanier, 2009). For instance, evidence shows that health outcomes are influenced, to some degree as discussed earlier, by genetic make-up (Braveman & Gottlieb, 2014; Moffitt, 2018). Although the CSDD does not contain the requisite measures to examine this variable, other datasets do, including the Dunedin Multidisciplinary Health and Human Development Study and Add Health. As participants grow older and begin to pass away, researchers should consider how the interplay between offending, genetics, lifestyle factors and differential susceptibility impact physical health across the life course and subsequent mortality, using robust IPD meta-analytic methodologies and data linkage packages.

The CSDD analyses in this thesis were also limited by the infrequency of the interviews, meaning that accuracy and detail may have been lost as the men had to recall their health over a long period of time. This is a point picked up by Jackson and Vaughn (2018) when critiquing Shepherd et al.'s (2004) CSDD piece for its extended chronological gaps in analysis, arguing that more direct temporal links between offending and health need to be analysed. It is also important to acknowledge that the large number of odds ratios displayed here means that the interpretation of 'significant' odds ratios should be made with care. Adjusting for risk factors, often minimising ORs and in some cases changing the direction of the OR, should also be taken into consideration when interpreting results.

Many of these limitations with the CSDD could be addressed through a further systematic review and meta-analysis investigating physical health and offending. Unfortunately, after conducting a systematic search with the view to conducting a global systematic review and meta-analysis, the lack of studies utilising community offender samples and a lack of specificity when detailing the nature of 'health' meant that this further study was not possible.

This systematic search highlights a prominent issue in criminology and indeed social science – the issue of replication and differentiation.

This issue has been addressed by many authors and mostly notably by Fredrich Losel's presentations and subsequent papers (Farrington, 2000; Farrington, Losel, Boruch, Gottfredson, Mazerolle, Sherman, & Weisburd, 2018b; Lipsey 2003; Lösel et al., 2018; Open Science Collaboration, 2015). The lack of replication and differentiation, even when there are sufficient numbers of papers for meta-analyses, can result in large heterogeneity between included studies in meta-analyses. The respective descriptive tables in Chapters 3 and 4, showing the included and excluded studies within the two meta-analyses of this thesis, attempt to be completely transparent in this regard, but when interpreting the results of the two meta-analyses within this paper, lack of replication, differentiation and subsequent sample heterogeneity should be at the forefront of one's mind.

Although systematic reviews and meta-analyses have many methodological strengths, the two meta-analyses are limited in several further ways, in addition to the aforementioned issue of replication. For example, within the two meta-analyses, it is not guaranteed that samples of community offenders used here had no mental health problems. Mental illness in general is chronically underreported and is likely to be an acute issue in community offenders, who often do not seek help or engage with healthcare services (Elonheimo et al., 2009). This picture is further muddied when studies only define someone has having a mental illness at a threshold of psychiatric hospitalization, meaning anyone below this severe threshold of illness is not excluded or differentiated within analyses. Therefore, individuals with sub-clinical and sub-forensic psychiatric hospitalizations levels of mental illness, such as antisocial personality disorder and conduct disorder, are likely to have been included in some of the studies meta-analysed in Chapters 3 and 4.

Furthermore, it was not possible to investigate the comorbidity of physical health and mental illness in this meta-analytic work. Comorbidity in offender populations is an incredibly important topic, with the potential to significantly impact statistical relationships. For example, Peters, Wexler, and Lurigio (2015) find that comorbid disorders are more common among justice-involved persons in than the general population (Council of State Governments, 2002), with large variance in both the combinations of disorders as well as in the severity (Kessler et al., 2005; Flynn & Brown, 2008; Peters et al., 2015). Although every effort was made to control

for mental health and its impact on the likelihood of mortality and suicide, in these meta-analyses, one should be mindful of the difficulty of controlling for this complicated interaction and the lack of specificity commonly found when reporting health categories.

It was not possible to compare different types of community offender sub-categories in either of my meta-analyses, other than ex-prisoners. For example, from a UK context, this research could not compare the differences between individuals serving a court order sentences in the community (including community orders, suspended sentence orders) or individuals on post-release supervision after completing a custodial sentence. Differences and the nature of relationships may be further impacted by the supervising body. For instance, community offenders may be supervised by the probation service or community rehabilitation companies and these sub-categories of community offenders need to be investigated further in future work (Gelsthorpe et al., 2012; Phillips et al., 2016; 2018).

In Chapter 3, it was not possible to disaggregate the causes of deaths further; drug/alcohol abuse are widely reported as issues following release from prison, and as major causes of mortality in offender samples, but I could not study them in my analyses. The present research was also based on the assumption that ex-prisoners and community offenders were similar in terms of socio-demographic and criminal history factors. It was also not possible to further differentiate between the severity of crimes committed or how prolific particular offenders may have been. Access to Offender Index data for the studies in Chapter 3 would have been helpful to make more nuanced comparisons between offenders. If it had been able to study and characterize individuals according to their criminal career durations into trajectories within studies, it may have been more able to effectively investigate how time at risk effects the mortality of offenders.

It is also important to note that very different effect sizes can be generated from the same types of offenders based upon the comparison group. The results in Chapter 3 show large differences between community comparison samples and population-based comparisons. Offenders were at greater risk of dying prematurely when compared to the general population. Differences in comparison groups are therefore likely to influence results. This should form an important consideration when reviewing empirical work on the mortality of offenders, and it has significant implications for intervention strategies.

When considering the meta-analysis in Chapter 4, the results must also be interpreted cautiously, in light of the small number of studies informing my analysis and conclusions. For example, only one longitudinal community sample was included and the analysis of differences between countries also tended to come from single studies which differ greatly in their scale (see Table 3 for a full description). These results are also likely to provide an underestimate of suicide risk, with many studies not specifically reporting on suicide as a cause of death, and those that did report not including open verdicts. The present study also could not compare ex-prisoners and community offenders on criminal histories and socio-demographic or other risk factors. Therefore, it was not possible to deduce why community offenders and non-offenders differ in their likelihood of suicide, or why community offenders have a greater likelihood of suicide than ex-prisoners. Again, Offenders Index data would have been helpful to make more nuanced comparisons between offenders.

Unfortunately, too few studies contained mortality by suicide data disaggregated by gender for analysis. It would have been interesting to see whether community offender statistics regarding suicide match non-offender gender differences in suicide prevalence, with males at greater risk (Moller-Leimkuhler, 2003), or whether they would agree with previous offender mortality research which highlights the enhanced risk of female offenders (Elonheimo et al., 2017).

Comparing results to worldwide suicide data must also be considered carefully. The sample presented in Chapter 4 was predominantly from high-income countries. Suicide is particularly prevalent in low- and middle-income countries, with 79% of suicides worldwide in 2016 occurring in this category (WHO, 2018). Future work needs to utilize low- and middle-income countries to assess the mortality and suicide risk of offenders, which one might expect to be considerably higher than the results found in my meta-analysis.

It is also necessary to consider the important finding in both meta-analyses that time at risk was not significant when investigating mortality and suicide. This is a striking result, contrary to the commonly held view in life course criminology and the results presented in Chapter 2 of this thesis. This finding is also in contrast to other unpublished work on mortality in the CSDD, which utilised Moffitt's (1993) trajectories, finding that individuals who offend for the longest time had the highest likelihood of multiple poor health outcomes. Although these non-significant meta-regressions are of great interest, one must be cautious when making direct comparisons with trajectory-based analyses. Unfortunately, insufficient studies utilised

Moffitt's trajectories or similar categorisations that could be harmonised across the sample for analysis. Time at Risk was the most closely related concept that could be analysed. However, the discrete categories of Moffitt's trajectories and the continuous nature of the Time at Risk variables may in part explain the differing relationships. Furthermore, the high degree of heterogeneity within the meta-analyses may have also contributed to this differing relationship.

Time at risk being non-significant, however, still seems pertinent, and we cannot rule out that, in terms of the health-crime relationship, differences when using population level comparisons diminish the significant relationship of offending duration in relation to health that Chapter 2 found and is commonly found in other community level studies (Piquero et al., 2007b; Loeber & Farrington, 2011; Welsh et al., 2019; Zane et al., 2018). It would be interesting to see if time at risk was also non-significant when investigating physical health versus offending meta-analytically and investigate how levels of poor physical health combined with time at risk may impact the increased likelihood of premature mortality and suicide of community offenders found in Chapters 3 and 4 of this thesis.

This thesis has approached this relationship of crime and health in a principally unidimensional fashion. Although efforts were made, for example by using specific search terms, to identify samples in bidirectional models, a lack of research in this area limited the ability of the meta-analysis to undertake analyses in this way (Testa & Semenza, 2020).

Yet, and with these limitations in mind, the findings from this thesis still provides valuable information and novel approaches based on this associative evidence. The findings within this thesis lend weight to the view that offending could be considered a risk factor *in itself* for poor physical health. Further investigation is needed to solidify this view, utilising the most appropriate forms of analyses and reported data as highlighted throughout this thesis.

# Chapter 6: Discussion

Piquero, Farrington and Blumstein stated in 2007 that "…although researchers have long established a linkage between offending and poor health outcomes, little specific information is known" (Piquero et al., 2007b, p. 211).

This thesis therefore set out to investigate whether there were differences between the physical health, mortality, and likelihood of suicide amongst community offenders compared to non-offenders. This contrasts with the focus of existing research on incarcerated offenders (e.g., Borschmann et al., 2014) and offenders with mental health histories (e.g., Fazel et al., 2007). This thesis began by conducting analyses into physical health in the Cambridge Study in Delinquent Development (CSDD). These analyses were supplemented by two global systematic reviews and meta-analyses, both of which produced several key and novel findings. It is important at this stage to reiterate that this thesis highlights only *associations*, not causal or predictive relationships, between offending, unidirectional physical health outcomes, mortality and suicide. This thesis also does not intend to provide a critique or recommendations for improving health pathways or the community supervision service. Thus, the findings and discussion should be interpretated with this scope in mind.

## Key Findings

### Physical Health in Community Offenders

There are marked individual differences in the stability of antisocial behaviour (Moffitt, 1993). Earlier longitudinal research has investigated offenders as a homogeneous group and few studies have investigated physical health outcomes based on offender trajectory typologies or investigated risk factors related to offender trajectories (Jolliffe et al., 2017a; 2017b; Reising et al., 2019). Therefore, one of the focuses of Chapter 2, in contrast to the conviction and longitudinal risk factor analyses previously performed (Piquero, 2008), was on temporary versus persistently antisocial persons, defined according to Moffitt's (1993) and Jolliffe and colleague's (Jolliffe et al., 2017b) offending trajectories, who constitute qualitatively distinct types of persons (Jolliffe et al., 2017b; McGee & Farrington, 2010; Moffitt & Caspi, 2001; Moffitt, Caspi, Rutter & Silva, 2001; Piquero et al., 2012; Zara & Farrington, 2009).

When considering physical illnesses (Respiratory Tract, Cardiovascular, Musculoskeletal, Skin, Allergic, Gastrointestinal and Infectious Illnesses) and hospitalizations (the number of

hospital visits), the present results largely confirm previous work (Shepherd et al., 2002; 2004). By age 48, unadjusted ORs showed that the incidence of organic illness was higher among Life-course-persistent, Late-onset offenders and offenders in general. Based on adjusted ORs at age 32, the incidence of hospitalizations was higher for Late-onset offenders. Adjusted ORs at age 48 also showed that the incidence of hospitalizations was higher for all three offender types and offenders in general. These results also provide evidence that offenders were more likely to suffer injuries than non-offenders.

Furthermore, when investigating the relationship between psychosocial risk factors at age 8-10, antisocial personality (ASP) at ages 18, 32 and 48, and poor physical health (based on self-reports and GP records), this new research found that high ASP scores at ages 18, 32 and 48 were related to a high prevalence of hospitalization. It was also found that, according to GP records, high ASP scores at age 32 were related to poor physical health, and high ASP scores at age 48 were related to a greater likelihood of having a disabling medical condition. Of the age 8-10 risk factors, having a convicted father and having high daring significantly predicted self-reported hospitalization. Low family income significantly predicted the GP-reported likelihood of disabling medical conditions. The relationships with high ASP scores did not hold up after controlling for age 8-10 risk factors.

These findings suggest that the impact of offending on physical health becomes more serious if offending persists beyond adolescence. These analyses also highlight age-specific health implications related to the ages at which offenders begin and end their delinquent behaviour. These results also provide evidence that offenders are more likely to suffer injuries than non-offenders. The worst consequence of poor physical health is premature mortality, so this element of the health-crime relationship was subsequently investigated.

**Premature Mortality in Community Offenders**

Chapter 3 sought to undertake research that would meta-analytically establish whether community offenders, without a history of mental illnesses, die prematurely compared to non-offender community and population comparison samples. Thirty-six studies met the inclusion criteria ($N$ = 1,116,614).

This systematic review and meta-analysis presented several unique findings. Firstly, offenders outside secure settings are over three times more likely to die prematurely compared to non-

offenders. Secondly, compared to non-offenders, community offenders are more likely to die from unnatural causes, as well as organic illnesses. Thirdly, there are differences in the odds of premature mortality, and causes of mortality, across countries, genders, and ethnicities. Fourthly, the type of comparison group used in studies can dramatically alter mortality effect sizes. Fifthly, a meta-regression revealed that time at risk was not a significant factor.

These results suggest that the rates of premature mortality previously found for offenders do not just reflect the impact of mental illness on these individuals, but rather that offending and antisocial lifestyles might have a significant physiological impact on the body over and above any impact of mental illness.

Suicide was of particular interest when considering the causes of premature mortality in community offenders, because one of the most prominent causes of death in offenders (Fazel et al., 2005) and males globally (WHO, 2018). A systematic review and meta-analysis was therefore conducted to investigate this significant element of the health-crime relationship.

**Suicide in Community Offenders**

Chapter 4 sought to meta-analytically establish whether community offenders, without mental illnesses, were more likely to commit suicide compared with community and general population comparison groups. Fifteen studies met the inclusion criteria ($N$ = 602,347). Several novel findings were reported. Firstly, community offenders are over four times as likely to commit suicide compared to non-offenders. Secondly, time at risk was not significant within the meta-regression, highlighting the risk of premature mortality due to suicide *at any age*. Thirdly, ex-prisoners had a high likelihood of suicide, but not as high as offenders who had not been incarcerated. Fourthly, there are differences across countries in the odds of community offenders committing suicide. Fifthly, the type of comparison group used in studies can influence effect sizes. Finally, time at risk was not significant within the meta-regression, highlighting the risk of premature mortality due to suicide *at any age* and length of offending history or interaction with the criminal justice system.

The findings again provided new evidence that community offenders, who do not have psychiatric histories, form a vulnerable group who would benefit from future interventions to reduce the incidence of suicide.

**The Implication of Data Sources**

A common limitation of criminological work and the first study within Chapter 2 (Farrington et al., 2015; Kirk, 2006) was the use of self-reported measures for both health and offending records, which may influence the associations reported and lead to the critical question as to whether inferences about the life-course of crime and health are different across different data sources. Earlier research has established variability in agreement between self-reported and general practitioner-reported data for different health outcomes (Hansen et al., 2014). In order to address this limitation, in Chapter 2, further analyses using General Practitioner (GP) records were conducted (Skinner & Farrington, 2021), which confirmed similar relationships between physical health, offending and antisocial personality.

The two meta-analyses in Chapters 3 and 4, respectively, also highlight the importance of the nature of the data used within analyses and how this can impact the overall findings from a study. For example, sub-analyses splitting samples into ex-prison, community longitudinal comparisons, and general population comparisons highlighted differing results between all three groups. Specifically, community longitudinal studies reported the smallest difference between offenders and non-offenders in terms of premature mortality. In contrast, studies which used general population comparisons, instead of community level comparisons, found the greatest difference in premature mortality. These diverging results may be a result of similarly low SES within the whole population of community longitudinal samples, with non-offenders also having worse physical health and greater chances of premature mortality than the national average (Cohen et al., 2003; Melchior et al., 2006; Stringhini et al., 2017). It may therefore be the case that longitudinal community samples, often drawn from low SES backgrounds, may be underreporting when considering physical health and mortality in offenders compared to the general population.

The findings from Chapters 2, 3 and 4 in relation to the possible confounding effect that data sources can have on the interpretation of results highlights the need, in particular, to carefully consider the comparison groups used. Within the CSDD, there was high concordance between self-reported and GP reported health measures. However, this is only one sample; self-reported health data should be used with caution and further work investigating concordance with official records should be conducted.

## Discussion

Building on the specific discussion sections within each respective chapter, this section seeks to integrate the findings of this thesis within the current theoretical and evidential contexts of health criminology, highlighting the current limitations for the field and possible insights from other disciplines and frameworks.

### Criminological Theories: Widening the Consideration of Explanatory Variables

Taken together, the present studies offer additional evidence that offending lifestyles may have long-term consequences for physical wellbeing and that certain subgroups, such as life-course persistent offenders, may suffer from poorer subsequent physical health than their non- or lower-offending counterparts. This is in line with earlier meta-analytic work on adverse mental health outcomes for LCP offenders compared to other criminal career groups (Reising et al., 2019). Within global meta-analyses, community offenders were also found to be significantly more likely to die prematurely (Skinner & Farrington, 2020a) and commit suicide (Skinner & Farrington, 2020b). The work within this thesis is therefore suggestive that there is an underlying and persistent association between offending and well-being in community offenders.

As highlighted by numerous authors (Farrington, 2000; Farrington et al., 2018b; Lipsey, 2003; Lösel et al., 2018), a meta-analytic approach, when possible, would help clarify the physical health and offending relationships, as would further dual trajectory approaches, similar to the Testa and Semenza's (2020) work. It is still unclear how the relationship between health and offending unfolds in relation to time, maturation, the exact temporal order of health and offending events, and the degree of delinquent involvement which affects health outcomes. Further longitudinal studies measuring the myriad risk factors involved in the health-crime relationship also are needed, and this must be investigated within an integrative framework.

Although "…assessing how offending affects health is challenging because offending and poor health share many of the same causes and consequences… (and) in the presence of time-varying covariates, which are simultaneously predictors and effects of the presumed causal variable" (Hernan, Brumback & Robins, 2002, p. 18-19), utilising novel methodologies from the epidemiological and medical sciences (such as IPD meta-analyses and Data Linkage packages discussed above) would allow further exploration of the complicated and extensive moderators and mediators in the health-crime relationship.

Previous research on the relationship between offending and physical health has consistently made the case that research needs to be life-long in its scope, broad based and that any causal relationships are not clear cut. Further work is also needed on non-incarcerated groups, controlling for person-time as an influencer (Testa & Semenza, 2020), and in a way that keeps physical wellbeing separate from mental health. Furthermore, the results in this thesis have clear implications for tests of developmental and life-course theories in criminology: their results may be misleading if they do not take account of time at risk or duration of offending in some way, to both confirm or refute currently held views of life course health criminology (Binswanger, Redmond, Steiner & Hicks, 2012).

The present work also supports the overall direction of travel in the literature, which has shown to be towards a wider range of explanatory causes and could be said to support a confounding line of argument (Van de Weijer et al., 2016). The possible existence of confounding factors in the health-crime relationship is supported by the results of this thesis, in that even when controlling for significant risk factors, and conceptualising offending as a constellation of antisocial personality traits, a relationship between offending and health nevertheless remains. This may be due to two reasons. Firstly, there was insufficient control of all variables influencing the relationship, and secondly, offending is a confounding variable in itself, influencing health in the same way that drug use or smoking would. Importantly, within this thesis, the relationships between offending over time, worse health and mortality are in a sample of 'lower risk' individuals, with analyses excluding violent, psychiatric, incarcerated and drug use samples. This again supports the view of this thesis that unexplained causality is both a well-recognised factor in the literature and that the results of this research thus sit well under this previously identified phenomenon.

Indeed, when considering prominent theories together, there seems to be a lack of theoretical explanations with sufficient specificity and predictive ability to address the interplay between health and criminology, compared with earlier attempts by integrated theories to explain offending itself (Farrington, 2017). The inclusion of a wide range of possible factors when examining the health-crime relationship highlights both a growing appreciation for the complexity of this relationship, and how previous research has not sufficiently controlled for the plethora of confounding variables. For example, the neuropsychological deficits of Moffitt's LCP category are variously argued to be inherited or acquired through a wide range of environmental influences. For instance, a lack of breastfeeding (Golding, Rogers & Emmett,

1997; Quinn, O'Callaghan, Williams, Najman, Andersen & Bor, 2001; Rogan & Gladen, 1993); pregnancy/birth problems (Arseneault, Tremblay, Boulerice & Saucier, 2002), maternal smoking (Raine, 2002) or alcohol consumption (Sampson, Streissguth, Barr & Bookstein, 1989) during pregnancy.

The attempts to 'cross-fertilize' across theories haves traditionally centred on the 'back end,' emphasizing mental health conditions, substance use/addiction and/or HIV by incarcerated persons (Lanier, Zaitzow, & Farrell, 2015). Additionally, despite racial/ethnic and socioeconomic stratification of crime and delinquency being acknowledged within life course criminological theories (Sampson & Lauritsen, 1997; Sampson, Raudenbush, & Earls, 1997; Sampson, Morenoff, & Raudenbush, 2005), such stratification is not explored as a function of early stratification in individual health – including health conditions and behaviours/lifestyles. Criminological research exploring health risks in relation to delinquency are (1) relatively infrequent, (2) disconnected and non-systematic (specific health risks are often examined in isolation with large variance in definitions), and (3) outside the framework of existing, cross-disciplinary health disparities research (Sampson et al., 2005).

**Issues of Bidirectionality**

The underdevelopment of theorizations underlying the health-crime relationship is further revealed when two other diverging views are considered. These concern the directionality of the relationship between poor physical health, mortality, and offending. Specifically, Testa and Semenza (2020) have recently highlighted two causation views on offending and poor ill health that have emerged in the literature over time. Testa and Semenza (2020) state that growing evidence indicates a link between various facets of physical health and crime, stating that the literature has variously argued that offending results from poor health (Ford, 2014; Grosholz & Semenza, 2018; Jackson, 2016; Semenza, 2018; Semenza & Grosholz, 2019; Stogner & Gibson, 2010, 2011), or that, conversely, it is offending that drives worse health outcomes (Farrington, 1995; Odgers et al., 2007; Piquero et al., 2007b, 2011; Shepherd et al., 2004; Schnittker & John, 2007; Vaughn et al., 2014).

The above approach makes the case for an interactional relationship between the two categories of offending and physical health (Jackson & Vaughn, 2018; Testa & Semenza, 2020). Jackson and Vaughn (2018) see the benefits as being that "a bidirectional framework can serve to demonstrate areas where improvements in certain health behaviours might also serve to

decrease particular types of crime. Conversely, reductions in violent offending or illegal drug use may improve one's health" (Jackson & Vaughn, 2018, p. 1). Longitudinal research with repeated measures of health and offending is needed to investigate to what extent within-individual changes in offending are followed by within-individual changes in health, and vice versa.

Jackson and Vaughn (2018) also highlight two further examples of bidirectional analyses in the recent literature. In the United States, a study by Stogner and colleagues (Stogner et al., 2014) showed that minor physical ailments could increase violent offending, while the latter then went on to generate poor health. In this work the bidirectional effects were stable even after controlling for self-control, age or gender. However, the study did not cover adults, only adolescents (Stogner et al., 2014). The second study, based in the U.K., used data from the Cambridge Study in Delinquent Development. Shepherd and colleagues (2004) showed that physical injury sustained in anti-social activity predicted further offending, and respiratory conditions were associated with subsequent criminal convictions (Shepherd et al., 2004).

However, Jackson and Vaughn (2018) still cite these studies as evidence that inter-activity between the two conditions is important, valid and merits additional work, stating that "…[research] suggest(s) caution and nuance is required when discussing the relationship between health and crime broadly construed" (p. 10). Once again this underlines the need for further, and unique, analysis of this topic as it applies in less analysed cohorts such as community-based offenders. Jackson and Vaughn (2018) conclude by saying that future research should exercise caution in combining mental and physical health elements "…since these different areas of health may have divergent implications for behavioural outcomes" (p. 11). This supports the decision in this thesis to focus on physical health.

Supporting the contention of this thesis that health-crime causation has latterly been increasingly regarded as complex, Moffitt herself set out relatively recently to take forward updated views on her arguments concerning offending and poor health. In a 2018 paper, she stated that her 1993 taxonomies were developed in order to bring together psychological and biological theories (underpinning the concept of long-term persistent offenders) and sociological theories (explaining adolescence short-term offending and abstainers). She also argued that the taxonomies put forward have largely stood the test of time as later evidence, including the ever-extending data available from longitudinal studies, largely supports her

predictions. Moffit's (2018) update states that recent work has confirmed her explanation of the age-crime curve (greater offending in the early years) and that new research, in areas such neuroimaging, genetics (Stogner & Gibson, 2013), and social epidemiology offer possibilities for deepening the understanding of developmental factors in offending.

**Insights from Public Health and Social Epidemiology**

As alluded to by Moffitt (2018), the Public Health and Social Epidemiological literature also highlights further possible evidence, theories, variables and methodologies that need to be utilised within criminological inquiry to better theoretically and empirically explain the relationships between physical health, subsequent premature mortality, suicide and crime (Ayyagari et al., 2012; Lee et al., 2012; Miller et al., 2011; Moffitt et al., 2011).

Adding to this growing pool of possible explanations, of particular interest from the medical fields is the impact of acute and chronic stress proliferation (Kort-Butler, 2017; Jang, 2007; Junger et al., 2001; Schroeder, Hill, Haynes & Bradley, 2011). For example, following Agnew's (2006) General Strain Theory and Tremblay and Pare's (2003) Hazard-strain conceptualization, poor physical health may be viewed as a noxious stimulus that interferes with the achievement of positively valued goals, while also eliminating positively valued stimuli from the individual. Poor physical health, as well as related strains (e.g. such as having a convicted father, low family income and poor parental supervision as identified within Chapter 2), could be interpreted as stressful, and are associated with ramifications that promote delinquency (Ford, 2014; Stogner & Gibson, 2010, 2011; Stogner et al., 2014). Furthermore, health-related stressors in adolescents can lead to stressors in other areas of their lives, such as struggles in schoolwork, issues with teachers, and missing social events, all of which can become proximate causes of criminal behaviour. If those behaviours continue, they can increase exposure to additional stressors, exacerbating health problems and problem behaviours over the life course (Slocum, 2010) – possibly in bidirectional ways (Vaughn et al., 2020a).

Subsequently, physical health is impacted through continuous biological wear-and-tear caused by these prolonged encounters of social or economic adversity (Geronimus, 1992; Geronimus, Hicken, Keene & Bound, 2006), early-life exposure to stressful events, and epigenetic mechanisms that control gene expression (Braveman & Gottlieb, 2014). These influences are significant, and, although the current evidence base does not specify the exact contributions of

each health determinant, it appears that the social environment may account for up to 40% of population health outcomes (McGovern, Miller, & Hughes-Cromwick, 2014).

One theory which may be useful to amalgamate future criminological and epidemiological inquiry is Ecosocial Theory, which integrates social and biological reasoning with dynamic, historical, and ecological perspectives (Krieger, 2011). Ecosocial theory looks at how our individual and collective histories, societal power arrangements, and ecological context 'get under our skin', resulting in a physical embodiment of social conditions, behaviours and lifestyles. While Ecosocial theory emphasizes biological mechanisms, it uses analyses fundamental to the 'social production of disease' and 'political economy of health' to understand how societal structures, like schools or the economy, impact health. Ecosocial theory therefore rejects a purely biomedical perspective, which relies on single primary principles, such as biological, chemical, and physical phenomena, to explain disease (Krieger, 2011).

This interplay and physical embodiment of social conditions, behaviours and lifestyles provides a useful framework to understand how differing offending typologies impact health over time, in addition to the mediating and moderating effects of personality, familial and environment risk factors, as highlighted within the analyses in Chapter 2. Ecosocial theory also provides a framework to understand why community offenders are more likely to die prematurely compared to non-offenders, with the stress resulting from offending over time, at whatever level of chronicity or severity, contributing to diminished physical health and the increased likelihood of mortality.

Ecosocial theory's explanation of health outcomes resolves around the concept of embodiment. Embodiment promotes the idea that human bodies function in the light of social conditions and behaviours, such as offending, that cause biological wear and tear on the body (Krieger, 2005). Health outcomes therefore result from a complex interaction and cumulative interplay between an individual's exposure, susceptibility, and tolerance to disease, as well as different contexts (such as employment, community supervision, and incarceration) and ecological resources. For example, unpaid sick leave, low wages, poor quality healthcare, and delinquency impact bodies differently from paid sick leave, a living wage, quality healthcare, access to clean water, safe neighbourhoods and not engaging in delinquent behaviour (Krieger, 2005). Similarly, a range of antisocial personality factors and environmental risk factors, as shown in Chapter 2 of this

thesis, all accumulate and interact to impact the relationship between health and offending over time. This also adds yet another argument to the view that scholarship is not yet sufficiently informed to provide interventional advice that may affect the lives of people.

The relationship between these exposures and physiological dysfunction is not surprising, as chronic victimization, childhood trauma, or living in constant fear of victimization are all known to cause psychological stress and, as a result, physiological dysfunction (e.g., see Vaughn et al., 2020b). However, participation in criminal offending may also be a type of activity that, similar to fear and victimization, may expose individuals to stressful life experiences (Junger et al., 2001; Penner, 1982; Schwartz et al., 2020). Offending may therefore act as a risk factor for poor health and premature mortality (Bacak & Karim (2018), in the same way that a multiplicity of sociodemographic factors (Ayyagari et al., 2012), social factors (Lee, Huang, Lee, Chen, & Lin, 2012), and personality traits (Miller et al., 2011; Moffitt et al., 2011) negatively impact physical health (Glymour & Spiegelman, 2017). The CSDD analyses in Chapter 2 and the two systematic reviews included in this dissertation support the idea that offending may be seen as a risk factor for poor health, premature mortality and suicide.

Indeed, multiple studies show that offending results in degraded health due to exposure to harsher environments and reduced health resources (Agnew, 1992; Grosholz & Semenza, 2018; Stogner & Gibson, 2010, 2011; Stogner et al., 2014). For example, using two waves of data collected on 14,738 adolescents from the National Longitudinal Study of Adolescent Health (Add Health), Stogner et al. (2014) used simultaneous structural equation modelling to determine that minor health problems have delayed effects on violence and that involvement in violence also negatively affects future health. Stogner and colleagues (2014) state that their findings may be the result of a number of processes, such as offending reducing healthy habits and increasing the likelihood of exposure to peer groups promoting substance use or further violence.

Similarly, Junger and colleagues (Junger et al., 2001) investigated the association between delinquency and health in a cross-sectional sample of 3,677 Dutch adolescents and young adults (aged 13-24). Junger et al. (2001) found that delinquency was significantly associated with all three measures of self-reported health assessed in this study (somatic symptoms, general health, and chronic conditions). Delinquency was also significantly related to three of the four measures of health behaviour (smoking, alcohol consumption, and drug use), even

after controlling for demographic and socio-economic factors. Interestingly, only minimal support was found for the hypothesis that the association between delinquency and health was mediated by differences in health behaviour or demographic/socio-economic differences.

Therefore, offending could be conceptualised as a social determinant of health, with the view that intervening early in a criminal career is extremely important, given the risk of developing lifetime chronic health problems during this period (Bethell, Newacheck, Hawes, & Halfon, 2014; Caruso, 2017; Krug, Mercy, Dahlberg, & Zwi, 2002) and the fact that cumulative adversity has more effect on health than single instances (Thoits, 2010; Turner & Llyod, 1995). The Ecosocial approach conceptualises the relationship between offending and health in terms of a 'generalised effect of offending' on health. In contrast to theories which advocate for one main factor, such as self-control, it is a theory that suggests many impacting and interacting factors act together to influence the health-crime relationship. This emphasis on a multitude of factors confounding and impacting the relationship between health and offending reflects the evidence provided within this thesis, Moffitt's Developmental Taxonomy and the increasing body of research in the health criminology field (Moffit, 2018; Van de Weijer et al., 2016).

There is one framework which applies Ecosocial principles and a social determinant of health approach to criminological theorizations and empirical findings. This new approach is called the Biosocial perspective (Fox, 2017). Similarly to Ecosocial models, Biosocial perspectives concern two principles, biological influence and social environment. These are argued to be the processes which individually and interactively prompt or protect a person from criminality (Beaver, 2008; Rafter et al., 2016; Walsh, 2002a; Walsh & Beaver, 2009). Instead of assuming that biology is a direct driver of offending, biosocial criminology proposes that biology underlies a susceptibility to offending and health that may be increased or decreased based on various environmental variables (Belsky & Pluess, 2009; DeLisi & Vaughn, 2015; DiLalla & Bersted, 2015; Ishikawa & Raine, 2002; Vaughn, DeLisi, Beaver, & Wright, 2009).

Furthermore, as Ecosocial and Biosocial research highlights that our explained variance increases when biological variables are considered in conjunction with environmental variables, and no single criminological theory explains the variance in offending between individuals, it seems likely that by combining biological findings and frameworks with sociologically informed criminological theories there will be an increase in the understanding

of the health-crime relationship (Barnes et al., 2014; DeLisi & Vaughn, 2015; Schwartz & Beaver, 2014; Walsh, 2002a, 2002b; Wright & Beaver, 2005; Wright & Boisvert, 2009).

Therefore, empirically supported criminological theories investigating the health-crime relationship could be enhanced by incorporating insights from biological sciences (Walsh, 2002; Wright & Beaver, 2005). The theories discussed in the section above, for example, could benefit by being linked to their underlying biological substrates: self-control in the case of Gottfredson and Hirschi's and responsivity to stress and strain in the case of Tremblay and Pare (2003) could be linked to biological factors. For instance, self-control forms part of the executive function constellation, located in the frontal cortex. Differential susceptibility to stress and negative life events has been investigated extensively through animal models, physiologically focused experimental designs, and brain imaging (Wright & Boisvert, 2009). As biology, environmental factors, and behaviour are interconnected (Burt & Simons, 2014), it is important to consider each disciplinary perspective in theories and studies of offending and health. Excluding just one of these perspectives minimizes the likelihood of disentangling the complex health-crime relationship. Indeed, their integration would lead to increased scope, robustness, and validity compared with research utilising a singular theory from a particular disciplinary approach. It is only by accounting for both biological factors and social context that offending and health can most accurately be investigated and interpreted (Rutter, 2006).

With this in mind, and despite the need for, and existence of, interventions to address the negative repercussions of offending on the health (Akers & Lanier, 2009; Akers, Potter, & Hill, 2013), it is argued that in light of the results of this thesis, current evidence and theorizations, it is premature to recommend interventions on matters that have yet to be clarified in terms of their exact causation and interaction (Vaughn et al., 2020b).

## Conclusion

In summary, from the work with this thesis, it is argued that there is an associative relationship between community level offenders, physical health, and premature mortality. Within the CSDD community sample, offenders had worse physical health when they offended for a greater duration, and in addition greater numbers of antisocial personality characteristics were significantly associated with the likelihood of poor physical health and repercussions such as being hospitalized. This thesis contributed to this ongoing debate by also producing, for the first time, two meta-analyses investigating the relation between poor health and community

offenders longitudinally, controlling for mental illness, drug use, alcohol use, violent samples and time at risk. These kinds of detailed analyses on the mortality of offenders have never been carried out before. Premature mortality, especially via suicide, is significantly more likely in offenders than in non-offender comparisons even in the absence of drug use and recorded mental illness.

From the extended literature review of prior criminological and social epidemiological work, there is likely to be a bidirectional relationship informed by a wide range of 'confounding' variables between offending and health, which needs to be further explored. Here, viewed within the context of criminological theories, Ecosocial theory and a Biosocial framework, possible evidence was provided for offending being a risk factor *in itself*, impacting health in a similar way to drug abuse or other key risk factors discussed earlier for poor physical health.

Intriguingly, the studies within this thesis highlight that the level of data analysis may make a significant difference to the direct empirical outcomes of analyses, but also to subsequent theorizations. Comparing the meta-analytic findings with work utilising the CSDD and other longitudinal studies, which shows that age and time at risk (often conceptualised as the longevity of criminal career in the form of life-course-persistent offenders) are significant factors, it seems that these relationships might be less significant when investigated at meta-analytic and population levels.

Although this research did not produce meta-analyses for criminal career trajectories specifically in relation to health and mortality, the studies within this thesis point to a different relationship between health and offending over the life course, as compared to the prolificity of offending over time. As the studies produced in this thesis were the first to investigate the health and offending relationship in the absence of mental health at a global level, with non-offender community and population comparisons, further work is needed to investigate the limitations of our findings. A detailed discussion of the limitations of the studies within this thesis and future directions that research may take to further inform our understanding of the health-crime relationship was also provided. Based on the recommendations made in Chapter 5, this work should produce further robust evidence and enter into evidence-based debates and critiques of the theoretical arguments and frameworks put forward in this thesis.

Community offenders form a vulnerable group who require targeted intervention to reduce their incidence of poor physical health, mortality and suicide across the lifespan. Yet, until there is further understanding of the health-crime relationship, the nature of these interventions remains difficult to specify. It seems likely, however, that the antisocial lifestyles that offenders lead, when out of secure environments, pose a significant risk to health and should therefore be viewed as a future public health challenge. The findings and review of literature on bidirectionality in this thesis suggests that strategies to reduce crime can potentially improve aspects of health (Stogner et al., 2014) and, on the other hand, improvements to health may have the additional benefit of reducing criminal behaviour (Jackson & Vaughn, 2018).

A shared responsibility lies with the research community, prison, probation, health and social services to develop more collaborative, interdisciplinary approaches and methodologies for the high-risk group that is community offenders. Although criminal justice populations and public health systems have become increasingly intertwined (Bond & Gittell, 2010; Schroeder et al., 2011; Stogner & Gibson, 2010; Vandecar-Burdin & Payne, 2010; Vaughn, 2011), the public health and social epidemiological literature highlights possible theories, variables and methodologies that need to be further utilised within criminological enquiry to better theoretically and empirically explain the relationships and directionality of health and crime.

There is a real opportunity to enhance criminological inquiry at this juncture by employing interdisciplinary methodologies, further establishing the field of Epidemiological Criminology that David Farrington described as early 1995 (Farrington, 1995). Once community offenders receive parity of attention with other offending sub-groups, then practitioners and policymakers will be more capable of implementing policies and evidence-based interventions which will serve to reduce the elevated physical health burden amongst this vulnerable group.

## Bibliography


Aalsma, M. C., Lau, K. S. L., Perkins, A. J., Schwartz, K., Tu, W., Wiehe, S. E., Monahan, P., & Rosenman, M. B. (2016). Mortality of Youth Offenders Along a Continuum of Justice System Involvement. *American Journal of Preventive Medicine, 50*(3), 303–310.

Abram, K. M., Zwecker, N. A., Welty, L. J., Hershfield, J. A., Dulcan, M. K., & Teplin, L. A. (2015). Comorbidity and continuity of psychiatric disorders in youth after detention: a prospective longitudinal study. *JAMA Psychiatry, 72*(1), 84–93.

Agnew, R. (1992). Foundation for a general strain theory of crime and delinquency. *Criminology, 30*(1), 47–87.

Agnew, R. (2006). *General strain theory: Current status and directions for future research*. In: F. Cullen, J. P. Wright, & K. Blevins (Eds.), Taking stock: The status of criminological theory——advances in criminological theory (pp. 105-123), New Bruns- wick, NJ: Transaction.

Agresti, A., & Min, Y. (2002), Unconditional small-sample confidence intervals for the odds ratio. *Biostatistics, 3*(3), 379-396.

Akers, T. A., & Lanier, M. M. (2009). "Epidemiological criminology": coming full circle. *American Journal of Public Health, 99*, 397–402.

Akers, T. A., Potter, R. H., & Hill, C. V. (2013). *Epidemiological Criminology: A Public Health Approach to Crime and Violence*. San Francisco: John Wiley & Sons, Inc.

Alder, N. E., & Newman, K. (2002). Socioeconomic disparities in health: pathways and policies. *Health Affairs: Leading Publication of Health Policy Research, 21*(2), 60-67.

Amone-P'Olak, K., Burger, H., Ormel, J., Huisman, M., Verhulst, F. C., & Oldehinkel, A. J. (2009). Socioeconomic position and mental health problems in pre- and early-adolescents. *Social Psychiatry and Psychiatric Epidemiology, 44*, 231-238.

Anda, R. F., Felitti, V. J., Bremner, J. D., Walker, J. D., Whitfield, Perry, B. D., Dube, S. R., & Giles, W. H. (2011). The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology. *European Archives of Psychiatry and Clinical Neuroscience, 256,* 174-86.

Anders, P., Jolley, R., & Leaman, J. (2016). Rebalancing Act: A resource for Directors of Public Health, Police and Crime Commissioners, the police service and other health and justice commissioners, service providers and users. *Public Health England.* Retrieved from: http://www. revolving-doors. org. uk/file/2049/download.

Andreasson, S., Allebeck, P., & Romelsjö, A. (1988). Alcohol and mortality among young men: longitudinal study of Swedish conscripts. *British Medical Journal (Clinical Research Education), 296*(6628), 1021–1025.

Arneklev, B. J., Grasmick, H. G., Tittle, C. R., & Bursik, R. J., Jr. (1993). Low self-control and imprudent behavior. *Journal of Quantitative Criminology,* 9, 225-247.

Arseneault, L., Tremblay, R. E., Boulerice, B., Saucier, J-F. (2002). Obstetrical complications and violent delinquency: Testing two developmental pathways. *Child Development, 73*(2), 496-508.

Auty, K. M., Farrington, D. P., & Coid, J. (2015). The validity of self-reported convictions in a community sample: Findings from the Cambridge Study in Delinquent Development. *European Journal of Criminology, 12*(5), 562–580.

Ayyagari, P., Ullrich, F., Malmstrom, T. K., Andresen, E. M., Schootman, M., Miller, J. P., Miller, D. K., & Wolinsky, F. D. (2012). Self-rated health trajectories in the African American health cohort. *PLoS One, 7*(12), e53278.

Bacak, V., & Karim, M. E. (2019). The Effect of Serious Offending on Health: A Marginal Structural Model. *Society and Mental Health, 9*(1) 18–32.

Baker, P., Dworkin, S. L., Tong, S., Banks, I., Shand, T., & Yamey, G. (2014). The men's health gap: Men must be included in the global health equity agenda. *Bulletin of the World Health Organization, 92,* 618–620.

Bales, W. D., Scaggs, S. J., Clark, C. L., Ensley, D., & Coltharp, P. (2014). Researcher–practitioner partnerships: a case of the development of a long-term collaborative project between a university and a criminal justice agency. *Criminal Justice Studies, 27*(3), 294-307.

Bargagli, A. M., Sperati, A., Davoli, M., Forastiere, F., & Perucci, C. A. (2001). Mortality among problem drug users in Rome: An 18-year follow-up study, 1980-97. *Addiction, 96,* 1455-1463.

Barnes, J. C., & Beaver, K. M. (2012). Extending research on the victim-offender overlap: evidence from a genetically informed analysis. *Journal of Interpersonal Violence, 27*(16), 3299-3321.

Barnes, J. C., Boutwell, B. B., & Beaver, K. M. (2016). Contemporary biosocial criminology: A systematic review of the literature, 2000-2012. In A. R. Piquero (Ed.), *The handbook of criminological theory* (pp. 75-99). Chichester, UK: Wiley & Sons.

Barnes, J. C., Boutwell, B. B., Beaver, K. M., Gibson, C. L., & Wright, J. P. (2014). On the consequences of ignoring genetic influences in criminological research. *Journal of Criminal Justice, 42*(6), 471-482.

Bartusch, D. R. J., Lynam, D. R., Moffitt, T. E., Silva, P. A. (2006). Is age important? Testing a general versus a developmental theory of antisocial behavior. *Criminology, 35*(1), 13-48.

Beaver, K. M. (2008). Desistance from delinquency: The marriage effect revisited and extended. *Environmental Research, 66*(1), 12-30.

Beaver, K. M., Barnes, J. C., May, J. S., & Schwartz, J. A. (2011). Psychopathic personality traits, genetic risk, and gene-environment correlations. *Criminal Justice and Behavior, 38*(9), 896–912.

Beaver, K. M., Boutwell, B. B., Barnes, J. C., Vaughn, M. G., & DeLisi, M. (2017). The association between psychopathic personality traits and criminal justice outcomes: Results from a nationally representative sample of males and females. *Crime & Delinquency, 63*(6), 708–730.

Beaver, K. M., DeLisi, M., Vaughn, M. G., & Wright, J. P. (2010). The intersection of genes and neuropsychological deficits in the prediction of adolescent delinquency and low self-control. *International Journal of Offender Therapy and Comparative Criminology, 54*(1), 22–42.

Beaver, K. M., Shutt, J. E., Boutwell, B. B., Ratchford, M., Roberts, K., & Barnes, J. C. (2009). Genetic and environmental influences on levels of self-control and delinquent peer affiliation: Results from a longitudinal sample of adolescent twins. *Criminal Justice and Behavior, 36*, 41–60.

Belenko, S., Hiller, M., & Hamilton, L. (2013). Treating substance use disorders in the criminal justice system. *Current Psychiatric Report, 15*, 414.

Belsky, J., & Pluess, M. (2009). Beyond diathesis stress: A differential susceptibility to environmental influences. *Psychological Bulletin, 135*, 885-908.

Bennett, T, Holloway, K., & Farrington, D. P. (2008). The statistical association between drug misuse and crime: A meta-analysis. *Aggression and Violent Behavior, 13*(2), 107–118.

Benson, M. L. (2013). *Crime and the lifecourse: An introduction*. New York, NY: Routledge.

Benyamini, Y., & Idler, E. L. (1999). Community studies reporting association between self-rated health and mortality: Additional studies, 1995 to 1998. *Research on Aging, 21*(3), 392–401.

Berg, L., Rostila, M., Arat, A., & Hjern, A. (2019). Parental death during childhood and violent crime in late adolescence to early adulthood: a Swedish national cohort study. *Palgrave Communications*, 5, 74.

Bertolote, J. M., & Fleischmann, A. (2002). Suicide and psychiatric diagnosis: A worldwide perspective. *World Psychiatry, 1*(3), 181-185.

Bethell, C. D., Newacheck, P., Hawes, E., & Halfon, N. (2014). Adverse childhood experiences: Assessing the impact on health and school engagement and the mitigating role of resilience. *Health Affairs, 33*(12), 2106-2115.

Bharel, M. (2017). *An assessment of fatal and nonfatal opioid overdoses in Massachusetts (2011–2015)*. Retrieved from: https://www.mass.gov/files/documents/2017/08/31/legislative-report-chapter-55-aug-2017.pdf.

Bjork, T., & Lindqvist, D. P. (2006). Mortality among mentally disorder offenders: a community based follow-up study. *Criminal Behaviour and Mental Health, 15*(2), 93-96.

Bjorkenstam, C., Kosidou, K., & Bjorkenstam, E. (2017). Childhood adversity and risk of suicide: cohort study of 548,721 adolescents and young adults in Sweden. *British Medical Journal, 357*, 1334.

Biles, D., Harding, R., & Walker, J. (1999). *The death of offenders serving community correction orders. Trends and issues in crime and criminal justice* (Report No. 107). Retrieved from: https://www.aic.gov.au/sites/default/files/2020-05/tandi107.pdf.

Binswanger, I. A., Blatchford, P. J., Lindsay, R. G., & Stern, M. F. (2011). Risk factors for all-cause, overdose and early deaths after release from prison in Washington state. *Drug and Alcohol Dependence, 117*(1), 1-6.

Binswanger, I. A., Krueger, P. M., & Steiner, J. F. (2009). Prevalence of Chronic Medical Conditions Among Jail and Prison Inmates in the United States Compared with the General Population. *Journal of Epidemiology and Community Health, 63*(11), 912–919.

Binswanger, I. A., Redmond, N., Steiner, J. F., & Hicks, L. S. (2012). Health disparities and the criminal justice system: An agenda for further research and action. *Journal of Urban Health: Bulletin of the New York Academy of Medicine, 89*(1), 98-107.

Binswanger, I. A., Stern, M. F., Deyo, R. A., Heagerty, P. J., Cheadle, A., Elmore, J. G., & Koepsell, T. D. (2007). Release from prison—a high risk of death for former inmates. *New England Journal of Medicine, 356*(2), 157-165.

Binswanger, I. A., Stern, M. F., Yamashita, T. E., Mueller, S. R., Baggett, T. P., & Blatchford, P. J. (2016). Clinical risk factors for death after release from prison in Washington State: A nested case-control study. *Addiction, 111*(3), 499-510.

Bird, S. M., & Hutchinson, S. J. (2003). Male drugs-related death among newly released prisoners in England and Wales. *Addiction, 103*, 251-255.

Bond, B. J., & Gittell, J. H. (2010). Cross-agency coordination of offender reentry: Testing collaboration outcomes. *Journal of Criminal Justice, 38*, 118-129.

Borrill, J., Cook, L., & Beck, A. (2017). Suicide and supervision: Issues for probation practice. *Probation Journal*, *64*(1), 6–19.

Borschmann, R., Janca, E., Carter A., Willoughby, M., Hughes, N., Snow, K., Stockgins, Hill, N. T. M., Hocking, J., Love, A., Patton, G. C., Sawyer, S. M., Fazel, S., Pujevic, C., Robinson, J., Kinner, S. A. (2020). The health of adolescents in detention: a global scoping review. *The Lancet Public Health, 5*(2), 114-126.

Borschmann, R., Tibble, H., Spittal., Preen, D., Pirkis, J., Larney, S., …et al. (2020). The Mortality After Release from Incarceration Consortium (MARIC): Protocol for a multi-national, individual participant data meta-analysis. *International Journal of Population Data Science, 5*(1), 1-8.

Borschmann, R., Young, J. T., Moran, P., Spittal, M. J., Snow, K., Mok, K., & Kinner, S. A. (2020). Accuracy and predictive value of incarcerated adults' accounts of their self-harm histories: findings from an Australian prospective data linkage study. *Canadian Medical Association Journal Open, 5*(3), E694-E701.

Boutwell, B. B., & Beaver, K. M. (2008). A biosocial explanation of delinquency abstention. *Criminal Behaviour and Mental Health, 18*, 59-74.

Brame, B., Nagin, D. S., & Tremblay, R. E. (2001). Developmental trajectories of physical aggression from school entry to late adolescence. *The Journal of Child Psychology and Psychiatry and Allied Disciplines, 42*(4), 503–512.

Braveman, P., & Barclay, C. (2009). Health disparities beginning in childhood: A life-course perspective. *Pediatrics*, *124*(3_suppl), 163S-175S.

Braveman, P., & Gottlieb, L. (2014). The social determinants of health: It's time to consider the causes of causes. *Public Health Reports, 129*, 19-31.

Braverman, P. K., & Murray, P. J. (2011). Health care for youth in the juvenile justice system. *Pediatrics, 128*(6), 1219–1235.

Brezina, T., Tekin, E., Topalli, V. (2009). "Might not be a tomorrow": A multimethods approach to anticipated early death and youth crime. *Criminology, 47*(4), 1091-1129.

Brinkley-Rubinstein, L. (2015). Understanding the effects of multiple stigmas among formerly incarcerated HIV-positive African American men. *AIDS Education and Prevention, 27*(2), 167-179.

Broidy, L., & Agnew, R. (1997). Gender and crime: A general strain theory perspective. *Journal of Research in Crime and Delinquency, 34*(3), 275–306.

Brooker, C., & Sirdifield, C. (2013). An investigation into the prevalence of mental health disorders in an English probation population: an overview. *Eurovista: Probation and Community Justice, 2*(3), 154-160.

Brooker, C., Sirdifield, C., Blizard, R., Denney, D., & Pluck, G. (2012). Probation and mental illness. *The Journal of Forensic Psychiatry & Psychology, 23*(4), 522-537.

Brooker, C., Syson-Nibbs, L., Barrett, P., & Fox, C. (2009). Community managed offenders' access to healthcare services: Report of a pilot study. *Probation Journal, 54*(1), 45–59.

Bulatao, R. A., & Anderson, N. B. (2004). *Understanding Racial and Ethnic Differences in Health in Later Life: A Research Agenda*. Washington, DC: National Research Council.

Bullock, R., & Gaehl, E. (2012). Children in care: A long-term follow up of criminality and mortality. *Children and Youth Services Review, 34*(9), 1947-1955.

Burt, C. H., & Simons, R. L. (2014). Pulling back the curtain on heritability studies: Biosocial criminology in the postgenomic era. *Criminology, 52*(2), 223-262.

Byng, R., Howerton, A., Owens, C. V., Campbell, J. (2015). Pathways to suicide attempts among male offenders: the role of agency. *Sociology of Health & Illness, 37*(6), 936-951.

Caruso, G. D. (2017). *Public Health and Safety: The Social Determinants of Health and Criminal Behavior*. UK: ResearchersLinks Books.

Caspi, A., Houts, R. M., Belsky, D. W., Goldman-Mellor, S. J., Harrington, H., Israel, S., Meier, M. H., Ramrakha, S., Shalev, I., Poulton, R., & Moffitt, T. E. (2014). The p factor: One general psychopathology factor in the structure of psychiatric disorders? *Clinical Psychological Science, 2*(2), 119–137.

Chassin, L. (2008). Juvenile justice and substance use. *The Future of Children, 18*(2), 165–183.

Chassin, L., Piquero, A. R., Losoya, S. H., Mansion, A. D., & Schubert, C. A. (2013). Joint consideration of distal and proximal predictors of premature mortality among serious juvenile offenders. *Journal of Adolescent Health, 52*(6), 689-696.

Chesney, E., Goodwin, G. M., & Fazel, S. (2014). Risks of all-cause and suicide mortality in mental disorders: a metareview. *World Psychiatry, 13*(2); 153–60.

Christakis, N. A., & Fowler, J. H. (2014). Friendship and natural selection. *Proceedings of the National Academy of Sciences of the United States of America, 111*, 10796–10801.

Christensen, P. B., Hammerby, E., Smith, E., & Bird, S. M. (2006). Mortality among Danish drug users released from prison. *International Journal of Prisoner Health, 2*(1), 13-19.

Cipriani, A., Furukawa, T. A., Salanti, G., Chaimani, A., Atkinson, L. Z., Ogawa, Y…et al. (2016). Comparative efficacy and acceptability of 21 antidepressant drugs for the acute treatment of adults with major depressive disorder: a systematic review and network meta-analysis. *The Lancet*, 391(10128), 1357 - 1366.

Cloud, D. (2014). *On Life Support: Public Health in the Age of Mass Incarceration*. Vera Institute of Justice. Retrieved from: www.vera.org/publications/on-life-support-public-health-in-the-age-of-mass-incarceration.

Cochran, J. C. (2012). The ties that bind or the ties that break: Examining the relationship between visitation and prisoner misconduct. *Journal of Criminal Justice, 40*(5), 433–440.

Coffey, C., Veit, F., Wolfe, R., Cini, E., & Patton, G. C. (2003). Mortality in young offenders: Retrospective cohort study. *British Medical Journal, 326(7398):* 1064.

Coffey, C., Wolfe, R., Lovett, A. W., Moran, P., Cini, E., & Patton, G. C. (2004). Predicting death in young offenders: a retrospective cohort study. *Medical Journal of Australia, 181*, 473–477.

Cohen, M. A. (1998). The monetary value of saving a high-risk youth. *Journal of Quantitative Criminology, 14*(1), 5–33.

Cohen, D. A., Mason, K., Bedimo, A., Scribner, R., Basolo, V., & Farley, T. A. (2003). Neighborhood physical conditions and health. *American Journal of Public Health, 93*(3), 467-471.

Cohen, M. A., & Piquero, A. R. (2009). New Evidence on the Monetary Value of Saving a High Risk Youth. *Journal of Quantitative Criminology, 25*, 25-49.

Cohen, M. A., Piquero, A. R., & Jennings, W. G. (2010). Studying the costs of crime across offender trajectories. *Criminology & Public Policy, 9,* 279-305.

Cohen, J., Tyrrell, D. A. J., Russell, M. A. H., Jarvis, M. J., & Smith, A. P. (1993). Smoking, alcohol consumption and susceptibility to the common cold. *American Journal of Public Health, 83*, 1277-82.

Coid, J. (2003). Epidemiology, public health and the problem of personality disorder. *British Journal of Psychiatry, 182*, 3-10.

Compton, W. M., Conway, K. P., Stinson, F. S., Colliver, J. D., & Grant, B. F. (2005). Prevalence, correlates, and comorbidity of DSM-IV antisocial personality syndromes and alcohol and specific drug use disorders in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry, 66*, 677–685.

Connolly, E. J., Schwartz, J. A., Nedelec, J. L., Beaver, K. M., & Barnes, J. C. (2015). Different slopes for different folks: Genetic influences on growth in delinquent peer association and delinquency during adolescence. *Journal of Youth and Adolescence, 44*, 1413–1427.

Cordeau, G. (1989). Les homicides entre delinquants: une analyse des conflits qui provoquent des reglements de comptes. *Criminologie, 22*(2), 13.

Craig, J. M., Piquero, A. R., Farrington, D. P., & Ttofi, M. M. (2017). A little early risk goes a long way bad: Adverse childhood experiences and life-course offending in the Cambridge study. *Journal of Criminal Justice, 53*, 34-45.

Crighton, D. (2000). Reflections on risk assessment: suicide in prisons. *The British Journal of Forensic Practice, 2*(1), 23-30.

Crosswhite, J. M., & Kerpelman, J. L. (2009). Coercion theory, self-control, and social information processing: Understanding potential mediators for how parents influence deviant behaviors. *Deviant Behavior, 30*, 611-646.

Council of State Governments. (2002). *Criminal Justice/Mental Health Consensus Project*. New York, NY: Author.

Cox, R., & Wallace, S. (2016). Identifying the link between food security and incarceration. *Southern Economic Journal, 82*(4), 1062-1077.

Daigle, M. S., & Naud, H. (2011). Risk of dying by suicide inside or outside prison: The shortened lives of male offenders. *Canadian Journal of Criminology and Criminal Justice*, 54(4), 511-528.

Davies, S., Clarke, M., Hollin, C., & Duggan, C. (2007). Long-term outcomes after discharge from medium secure care: a cause for concern. *British Journal of Psychiatry, 191*(1), 70–4.

Denney, A. S., Tewksbury, R., & Jones, R. S. (2014). Beyond basic needs: social support and structure for successful offender reentry. *Journal of Quantitative Criminal Justice & Criminology, 2*(1), 39-67.

Dekker, M. C., Ferdinand, R. F., Van Lang, N. D., Bongers, I. L., Van Der Ende, J., & Verhulst, F. C. (2007). Developmental trajectories of depressive symptoms from early childhood

to late adolescence: Gender differences and adult outcome. *Journal of Child Psychology and Psychiatry, 48*(7), 657–666.

DeLisi, M., & Piquero, A. R. (2011). New frontiers in criminal careers research, 2000–2011: A state-of-the-art review. *Journal of Criminal Justice, 39*(4), 289–301.

Delisi, M., & Vaughn, M. (2015). *The Routledge international handbook of biosocial criminology*. New York, NY: Routledge.

DeLisi, M., Vaughn, M., Beaver, K. M., Wexler, J., Barth, A. E., & Fletcher, J. M. (2011). Fledgling psychopathy in the classroom: ADHD subtypes, psychopathy, and reading comprehension in a community sample of adolescents. *Youth Violence and Juvenile Justice, 9*(1), 43–58.

DeLisi, M., Vaughn, M. G., Salas-Wright, C. P., & Jennings, W. G. (2015). Drugged and dangerous: Prevalence and variants of substance use comorbidity among seriously violent offenders in the United States. *Journal of Drug Issues, 45*(3), 232–248.

Desai, R. A., Goulet, J. L., Robbins, J., Chapman, J. F., Migdole, S. J., & Hoge, M. A. (2006). Mental health care in juvenile detention facilities: A review. *Journal of the American Academy of Psychiatry and the Law, 34*(2), 204–214.

DeSalvo, K. B., Bloser, N., Reynolds, K., He, J., & Muntner, P. (2006). Mortality prediction with a single general self-rated health question: A meta-analysis. *Journal of General Internal Medicine, 21*(3), 267–275.

Dhejne, C., Van Vlerken, R., Heylens, G., & Arcelus, J. (2016). Mental health and gender dysphoria: A review of the literature. *International Review of Psychiatry, 28*, 44-57.

Dilalla, L. F., & Bersted, K. (2015). Biosocial foundations of externalising behaviors. In M. DeLisi, & M. G. Vaughn (Eds.), *The Routledge international handbook of biosocial criminology* (pp. 349-364). New York: Routledge.

Dirkzwager, A., Nieuwbeerta, P., & Blokland, A. (2012). Effects of first-time imprisonment on postprison mortality: A 25-year follow-up study with a matched control group. *Journal of Research in Crime and Delinquency, 49*(3), 383-419.

Doherty, E. E. (2006). Self-control, social bonds, and desistance: A test of life-course interdependence. *Criminology, 44*(4), 807-833.

Dooley, E. (1990). Prison suicide in England and Wales 1972–87. *British Journal of Psychiatry,* 156, 40–45.

Drahota, A., Meza, R. D., Brikho, B., Naaf, M., Estabillo, J. A., Gomez, E. D., ... & Aarons, G. A. (2016). Community-academic partnerships: A systematic review of the state of

the literature and recommendations for future research. *The Milbank Quarterly, 94*(1), 163-214.

DuRand, C. J., Burtka, G. J., Federman, E. J., Haycox, J. A., & Smith, J. W. (1995). A quarter century of suicide in a major urban jail: Implications for community psychiatry. *American Journal of Psychiatry, 152*(7), 1077-1080.

Duthé, G., Hazard, A., Kensey, A., & Shon, J-L. P. K. (2013). Suicide among male prisoners in France: a prospective population-based study. *Forensic Science International, 233*, 273–77.

Edwards, A., Curtis, S., & Sherrard, J. (1999). Survey of risk behaviour and HIV prevalence in an English prison. *International Journal of STD & AIDS, 10*, 464-466.

Elder, G. H., Jr. (1995). *The life course paradigm: Social change and individual development.* In P. Moen, G. H. Elder, Jr., & K. Lüscher (Eds.), *Examining lives in context: Perspectives on the ecology of human development* (p. 101–139). American Psychological Association.

Elder, G. H., Jr. (1998). The life course as developmental theory. *Child Development, 69*, 1–12.

Elonheimo, H., Sillanmaki, L., & Sourander, A. (2017). Crime and mortality in a population-based nationwide 1981 birth cohort: Results from the FinnCrime study. *Criminal Behaviour and Mental Health, 27*(1), 15-26.

Elonheimo, H., Sourander, A., Niemelä, S., Nuutila, A-M., Helenius, H., Sillanmäki, L., Ristkari, T., & Parkkola, K. (2009). Psychosocial correlates of police-registered youth crime. A Finnish population-based study. *Nordic Journal of Psychiatry, 63*, 292–300.

Evans, T. D., Cullen, F. T., Burton, V. S., Jr., Dunaway, R. G., & Benson, M. L. (1997). The social consequences of self-control: Testing the general theory of crime. *Criminology,* 5, 475-501.

Ezell, M. E., & Cohen, L. E. (2005). *Desisting from Crime*. New York: Oxford University Press.

Farrell, M., & Marsden, J. (2007). Acute risk of drug-related death among newly released prisoners in England and Wales. *Addiction, 103*, 251-255.

Farrington, D. P. (1991). Antisocial personality from childhood to adulthood. *The Psychologist: Bulletin of The British Psychological Society, 4*, 389-394.

Farrington, D. P. (1995). Crime and physical health: illnesses, injuries and accidents. *Criminal Behaviour and Mental Health, 5*, 261–78.

Farrington, D. P. (1995). The development of offending and antisocial behaviour from childhood: Key findings from the Cambridge Study in Delinquent Development. *Journal of Child Psychology and Psychiatry, 36,* 929-964.

Farrington, D. P. (2000). Explaining and preventing crime: the globalization of knowledge. *Criminology, 38,* 1–24.

Farrington, D. P. (2003). Key results from the first 40 years of the Cambridge Study in Delinquent Development. In T. P. Thornberry and M. D. Krohn, (Eds.), *Taking stock of delinquency: An overview of findings from contemporary longitudinal studies* (pp. 137-183). New York: Kluwer/Plenum.

Farrington, D. P. (2017). *Integrated developmental and life-course theories of offending*. UK: Routledge.

Farrington, D. P. (2019). The Cambridge Study in Delinquent Development. In D. Eaves, C. D. Webster, Q. Haque, and J. Eaves-Thalken (Eds.), *Risk rules: A practical guide to structured professional judgment and violence prevention* (pp. 225-233). Hove, UK: Pavilion Publishing.

Farrington, D. P. (2019). The development of violence from age 8 to 61. *Aggressive Behaviour, 45*, 365-376.

Farrington, D. P. (2019). The duration of criminal careers: How many offenders do not desist up to age 61? *Journal of Developmental & Life-Course Criminology, 5*, 4-21.

Farrington, D. P. (2020). Childhood risk factors for criminal career duration: Comparisons with prevalence, onset, frequency and recidivism. *Criminal Behaviour and Mental Health, 30*, 159-171.

Farrington, D. P. (2020). Interactions between resting heart rate and childhood risk factors in predicting convictions and antisocial personality scores. *Crime & Delinquency, 66*(10), 1369-1391.

Farrington, D. P., Coid, J. W., & Murray, J. (2009). Family factors in the intergenerational transmission of offending. *Criminal Behaviour and Mental Health, 19*, 109–124.

Farrington, D. P., Coid, J. W., & West, D. J. (2009). The development of offending from age 8 to age 50: Recent results from the Cambridge Study in Delinquent Development. *Journal of Criminology and Penal Reform, 92*, 160–173.

Farrington, D. P., Coid, J. W., Harnett, L. M., Jolliffe, D., Soteriou, N., Turner, R. E., West, D. J. (2006). *Criminal careers up to age 50 and life success up to age 48: new findings from the Cambridge Study in Delinquent Development* (Report No. 299). Retrieved from: https://www.bl.uk/collection-items/criminal-careers-up-to-age-50-and-life-

success-up-to-age-48-new-findings-from-the-cambridge-study-in-delinquent-development-2nd-edition.

Farrington, D. P., & Hawkins, D. J. (2019). The need for long-term follow-ups of delinquency prevention experiments. *Journal of the American Medical Association, 2*(3): e190780.

Farrington, D. P., Jolliffe, D., & Ttofi, M. M. (2021). Empathy, Convictions and Self-Reported Offending of Males and Females in the Cambridge Study in Delinquent Development. In D. Jolliffe & D. P. Farrington (Eds.), *Empathy versus Offending, Aggression and Bullying: Advancing Knowledge using the Basic Empathy Scale* (pp. 73-85). Abington: Routledge.

Farrington, D. P., Kazemian, L., & Piquero, A. R. (2018a). *The Oxford Handbook of Developmental and Life-Course Criminology*. UK: Oxford University Press.

Farrington, D. P., & Loeber, R. (2000). Some benefits of dichotomization in psychiatric and criminological research. *Criminal Behaviour and Mental Health,* 10, 100-122.

Farrington, D. P., Losel, F., Boruch, R. F., Gottfredson, D. C., Mazerolle, L., Sherman, L. W., & Weisburd, D. (2018b). Advancing knowledge about replication in criminology. *Journal of Experimental Criminology, 15,* 373-396.

Farrington, D. P., Piquero, A. R., & Jennings, W. G. (2013). *Offending from childhood to late middle age: Recent results from the Cambridge Study in Delinquent Development*. New York, NY: Springer.

Farrington, D. P., Ttofi, M. M., & Coid, J. W. (2009). Development of adolescence-limited, late-onset, and persistent offenders from age 8 to age 48. *Aggressive Behavior, 35,* 150-163.

Farrington, D. P., Ttofi, M. M., Crago, R. V., & Coid, J. W. (2014). Prevalence, frequency, onset, desistance and criminal career duration in self-reports compared with official records. *Criminal Behaviour and Mental Health, 24,* 241-253.

Farrington, D. P., Ttofi, M. M., Crago, R. V., & Coid, J. W. (2015). Intergenerational similarities in risk factors for offending. *Journal of Developmental & Life-Course Criminology, 1,* 48-62.

Farrington, D. P., & West, D. J. (1981). The Cambridge Study in Delinquent Development (United Kingdom). In S. A. Mednick & A. E. Baert (Eds.), *Prospective longitudinal research* (pp. 137-145). Oxford, UK: Oxford University Press.

Farrington, D. P., & West, D. J. (1990). The Cambridge Study in Delinquent Development: A long-term follow-up of 411 London males. In H-J. Kerner & G. Kaiser (Eds.), *Kriminalitat: Personlichkeit, lebensgeschichte und verhalten [Criminality:*

*Personality, behavior and life history]* (pp. 115-138). Berlin, Germany: Springer-Verlag.

Fazel, S., & Baillargeon, J. (2011). The health of prisoners**.** *Lancet, 377*, 956-965.

Fazel, S., & Benning, R. (2006). Natural deaths in male prisoners: a 20-year mortality study. *European Journal of Public Health, 16*(4), 441-444.

Fazel, S., Benning, R., & Danesh, J. (2005). Suicides in male prisoners in England and Wales, 1978-2003. *Lancet, 366*(9493), 1301-1302.

Fazel, S., Doll, H., & Långström, N. (2008). Mental disorders among adolescents in juvenile detention and correctional facilities: A systematic review and metaregression analysis of 25 surveys. *Journal of the American Academy of Child and Adolescent Psychiatry, 47*(9), 1010–1019.

Fazel, S., Fimińska, Z., Cocks, C., & Coid, J. (2016a). Patient outcomes following discharge from secure psychiatric hospitals: Systematic review and meta-analysis. *British Journal of Psychiatry, 208*(1), 17-25.

Fazel, S., Grann, M., Kling, B., & Hawton, K. (2010). Prison suicide in 12 countries: an ecological study of 861 suicides during 2003–2007. *Social Psychiatry and Psychiatric Epidemiology, 46*, 191–95.

Fazel, S., Gulati, G., Linsell, L., Geddes, J. R., & Grann, M. (2009). Schizophrenia and violence: systematic review and meta-analysis. *PLoS Medicine, 6*(8), p. e1000120.

Fazel, S., Hayes, D. J., Bartellas, K., Clerici, M., & Trestman, R. (2016). The mental health of prisoners: A review of prevalence, adverse outcomes and interventions. *Lancet Psychiatry, 3*(9), 871-881.

Fazel, S., Långström, N., Hjern, A., Grann, M., & Lichtenstein, P. (2009). Schizophrenia, substance abuse and violent crime. *Journal of the American Medical Association, 301*, 2016-2023.

Fazel, S., Martin, G., Johan, A., & Goodwin, G. (2007). Suicides by violent means in individuals taking SSRIs and other antidepressants: A postmortem study in Sweden, 1992-2004. *Journal of Clinical Psychopharmacology, 27*(5), 503-506.

Fazel, S., Ramesh, T., & Hawton, K. (2017). Suicide in prisons: an international study of prevalence and contributory factors. *Lancet Psychiatry, 4*, 946–52.

Fazel, S., & Seewald, K. (2012). Severe mental illness in 33 588 prisoners worldwide: Systematic review and meta-regression analysis. *The British Journal of Psychiatry, 200*(5), 364–373.

Fazel, S., & Zlodre, J. (2012). All-cause and external mortality in released prisoners: systematic review and meta-analysis. *American Journal of Public Health,* 102(12), e67-75.

Fazel, S., Wolf, A., & Geddes, J. R. (2013). Suicide in prisoners with bipolar disorder and other psychiatric disorders: a systematic review. *Bipolar Disordesr, 15,* 491

Fazel, S., Wolf, A., Fimińska, Z., & Larsson, H. (2016). Mortality, Rehospitalisation and Violent Crime in Forensic Psychiatric Patients Discharged from Hospital: Rates and Risk Factors. *PLoS ONE, 11*(7), e0159020.

Fazel, S., Wolf, A., Palm, C., & Lichtenstein, P. (2014). Violent crime, suicide, and premature mortality in patients with schizophrenia and related disorders: a 38-year total population study in Sweden. *Lancet Psychiatry,* 1(1), 44-54.

Feinstein, R. A., Lampkin, A., Lorish, C. D., Klerman, L. V., Maisiak, R., & Oh, M. K. (1998). Medical status of adolescents at time of admission to a juvenile detention centre. *Journal of Adolescent Health, 22,* 190-196.

Feise, R. J. (2002). Do multiple outcome measures require p-value adjustment? *BMC Medical Research Methodology, 2,* Article 8. Retrieved from: https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/1471-2288-2-8.

Flannery, D. J., Singer, M. I., & Wester, K. L. (2001). Violence exposure, psychological trauma, and suicide risk in community sample of dangerously violent adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry, 40*(4), 435-442.

Flay, B. R., Graumlich, S., Segawa, E., Burns, J. L., & Holliday, M. Y. (2004). Effects of 2 prevention programs on high-risk behaviors among African American youth: A randomized trial. *Archives of Pediatrics & Adolescent Medicine, 158*(4), 377–384.

Flynn, P. M., & Brown, B. S. (2008). Co-occurring disorders in substance abuse treatment: issues and prospects. *Journal of Substance Abuse and Treatment, 34*(1), 36-47.

Ford, J. A. (2014). Poor health, strain, and substance use. *Deviant Behavior, 35,* 654-667.

Foster, H., & Hagan, J. (2015). Punishment regimes and the multilevel effects of parental incarceration: Intergenerational, intersectional, and interinstitutional models of social inequality and systemic exclusion. *Annual Review of Sociology, 41,* 135–158.

Fox, B. (2017). It's nature and nurture: Integrating biology and genetics into social learning theory of criminal behavior. *Journal of Criminal Justice, 49,* 22-31.

Frankenburg, R., & Zanarini, M. C. (2006). Personality disorders and medical comorbidity. *Current Opinion in Psychiatry, 19,* 428-431.

Fruehwald, S., Frottier, P., Matschnig, T., Konig, F., & Bauer, P. (2004). Suicide in custody: A case-control study. *British Journal of Psychiatry,* 185**,** 494–498.

Gelsthorpe, L., Padfield, N., & Phillips, J. (2012). Death on probation: An analysis of data regarding people dying under probation supervision. The Howard League for Penal Reform. Retrieved from: https://howardleague.org/wp-content/uploads/2016/05/Deaths-on-probation.pdf

Geronimus, A. T. (1992). The weathering hypothesis and the health of African-American women and infants: evidence and speculations. *Ethnicity & Disease, 2*(3), 207-221.

Geronimus, A. T., Hicken, M., Keene, D., & Bound, J. (2006). "Weathering" and age patterns of allostatic load scores among black and whites in the United States. *American Journal of Public Health, 96*(5), 826-833.

Glymour, M. M., & Spiegelman, D. (2017). Evaluating public health interventions: 5. Causal inference in public health research – do sex, race, and biological factors cause health outcomes? *American Journal of Public Health, 107*(1), 81-85.

Gottfredson, D. C., Cook, T. D., Gardner, F. E. M., Gorman-Smith, D., Howe, G. W., Sandler, I. N., & Zafft, K. M. (2015). Standards of evidence for efficacy, effectiveness, and scale-up research in prevention science: next generation. *Prevention Science, 16*, 893–926.

Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime*. Palo Alto, CA: Stanford University Press.

Graham, A. (2003), 'Post-prison mortality: Unnatural death among people released from Victorian prisons between January 1990 and December 1999', *Australian & New Zealand Journal of Criminology, 13*(1): 94-108.

Grosholz, J. M., & Semenza, D. C. (2018). Assessing the relationship between physical health and inmate misconduct. *Criminal Justice and Behavior, 45*(10), 1527–1546.

Guebert, A. F., & Olver, M. E. (2014). An examination of criminogenic needs, mental health outcomes, and recidivism in a sample of violent young offenders: Implications for risk, need, and responsivity. *International Journal of Forensic Mental Health, 13*(4), 295-310.

Golding, J., Rogers, I. S., & Emmett, P. M. (1997). Association between breast feeding, child development and behaviour. *Early Human Development, 49*, 175–184.

Gupta, V., Gu, K., Chen, Z., Lu, W., Shu, X. O., & Zheng, Y. (2011). Concordance of self-reported and medical chart information on cancer diagnosis and treatment. BMC Medical Research Methodology, ***11***, 72.

Halpern, C. T., Oslak, S. G., Young, M. L., Martin, S. L., & Kupper, L. L. (2001). Partner violence among adolescents in opposite-sex romantic relationships: Findings from the

National Longitudinal Study of Adolescent Health. *American Journal of Public Health, 91*(10), 1679–1685.

Hämäläinen, M, & Pulkkinen, L. (1996). Problem behavior as a precursor of male criminality. *Development and Psychopathology*, *8,* 443–455.

Harding-Pink, D. (1990). Mortality following release from prison. *Medicine, Science and the Law, 30,* 12–16.

Harding-Pink, D., & Fryc, O. (1988). Risk of death after release from prison: a duty to warn. *British Medical Journal, 297*(6648), 596.

Harris, K. M. (2013). The add health study: Design and accomplishments. Chapel Hill: Carolina Population Center, University of North Carolina at Chapel Hill. Retrieved from: https://cdr.lib.unc.edu/concern/articles/6t053j27s.

Harner, H. M., & Budescu, M. (2014). Sleep quality and risk for sleep apnea in incarcerated women. *Nursing Research, 63*(3), 158-169.

Haskins, A., & Turney, K. (2017). The demographic landscape and sociological implications of parental incarceration for childhood inequality. In C. Wildeman, A. Haskins & J. Poehlmann-Tynan (Eds.), *When parents are incarcerated: Interdisciplinary research and interventions to support children* (pp. 9-28). Washington, DC: American Psychological Association Press.

Haycock, J. (1989). Manipulation and suicide attempts in jails and prisons. *Psychiatric Quarterly, 60*(1), 85–98.

Hausken, A. M., Skurtveit, S., & Christophersen, A. S. (2005). Mortality among subjects previously apprehended for driving under the influence of traffic-hazardous medicinal drugs. *Drug and Alcohol Dependence, 79,* 423-429.

Hawton, K., Linsell, L., Adeniji, T., Sariaslan, A., & Fazel, S. (2014). Self-harm in prisons in England and Wales: an epidemiological study of prevalence, risk factors, clustering, and subsequent suicide. *The Lancet; 383*, 1147–54.

Hernán, M. A., Brumback, B. A., & Robins, J. M. (2002). Estimating the Causal Effect of Zidovudine on CD4 Count with a Marginal Structural Model for Repeated Measures. *Statistics in Medicine, 21*, 1689–709.

Herrenkohl, T. I., Maguin, E., Hill, K. G., Hawkins, J. D., Abbott, R. D., & Catalano, R. F. (2000). Developmental risk factors for youth violence. *Journal of Adolescent Health,* 26, 176–186.

Hickert, A., Tahamont, S., & Bushway, S. (2018). A tale of two margins: Exploring the probabilistic processes that generate prison visits in the first two years of incarceration. *Journal of Quantitative Criminology, 34*(3), 691–716.

Higgins, J. P., Altman, D. G., & Sterne, J. A. (2011). Assessing risk of bias in included studies. In J. P. T. Higgins and S. Green (Eds.), *Cochrane handbook for systematic reviews of interventions* (pp. 187-235). The Cochrane Collaboration, Oxford.

Hobbs, M., Krazlan, K., Ridout, S., Mai, Q., Knuiman, M., & Chapman, R. (2006). Mortality and morbidity in prisoners after release from prison in Western Australia 1995-2003. *Research and Public Policy Series No. 71*. Retrieved from https://aic.gov.au/publications/tandi/tandi320.

Hoeve, M., McReynolds, L. S., Wasserman, G. A., & McMillan, C. (2013). The influence of mental health disorders on severity of reoffending in juveniles. *Criminal Justice and Behavior, 40*(3), 289–301.

Holman, B., & Ziedenberg, J. (2006). *The dangers of detention: The impact of incarcerating youth in detention and other secure facilities*. Washington, DC: Justice Policy Institute.

Holzer, K. J., Millan, M. A., AbiNader, M. A., Vaughn, M. G., Salas-Wright, C. P., & Oh, S. (2020). Crime and Violence in Older Adults: Findings From the 2002 to 2017 National Survey on Drug Use and Health. *Journal of Interpersonal Violence*. Advance Online Publication. Retrieved from: https://journals.sagepub.com/doi/10.1177/0886260520913652.

Home Office. (2004). Reducing re-offending national action plan. Retrieved from: https://www.nicco.org.uk/userfiles/downloads/024%20-%20Reducing%20Reoffending%20Action%20Plan%202004.pdf

Hopewell, S., Clarke, M., Moher, D., Wager, E., Middleton, P., Altman, D. G., Schulz, K. F., & the CONSORT Group. (2002). CONSORT for reporting randomized trials in journal and conference abstracts: explanation and elaboration. *PLoS Medicine, 5*(1), e20.

Houle, B. (2014). The effect of incarceration on adult male BMI trajectories, USA, 1981-2006. *Journal of Racial and Ethnic Health Disparities, 1*(1), 21-28.

Huang, D. Y., Lanza, H. I., & Anglin, M. D. (2013). Association between adolescent substance use and obesity in young adulthood: A group-based dual trajectory analysis. *Addictive Behaviors, 38*(11), 2653–2660.

Hughes, K., Bellis, M. A., Hardcastle, K. A., Sethi, D., Butchart, A., Mikton, C., Jones, L., & Dunne, M. P. (2017). The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. *The Lancet Public Health, 2*(8), e356 - e366.

Hughes, N., Ungar, M., Fagan, A., Murray, J., Atilola, O., Nichols, K., Garcia, J., & Kinner, S. (2020). Health determinants of adolescent criminalisation. *Lancet Child & Adolescent Health, 4*(2), 151-162.

Huizinga, D., & Jakob-Chien, C. (1999). The contemporaneous co-occurrence of serious and violent juvenile offending and other problem behaviors. In R. Loeber, and D. P. Farrington (Eds.), *Serious and Violent Juvenile Offenders: Risk Factors and Successful Interventions* (pp. 47-67). Thousand Oaks: Sage.

Idler, E. L., & Benyamini, Y. (1997). Self-rated health and mortality: A review of twenty-seven community studies. *Journal of Health and Social Behavior, 38*(1), 21–37.

Ishikawa, S. S., & Raine, A. (2002). Behavioral genetics and crime. In J. Glicksohn (Ed.), *The neurobiology of criminal behavior* (pp. 81-110). Boston: Kluwer Academic Publishers.

Jackson, D. B. (2006). Breastfeeding duration and offspring conduct problems: The moderating role of genetic risk. *Social Science & Medicine, 166,* 128-136.

Jackson, D. B., Newsome, J., Vaughn, M. G., & Johnson, K. R. (2018). Considering the role of food insecurity in low self-control and early delinquency. *Journal of Criminal Justice, 56,* 127-139.

Jackson, D. B., & Vaughn, M. G. (2017). Household food insecurity during childhood and adolescent misconduct. *Preventive Medicine, 96*, 113–117.

Jackson, D. B., & Vaughn, M. G. (2017). Parental incarceration and child sleep and eating behaviors. The *Journal of Pediatrics, 185*, 211-217.

Jackson, D. B., & Vaughn, M. G. (2017). Sleep and preteen delinquency: Is the association robust to ADHD symptomatology and ADHD diagnosis? *Journal of Psychopathology and Behavioral Assessment, 39*(4), 585-595.

Jackson, D. B., & Vaughn, M. G. (2018). Promoting health equity to prevent crime. *Preventive Medicine, 113,* 91–94.

Johnson, R. C., & Raphael, S. (2009). The Effects of Male Incarceration Dynamics on Acquired Immune Deficiency Syndrome Infection Rates Among African American Women and Men. *The Journal of Law and Economics, 52*(2), 251–293.

Jolliffe, D., Farrington, D. P., Piquero, A. R., Loeber, R., & Hill, K. G. (2017a). Systematic review of early risk factors for life-course-persistent, adolescence-limited, and late-onset offenders in prospective longitudinal studies. *Aggression & Violent Behavior, 33*, 15-23.

Jolliffe, D., Farrington, D. P., Piquero, A. R., MacLeod, J. F. & Van de Weijer, S. (2017b). Prevalence of life-course-persistent, adolescence-limited and late-onset offenders: A

systematic review of prospective longitudinal studies. *Aggression and Violent Behavior*, *33*, 4-14.

Jang, S. J. (2007). Gender differences in strain, negative emotions, and coping behaviors: A general strain theory approach. *Justice Quarterly, 24*, 523-553.

Jones, D., & Maynard, A. (2013). Suicide in recently released prisoners: a systematic review. *Mental Health Practice, 17*, 20-27.

Jones, B. L., & Nagin, D. S. (2007). Advances in group-based trajectory modeling and an SAS procedure for estimating them. *Sociological Methods & Research, 35*(4), 542–571.

Joukamaa, M. (1997). Prison suicide in Finland, 1969–1992. *Forensic Science International, 89*, 167–74.

Joukamaa, M. (1998). The mortality of released Finnish prisoners: a 7-year follow-up study of the WAT TU project. *Forensic Science International, 96***,** 11–19.

Junger, M,, Stroebe, W., & Van der Laan, A. (2001). Delinquency, health behavior, and health. *British Journal of Health Psychology, 6(*2), 103−120.

Kariminia, A., Butler, T. G., Corben, S. P., Levy, M. H., Grant, L., Kaldor, J. M., & Law, M. G. (2007). Extreme cause-specific mortality in a cohort of adult prisoners – 1988 to 2002: a data-linkage study. *International Journal of Epidemiology, 36*(2), 310-316.

Karnick, N. S., Soller, M., Redlich, A., Silverman, M., Kraemer, H. C., Haapanen, R., & Steiner, H. (2009). Prevalence of and gender differences in psychiatric disorders among juvenile delinquents incarcerated for nine months. *Psychiatric Services, 60*(6), 838–841.

Karp, J. G., Whitman, L., & Convit, A. (1991). Intentional Ingestion of Foreign Objects by Male Prison Inmates. *Hospital and Community Psychiatry, 42*(5), 533-535.

Keen, C., Kinner, S. A., Borschmann, R., & Young, J. T. (2020). Comparing the predictive capability of self-report and medically-verified non-fatal overdose in adults released from prison: A prospective data linkage study. *Drug and Alcohol Dependence, 206*, 107742.

Kendler, K. S., Jacobson, K. C., Gardner, C. O., Gillespie, N., Aggen, S. A., & Prescott, C. A. (2007). Creating a social world: a developmental twin study of peer-group deviance. *Archives of general psychiatry, 64*(8), 958–965.

Kenny, D. T., Nelson, P. K., Schreiner, Lennings, C. J., & Butler, T. (2008). *Young Offenders on Community Orders: Health, Welfare and Criminogenic Needs*. Australia: Sydney University Press.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merkangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62*, 593-602.

King, C., Senior, J., Webb, R. T., Millar, T., Piper, M., Pearsall, A., Humber, N., Appleby, L., & Shaw, J. (2015). Suicide by people in a community justice pathway: population-based nested case–control study. The British Journal of Psychiatry, *207*, 175–176.

Kinner, S. A., Preen, D. B., Kariminia, A., Butler, T., Andrews, J. Y., Stoove, M., & Lee, M. (2011). Counting the cost: Estimating the number of deaths among recently released prisoners in Australia. *Medical Journal of Australia, 195*, 64-68.

Kinner, S. A., Snow, K., Wirtz, A. L., Altice, F. L., Beyrer, C., & Dolan, K. (2018). Age-specific global prevelance of hepatitis B, hepatitis C, HIV, and tuberculosis among incarcerated people: a systematic review. *Journal of Adolescent Health, 62*, 18-26.

Kinner, S. A., & Young, J. T. (2018). Understanding and improving the health of people who experience incarceration: an overview and synthesis. *Epidemiologic Reviews, 40*, 4-11.

Kirk, D. S. (2006). Examining the divergence across self-report and official data sources on inference about the adolescent life-course of crime. *Journal of Quantitative Criminology, 22*, 107-129.

Kjelsberg, E., & Laake, P. (2010). Is the high mortality risk in sentence offenders independent of previous imprisonment? *European Journal of Epidemiology, 25*(4), 237-243.

Kjelsberg, E., Sandvik, L., & Dahl, A. (1999). A long-term follow-up study of adolescent psychiatric in-patients. Part I. Predictors of early death. *Acta Psychiatrica Scandinavica, 99*, 231-236.

Kopp, M. S., & Rethelyi, J. (2004). Where psychology meets physiology: chronic stress and premature mortality – the Central-Eastern European health paradox. *Brain Research Bulletin, 62*, 351-367.

Kort-Butler, L. A. (2017). Health-related strains and subsequent delinquency and marijuana use. *Youth & Society, 49*, 1077–1103.

Krieger, N. (2005). Embodiment: A conceptual glossary for epidemiology. *Journal of Epidemiology & Community Health, 59*, 350-355.

Krieger, N. (2011). *Epidemiology and the people's health: Theory and context.* Oxford University Press.

Krug, E. G., Mercy, J. A., Dahlberg, L. L., & Zwi, A. B. (2002). The world report on violence and health. *Lancet, 360*(9339), 1083-1088.

Lacourse, E., Nagin, D. S., Vitaro, F., Cote, S., Arseneault, L., & Tremblay, R. E. (2006). Prediction of early onset deviant peer group affiliation: A 12 year longitudinal study. *Archives of General Psychiatry, 63*, 562–568.

Lambert, D. (1992). Zero-inflated Poisson regression, with an application to defects in manufacturing. *Technometrics, 34*(1), 1–14.

Langan, M. (2005). *Welfare: Needs, Rights and Risks*. UK: Routledge.

Lanier, M. M., Lucken, K., & Akers, T. (2010). Further Need for Epidemiological Criminology. In R. Muraskin (Ed.,) *Key Correctional Issues*. Upper Saddle River, NJ: Prentice Hall.

Lanier, M. M., Zaitzow, B., & Farrell, C. T. (2015). Epidemiological criminology: contextualization of HIV/AIDS health care for female inmates. *Journal of Correctional Health Care, 21*(2), 152-163.

Lattimore, P. K., Linster, R. L., & MacDonald, J. M. (1997). Risk of death among serious young offenders. *Journal of Research in Crime and Delinquency, 34*(2), 187-209.

Lau, J., Ioannidis, J. P. A., & Schmid, C. H. (1998). Summing up evidence: one answer is not always enough. *Lancet, 351*(9096), 123-127.

Laub, J. H., & Sampson, R. J. (2003). *Shared beginnings, divergent lives: Delinquent boys to age 70*. Cambridge, MA: Harvard University Press.

Laub, J. H., & Vaillant, G. E. (2000). Delinquency and mortality: A 50-year follow-up study of 1,000 delinquent and nondelinquent boys. *American Journal of Psychiatry, 157*(1), 96-102.

Lee, H. L., Huang, H. C., Lee, M. D., Chen, J. H., & Lin, K. C. (2012). Factors affecting trajectory patterns of self-rated health (SRH) in an older population—A community based longitudinal study. *Archives of Gerontology and Geriatrics, 54*(3), e334–e341.

Lemert, E. M. (1967). *Human deviance, social problems and social control*. Englewoord Cliffs, NJ: Prentice-Hall.

Lewis, D. O., & Shanok, S. S. (1977). Medical histories of delinquent and non-delinquent children: an epidemiological study. *American Journal of Psychiatry, 134*, 1020-1025.

Lewis, D. O., Yeager, C. A., Cobham-Portorreal, C. S., Klein, N., Showalter, C., & Anthony, A. (1991). A follow-up of female delinquents: Maternal contributions to the perpetuation of deviance. *Journal of the American Academy of Child & Adolescent Psychiatry, 30*(2), 197-201.

Liebling, A. (1992). *Suicides in prison*. London: Routledge.

Lindberg, N., Miettunen, J., Heiskala, A., & Kaltiala-Heino, R. (2017). Mortality of young offenders: A national register-based follow-up study of 15- to 19-year-old Finnish delinquents referred for forensic psychiatric examination between 1980 and 2010. *Child and Adolescent Psychiatry and Mental Health, 11*, 37.

Lindqvist, P., Lefiman, A., & Eriksson, A. (2007). Mortality among homicide offenders: A retrospective population-based long-term follow up. *Criminal Behaviour and Mental Health, 17*, 107-112.

Link, N. W., Ward, J. T., & Stansfield, R. (2019). Consequences of mental and physical health for reentry and recidivism: Toward a health-based model of desistance. *Criminology, 57*(3), 544–573.

Lipsey, M. W. (2003). Those confounded moderators in meta-analysis: good, bad, and ugly. *Annals of the American Academy of Political and Social Science, 587*, 69–81.

Lize, S. E., Scheyett, A. M., Morgan, C. R., Proescholdbell, S. K., Norwood, T., & Edwards, D. (2015). Violent death rates and risk for released prisoners in North Carolina. *Violence and Victims, 30*(6), 1019-36.

Loeber, R., & Farrington, D. P. (2011). *Young Homicide Offenders and Victims*. New York: Springer Science+Business Media.

Losel, F. (2018). Evidence comes by replication, but needs differentiation: the reproducibility issue in science and its relevance for criminology. *Journal of Experimental Criminology, 14*, 257-278.

Losel, F., & Beelman, A. (2003). Effects of Child Skills Training in Preventing Antisocial Behaviour: A Systematic Review of Randomized Evaluations. *The Annals of the American Academy of Political and Social Science, 587,* 84-110.

Lund, C., Hofvander, B., Forsman, A., Anckarsäter, H., & Nilsson, T. (2013). Violent criminal recidivism in mentally disordered offenders: A follow-up study of 13-20 years through different sanctions. *International Journal of Law and Psychiatry, 36*(3-4),250-257.

Macdonald, G. (2002). Violence and health: the ultimate public health challenge. *Health Promotion International, 17*(4), 293-295.

Mackenzie, J. M., Borrill, J., & Dewart, H. (2013). Researching Suicide, Attempted Suicide and Near Lethal Self-Harm by Offenders in Community Settings: Challenges for Future Research. *International Journal of Forensic Mental Health, 12*(1), 26-32.

Mallett, C., DeRigne, L. A., Quinn, L., Dare, P. S. (2017). Discerning reported suicide attempts within a youthful offender population. *Suicide and Life-Threatening Behavior, 42*(1), 67-77.

Mandracchia, J., Sylvara, A., Wikowsky, A., Tieman, K., & Smith, P. (2018). An Exploratory Analysis of Violent Offending and the Acquired Capability for Suicide in Male Prisoners. *International Journal of Offender Therapy and Comparative Criminology, 62*(11) 3436–3446.

Marzano, L., Hawton, K., Rivlin, A., Smith, N., Piper, M., & Fazel, S. (2016). Prevention of suicidal behavior in prisons. *Crisis, 37*, 323–34.

Massoglia, M. (2008a). Incarceration as Exposure: The Prison, Infectious Disease, and Other Stress-Related Illness. *Journal of Health and Social Behavior, 49*(1), 56–71.

Massoglia, M. (2008b). Incarceration, Health and Racial Disparities in Health. *Law & Society Review, 42*(2), 275–306.

Massoglia, M., & Pridemore, W. A. (2015). Incarceration and health. *Annual Review of Sociology, 41*, 291–310.

Massoglia, M., & Remster, B. (2019). Linkages between incarceration and health. *Public Health Reports*, 134(1_suppl), 8S-14S.

Maughan, B., Stafford, M., Shah, I., & Kuh, D. (2013). Adolescent conduct problems and premature mortality: follow-up to age 65 years in a national birth cohort. *Psychological Medicine, 44*(5), 1077-1086.

McDonough, P., & Berglund, P. (2003). Histories of poverty and self-rated health trajectories. *Journal of Health and Social Behavior, 44(*2), 198–214.

McGee, T. R., & Farrington, D. P. (2010). Are there any true adult-onset offenders? *British Journal of Criminology, 50*, 530-549.

McGee, T. R., Hayatbakhsh, M. R., Bor, W., Aird, R. L., Dean, A. J., & Najman, J. M. (2015). The impact of snares on the continuity of adolescent-onset antisocial behavior: A test of Moffitt's developmental taxonomy. *Australian and New Zealand Journal of Criminology, 48*(3), 345-366.

McGee, T. R., & Moffitt, T. E. (2019). The Developmental Taxonomy. In D. P. Farrington, L. Kazemian, and A. R. Piquero (Eds.), *The Oxford Handbook of Developmental and Life-Course Criminology* (pp. 149-158). New York: Oxford University Press.

McGloin, J. M., Pratt, T. C., & Piquero, A. R. (2006). A life course analysis of the criminogenic effects of maternal cigarette smoking during pregnancy: A research note on the mediating impact of neuropsychological deficit. *Journal of Research in Crime and Delinquency,* 43, 412-426.

McGovern, L., Miller, G., & Hughes-Cromwick, P. (2014). The relative contribution of multiple determinants on health. Health Affairs Health Policy Brief. Retrieved from: https://www.healthaffairs.org/do/10.1377/hpb20140821.404487/full/

McLeod, J. D., Uemura, R., & Rohrman, S. (2012). Adolescent mental health, behavior problems, and academic achievement. *Journal of Health and Social Behavior, 53*(4), 482-497.

McReynolds, L. S., Schwalbe, C. S., & Wasserman, G. A. (2010). The contribution of psychiatric disorder to juvenile recidivism. *Criminal Justice and Behavior, 37*(2), 204–216.

Measelle, J. R., Stice, E., & Hogansen, J. M. (2006). Developmental trajectories of cooccurring depressive, eating, antisocial, and substance abuse problems in female adolescents. *Journal of Abnormal Psychology, 115*(3), 524–538.

Melchior, M., Berkman, L. F., Kawachi, I., Krieger, N., Zins., M., Bonenfant, S., & Goldberg, M. (2006). Lifelong socioeconomic trajectory and premature mortality (35-65 years) in France: Findings from the GAZEL cohort study. *Journal of Epidemiology and Community Health, 60*(11), 937-944.

Merikangas, K. R., He, J. P., Brody, D., Fisher, P. W., Bourdon, K., & Koretz, D. S. (2010). Prevalence and treatment of mental disorders among US children in the 2001–2004 NHANES. *Pediatrics, 125*(1), 75–81.

Merrall, E. L. C., Kariminia, A., Binswanger, I. A., Hobbs, M. S., Farrell, M., Marsden, J., Hutchinson, S. J., & Bird, S. M. (2010). Meta-analysis of drug-related deaths soon after release from prison. *Addiction, 105*(9), 1545-1554.

Messerschmidt, J. W. (2007). *Crime and masculinities*. In G. Ritzer, J. M. Ryan, & B. Thorn (Eds.). The Blackwell Encyclopedia of Sociology (pp. 1–4). Somerset, NJ: John Wiley & Sons.

Miller, H. V., Barnes, J. C., & Beaver, K. M. (2011). Self-control and health outcomes in a nationally representative sample. *American Journal of Health Behavior, 35*(1), 15–27.

Ministry of Justice (2014). *Reviewing and Reporting Deaths of Offenders under Probation Supervision. London: Ministry of Justice. Retrieved from:* https://www.researchgate.net/profile/Dina_Gojkovic/post/Where_can_data_on_suicide_in_probation_be_obtained/attachment/59d63733c49f478072ea4ac4/AS%3A273683585667073%401442262660075/download/pi-01-2014-reviewing-and-reporting-deaths-of-offenders-1.doc

Ministry of Justice (2016a). *Deaths of offenders in the community annual statistics bulletin 2015 to 2016*. London: Ministry of Justice.

Ministry of Justice (2016b). *Probation: 2016*. London: Ministry of Justice. Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633168/probation-2016.xlsx

Ministry of Justice (2017a). *Deaths of offenders in the community, annual update to march 2017*. London: Ministry of Justice.

Ministry of Justice (2017b). *Safety in custody statistics bulletin, England and Wales, deaths in prison custody to march 2017, assaults and self-harm to December 2016*. London: Ministry of Justice.

Ministry of Justice. (2020). *Deaths of Offenders in the Community, England and Wales, 2019/20*. London: Ministry of Justice. Retrieved from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/980144/Deaths_of_Offenders_in_the_Community_2019-20_bulletin.pdf

Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behaviour: A developmental taxonomy. *Psychological Review, 100*(4), 674-701.

Moffitt, T. E., (1994). *Natural Histories of Delinquency*. In: Weitekamp E.G.M., Kerner HJ. (Eds.), Cross-National Longitudinal Research on Human Development and Criminal Behavior. Switzerland, Springer.

Moffitt, T. E. (2003). Life-course-persistent and adolescence-limited antisocial behavior: A 10-year research review and a research agenda. In B. B. Lahey, T. E. Moffitt, and A. Caspi (Eds.), *Causes of conduct disorder and juvenile delinquency* (pp. 49-75). New York, NY: The Guilford Press.

Moffitt, T. E. (2006). Life-course-persistent versus adolescence-limited antisocial behavior. In D. Cicchetti and D. J. Cohen (Eds.), Developmental psychopathology: Risk, disorder, and adaptation *(pp. 570-598).* Hoboken, NJ: Wiley.

Moffitt, T. E. (2018). Male antisocial behaviour in adolescence and beyond. *Nature Human Behaviour, 2,* 177-186.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., Houts, R., Poulton, R., Roberts, B. W., Ross, S., Sears, M. R., Thomson, W. M., & Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences, 108*(7), 2693–2698.

Moffitt, T. E., & Caspi, A. (2001). Childhood predictors differentiate life-course persistent and adolescence-limited antisocial pathways among males and females. *Developmental Psychopathology, 13*, 355-75.

Moffitt, T. E., Caspi, A., Dickson, N., Silva, P. A., & Stanton, W. (1996). Childhood-onset versus adolescent-onset antisocial conduct in males: Natural history from age 3 to 18. *Developmental and Psychopathology, 8*, 399-424.

Moffitt, T. E., Caspi, A., Rutter, M., & Silva, P. A. (2001). *Sex difference in antisocial behaviour: Conduct disorder, delinquency, and violence in the Dunedin Longitudinal Study*. New York: Cambridge University Press.

Moffitt, T. E., Lynam, D., & Silva, P. A. (1994). Neuropsychological tests predict persistent male delinquency. *Criminology, 32*, 101-124.

Moller-Leimkuhler, A. M. (2003). The gender gap in suicide and premature death or: why are men so vulnerable? *European Archives of Psychiatry and Clinical Neuroscience, 253*(1), 1-8.

Mora, P. A., Bennett, I. M., Elo, I. T., Mathew, L., Coyne, J. C., & Culhane, J. F. (2008). Distinct trajectories of perinatal depressive symptomatology: Evidence from growth mixture modeling. *American Journal of Epidemiology, 169*(1), 24–32.

Murray, J., Bijleveld, C. C. J. H., Farrington, D. P., & Loeber, R. (2014). *Effects of parental incarceration on children: Cross-national comparative studies.* Washington, D.C.: American Psychological Association.

Murray, J., Blokland, A., Farrington, D. P., & Theobald, D. (2014). Long term effects of conviction and incarceration on men in the Cambridge Study in Delinquent Development. In D. P. Farrington and J. Murray (Eds.), *Labelling Theory: Empirical Tests (Advances in Criminological Theory, vol. 18)* (pp. 209-235). New Brunswick, N.J.: Transaction.

Murray, J., Farrington, D. P., & Sekol, I. (2012). Children's antisocial behavior, mental health, drug use, and educational performance after parental incarceration: A systematic review and meta-analysis. *Psychological Bulletin, 138*(2), 175–210.

Na, C., & Paternoster, R. (2012). Can self-control change substantially over time? Rethinking the relationship between self-and social control. *Criminology, 50*(2), 427–462.

Nagin, D. S. (2005). *Group-based modeling of development*. Cambridge, MA: Harvard University Press.

Nagin, D. S. (2016). Group-based trajectory modelling and criminal career research. *Journal of Research in Crime and Delinquency, 53*(3), 356–371.

Nagin, D. S., & Farrington, D. P. (1992). The stability of criminal potential from childhood to adulthood. *Criminology, 30*(2), 235-260.

Nagin, D. S., Farrington, D. P., & Moffitt, T. E. (1995). Life-course trajectories of different types of offenders. *Criminology, 33*(1), 111–139.

Nagin, D. S., & Land, K. C. (1993). Age, criminal careers, and population heterogeneity: Specification and estimation of a nonparametric, mixed Poisson model. *Criminology, 31*(3), 327–362.

Nagin, D. S., & Tremblay, R. E. (2001). Analyzing developmental trajectories of distinct but related behaviors: A group-based method. *Psychological Methods, 6*(1), 18–34.

Nagin, D. S., & Tremblay, R. E. (2005). What has been learned from group-based trajectory modeling? Examples from physical aggression and other problem behaviors. *The Annals of the American Academy of Political and Social Science, 602*(1), 82–117.

Nakagawa, S. (2004). A farewell to Bonferroni: The problems of low statistical power and publication bias. *Behavioral Ecology, 15*, 1044–1045.

National Collaborating Centre for Mental Health. (2010). Antisocial Personality Disorder: Treatment, Management and Prevention. *National Clinical Practice Guideline Number 77***.** Retrieved from: https://www.nice.org.uk/guidance/cg77/evidence/full-guideline-242104429

National Commission on Correctional Health Care. (2002). The Health Status of Soon-To-Be-Released Inmates: A Report to Congress. *Chicago, IL: National Commission on Correctional Health Care.* Retrieved from: https://www.ojp.gov/pdffiles1/nij/grants/189735.pdf.

National Probation Service. (2019). National Probation Service Health and Social Care Strategy 2019–2022. Retrieved from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/831817/MOJ3131_210658_NPS-Health-and-Social-Care-Stategy-2019-Brochure-v5.pdf

Nieuwbeerta, P., & Piquero, A. R. (2008). Mortality rates and causes of death of convicted Dutch criminals 25 years later. *Journal of Research in Crime and Delinquency, 45*, 256-286.

Nikolic-Ristanovic, V. (2014). Making people happy is the best crime prevention: towards happy making criminology. *European Journal of Criminology, 11,* 401–409.

Nofziger, S., & Johnson, T. (2020). Revisiting the Concept of Stability in the General Theory of Crime. *Crime & Delinquency, 66*(6-7), 739–769

Odgers, C. L., Caspi, A., Broadbent, J. M., Dickson, N., Hancox, R. J., Harrington, H., ... Moffitt, T. E. (2007). Prediction of differential adult health burden by conduct problem subtypes in males. *Archives of General Psychiatry, 64*(4), 476–484.

Odgers, C. L., Caspi, A., Nagin, D. S., Piquero, A. R., Slutske, W. S., Milne, B., Dickson, N., Poulton, R., & Moffitt, T. E. (2008). Is it important to prevent early exposure to drugs and alcohol among adolescents? *Psychological Science, 19*, 1037-1044.

Oesterle, S., Hill, K. G., Hawkins, J. D., Guo, J., Catalano, R. F., & Abbott, R. D. (2004). Adolescent heavy episodic drinking trajectories and health in young adulthood. *Journal of Studies on Alcohol, 65*(2), 204–212.

Ojansuu, I., Putkonen, H., & Tiihonen, J. (2018). Cause-specific mortality in Finnish forensic psychiatric patients. *Nordic Journal of Psychiatry, 72*(5), 374-379.

Open Science Collaboration. (2015). Estimating the reproducibility of psychological science. *Science, 349*, 4716-3–4716-8.

Paanila, J., Hakola, P., & Tiihonen, J. (1999). Mortality among habitually violent offenders. *Forensic Science International, 105*(3), 195.

Pajer, K. A., Kelleher, K., Gupta, R. A., Rolls, J., & Gardner, W. (2007). Psychiatric and medical health care policies in juvenile detention facilities. *Journal of the American Academy of Child and Adolescent Psychiatry, 46*(12), 1660–1667.

Pandey, A., Hale, D., Das, S., Goddings, A. L., Blakemore, S. J., & Viner, R. M. (2018). Effectiveness of universal self-regulation–based interventions in children and adolescents: A systematic review and meta-analysis. *JAMA Pediatrics, 172*(6), 566–575.

Pari, A. A. A., Plugge, E., Holland, S., Maxwell, J., & Webster, P. (2012). Health and wellbeing of offenders on probation in England: an exploratory study. *The Lancet, 380*(3), S21.

Pasricha, S-R., Hayes, E., Kalumba, K., & Biggs. (2013). Effect of daily iron supplementation on health in children aged 4–23 months: a systematic review and meta-analysis of randomised controlled trials. *The Lancet Global Health*, 1(2), e77 - e86.

Paternoster, R., & Brame, R. (1998). The structural similarity of processes generating criminal and analogous behaviors. *Criminology, 36,* 633-666.

Penner, M. J. (1982). The role of selected health problems in the causation of juvenile delinquency. *Adolescence, 17,* 347-368.

Perneger, T. V. (1998). What's wrong with Bonferroni adjustments. *British Medical Journal, 316*(7139), 1236–1238.

Perrone, D., Sullivan, C. J., Pratt, T. C., & Margaryan, S. (2004). Parental efficacy, self-control, and delinquency: A test of a general theory of crime on a nationally representative sample of youth. *International Journal of Offender Therapy and Comparative Criminology, 48*(3), 298–312.

Perry, A. E., Weisburd, D., & Hewitt, C. (2010). Are criminologists describing randomized controlled trials in ways that allow us to assess them? Findings from a sample of crime and justice trials. *Journal of Experimental Criminology, 6*, 245–282.

Peters, R. H., Wexler, H. K., & Lurigio, A. J. (2015). Co-occurring substance use and mental disorders in the criminal justice system: A new frontier of clinical practice and research [Editorial]. *Psychiatric Rehabilitation Journal, 38*(1), 1–6.

Petersilia, J. (2003). *When prisoners come home: Parole and prisoner re-entry*. Oxford, UK: Oxford University Press.

Petersilia, J. (2008). Influencing public policy: An embedded criminologist reflects on California prison reform. *Journal of Experimental Criminology, 4*(4), 335-356.

Phillips, J., Gelsthorpe, L., & Padfield, N. (2018). Suicide and community justice. *Health and Justice, 6*, 14.

Phillips, J., Gelsthorpe, L., & Padfield, N. (2019). Non-custodial deaths: Missing, ignored or unimportant? *Criminology & Criminal Justice, 19*(2), 160-178.

Phillips, J., Gelsthorpe, L., Padfield, N., & Buckingham, S. (2017a). Non-natural deaths following prison and police custody. *Equality and Human Rights Commission Research report 106.* Retrieved from: https://www.equalityhumanrights.com/sites/default/files/non-natural_deaths_following_prison_and_police_custody_2.pdf.

Piquero A. R. (2008). Taking stock of developmental trajectories of criminal activity over the life course. In: A. Liberman (Eds.), *The long view of crime: A synthesis of longitudinal research* (pp. 23-78). New York: Springer.

Piquero, A. R. (2001). Testing Moffitt's neuropsychological variation hypothesis for the prediction of life-course persistent offending. *Psychology, Crime and Law, 7*, 193-216.

Piquero, A. R., & Benson, M. L. (2004). White-collar crime and criminal careers: Specifying a trajectory of punctuated situational offending. *Journal of Contemporary Criminal Justice, 20*(2), 148-165.

Piquero, A. R., Brezine, T., & Turner, M. G. (2005a). Testing Moffitt's account of delinquency abstention. *Journal of Research in Crime and Delinquency, 42*(1), 27-54.

Piquero, A. R., Daigle, L. E., Gibson, C., Piquero, N. L., & Tibbetts, S. G. (2007a). Research note: Are life course-persistent offenders at risk for adverse health outcomes? *Journal of Research in Crime and Delinquency, 44*(2), 185-207.

Piquero, A. R., Diamond, B., Jennings, W. G., & Reingle, J. M. (2016). Adolescence-limited offending. In C. L. Gibson, M. D. (Krohn (Eds.), *Handbook of life-course criminology: Emerging trends and directions for future research* (p. 129-142). New York: Springer.

Piquero, A. R., Farrington, D. P., & Blumstein, A. (2007b). *Key issues in criminal career research: New analyses of the Cambridge Study in Delinquent Development*. Cambridge University Press.

Piquero, A. R., Farrington, D. P., Nagin, D. S., & Moffitt, T. E. (2010). Trajectories of offending and their relation to life failure in late middle age: findings from the Cambridge Study in Delinquent Development. *Journal of Research in Crime and Delinquency, 47*, 151– 173.

Piquero, A. R., Farrington, D. P., Shepherd, J. P., & Auty, K. (2014). Offending and early death in the Cambridge Study in Delinquent Development. *Justice Quarterly, 31*(3), 445-472.

Piquero, A. R., Farrington, D. P., Welsh, B. C., Tremblay, `r., & Jennings, W. G. (2009). Effects of early family/parent training programs on antisocial behavior and delinquency. *Journal of Experimental Criminology, 5*, 83.

Piquero, A. R., Jennings, W. G., & Barnes, J. C. (2012). Violence in criminal careers: A review of the literature from a developmental life-course perspective. *Aggression & Violent Behavior, 17*, 171-179.

Piquero, A. R., Jennings, W. G. & Farrington, D. P. (2013). The monetary costs of crime to middle adulthood: findings from the Cambridge Study in Delinquent Development. *Journal of Research in Crime and Delinquency, 50*, 53–74.

Piquero, A. R., MacDonald, J., Dobrin, A., Daigle, L., & Cullen, F. T. (2005b). The relationship between violent offending and death by homicide: A test of the general theory of crime. *Journal of Quantitative Criminology, 21*, 55-71.

Piquero, A. R., Shepherd, I., Shepherd, J. P., & Farrington, D. P. (2011). Impact of offending trajectories on health: disability, hospitalisation and death in middle-aged men in the Cambridge Study in Delinquent Development. *Criminal Behaviour and Mental Health, 21*, 189-201.

Pluck, G., & Brooker, C. (2014). Epidemiological survey of suicide ideation and acts and other deliberate self-harm among offenders in the community under supervision of the

Probation Service in England and Wales. *Criminal Behaviour and Mental Health, 24*(5), 358-364.

Porter, L. C. (2014). Incarceration and post-release health behavior. *Journal of Health and Social Behavior, 55*(2), 234-249.

Porter, L. C., & Novisky, M. A. (2017). Pathways to depressive symptoms among former inmates. *Justice Quarterly, 34*(5), 847–872.

Porter, L., & Vogel, M. (2014). Residential mobility and delinquency revisited: Causation or selection? *Journal of Quantitative Criminology, 30*(2), 187–214.

Poulton, R., Caspi, A. C., Milne, B. J., Thompson, W. M., Taylor, A., Sears, M. R., & Moffitt, T. E. (2002). Association Between Children's Experience of Socioeconomic Disadvantage and Adult Health: A Life-Course Study. *The Lancet, 360*, 1640-5.

Powis, B. (2002). Offenders' risk of serious harm: a literature review. Offenders and Corrections Unit Home Office Research, Occasional Paper No. 81. Retrieved from: http://nomsintranet.org.uk/roh/official-documents/HomeOfficeRDS_OP81.pdf.

Pratt, T. C., & Cullen, F. T. (2000). The empirical status of Gottfredson and Hirschi's general theory of crime: A meta-analysis. *Criminology, 38*(3), 931–964.

Pratt, D., Piper, M., Appleby, L., Webb, R., & Shaw, J. (2006). Suicide in recently released prisoners: a population-based cohort study. *Lancet, 368*, 119–23.

Pridemore, W. A. (2014). The mortality penalty of incarceration: Evidence from a population-based case-control study of working-age males. *Journal of Health and Social Behavior, 55*(2), 215-233.

Pridmore, W. A., & Berg, M. T. (2017). What is past is prologue: A population-based case-control study of repeat victimization, premature mortality and homicide. *Aggressive Behaviour, 43*(2), 176-189.

Pritchard, C., Cox, M., & Dawson, A. (1997). Suicide and 'violent' death in a six-year cohort of male probationers compared with pattern of mortality in the general population: evidence of accumulative socio-psychiatric vulnerability. *Perspective in Public Health, 117*(3), 180-185.

Public Health England. (2021). Mortality Profile. *PHE Public Health Profiles*. Retrieved from: https://fingertips.phe.org.uk/profile/mortality-profile

Putkonen, H., Komulainen, E., Virkkunen, J., & Lonnqvist, J. (2001). Female homicide offenders have greatly increased mortality from unnatural deaths. *Forensic Science International, 119*, 221-224.

Quinn, P. J., O'Callaghan, M., Williams, G. M., Najman, J. M., Andersen, M. J., & Bor, W. (2001). The effect of breastfeeding on child development at 5 years: a cohort study. *Journal of Paediatric Child Health, 37*(5), 465-469.

Quon, E. C., & McGrath, J. J. (2015). Community, family, and subjective socioeconomic status: Relative status and adolescent health. *Health Psychology, 34*(6), 591–601.

Rafter, N., Posick, C., & Rocque, M. (2016). *The criminal brain: Understanding biological theories of crime*. New York: New York University Press.

Raine, A. (2002). Annotation: The role of prefrontal deficits, low autonomic arousal, and early health factors in the developmental of antisocial and aggressive behavior in children. *The Journal of Child Psychology and Psychiatry, 43*(4), 417-434.

Raine, A., Moffitt, T. E., Caspi, A., Loeber, R., Stouthamer-Loeber, M., & Lynam, D. (2005). Neurocognitive impairments in boys on the life-course persistent antisocial path. *Journal of Abnormal Psychology, 114*(1), 38.

Ramchand, R., Morral, A. R., & Becker, K. (2009). Seven-year life outcomes of adolescent offenders in Los Angeles. *Research and Practice, 99*(5), 863-870.

Rasanen, P., Tiihonen, J., Isohanni, M., Moring, J., & Koiranen, M. (1998). Juvenile mortality, mental disturbances and criminality: A prospective study of the Northern Finland 1966 birth cohort. *Acta Psychiatrica Scandinavica, 97*, 5-9.

Rasmussen, L. J. H., Moffitt, T. E., Arseneault, L., Danese, A., Eugen-Olsen, J., Fisher, H. L…et al. (2020). Association of adverse experiences and exposure to violence in childhood and adolescence with inflammatory burden in young people. *Journal of the American Medical Association Paediatrics, 174*(1), 38-47.

Redcross, C., Millenky, M., Rudd, T., & Levshin, V. (2011). More than a job: Final results from the evaluation of the center for employment opportunities (CEO) transitional jobs program. OPRE Report 2011-18. Retrieved from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2010208

Rehkopf, D. H., & Buka, S. L. (2006). The association between suicide and the socio-economic characteristics of geographical areas: A systematic review. *Psychological Medicine, 36*(2), 145-57.

Reising, K., Ttofi, M. M., Farrington, D. P., & Piquero, A. R. (2019). Depression and anxiety outcomes of offending trajectories: A systematic review of prospective longitudinal studies. *Journal of Criminal Justice, 62*, 3–15.

Repo-Tiihonen, E., Virkkunen, M., & Tiihonen, J. (2001). Mortality of antisocial male criminals. *Journal of Forensic Psychiatry and Psychology, 12*, 677-683.

Reynolds, A. J., Temple, J. A., Ou, S. R., Robertson, D. L., Mersky, J. P., Topitzes, J. W., & Niles, M. D. (2007). Effects of a school-based, early childhood intervention on adult health and well-being: A 19-year follow-up of low-income families. *Archives of Pediatrics & Adolescent Medicine, 161*(8), 730–739.

Richardson, J., Brown, J., & Brakle, M. V. (2013). Pathways to early violent death: The voices of serious violent youth offenders. *American Journal of Public Health, 103*(7), e1-e12.

Rieger, W. (1971). Suicide attempts in a Federal prison. *Archives of General Psychiatry, 24*(6), 532-535.

Robins, L. N., & O'Neal, P. (1958). Mortality, Mobility, and Crime: Problem Children Thirty Years Later. *American Sociological Review, 23*(2), 162-171.

Rogan, W. J., & & Gladen, B. C. (1993). Breast-feeding and cognitive development. *Early Human Development, 31*(3), 181-93.

Rönkä, A., Kinnunen, U., & Pulkkinen, L. (2001). Continuity in problems of social functioning in adulthood: a cumulative perspective. *Journal of Adult Development, 8*, 161–171.

Rosen, D. L., Schoenbach, V. J., & Wohl, D. A. (2008). All-cause and cause-specific mortality among men released from state prison, 1980-2005. *American Journal of Public Health, 98*(12), 2278-2284.

Ross, C. E., & J. Mirowsky. (2001). Neighborhood Disadvantage, Disorder and Health. *Journal of Health and Social Behavior, 42*, 258-76.

Ross, C. E., Mirowsky, J., & Goldsteen, K. (1990). The Impact of the Family on Health: The Decade in Review. *Journal of Marriage and the Family, 52*(4), 1059–1078.

Rudes, D. S., Viglione, J., Lerch, J., Porter, C., & Taxman, F. S. (2014). Build to sustain: Collaborative partnerships between university researchers and criminal justice practitioners. *Criminal Justice Studies, 27*(3), 249-263.

Ruiz, J. D., Molitor, F., Sun, R. K., Mikander, J., Facer, M., Colford, J. M., Rutherford, G. W., & Ascher, M. A. (1999). Prevalence and correlates of hepatitis C virus infection among inmates entering the California correctional system. *Western Journal of Medicine, 170*, 156-160.

Rutter, M. (2006). *Genes and behavior: Nature-nurture interplay explained*. Malden, MA: Blackwell.

Ruxton, G. D., & Neuhauser, M. (2012). Review of alternative approaches to calculation of confidence interval for the odds ratio of a 2x2 contingency table. *Methods in Ecology and Evolution, 4*(1), 9-13.

Rydelius, A. (1988). The development of antisocial behaviour and sudden violent death. *Acta Psychiatrica Scandinavica, 77*, 398-403.

Sailas, E. S., Feodoroff, B., Lindberg, N. C., Virkkunun, M. E., Sund, R., & Wahlbeck, K. (2005). The mortality of young offenders sentenced to prison and its association with psychiatric disorders: A register study. *European Journal of Public Health, 16*, 193-197.

Salas-Wright, C. P., Gonzalez, J. M. R., Vaughn, M. G., Schwartz, S. J., & Jetelina, K. K. (2016). Age-related changes in the relationship between alcohol use and violence from early adolescence to young adulthood. *Addictive Behaviors Reports, 4*, 13–17.

SAMHSA. (2014). Estimates from the 2013 National Survey on Drug Use and Health: Overview of Findings. *The NSDUH Report*. Retrieved from: https://www.samhsa.gov/data/sites/default/files/NSDUHresultsPDFWHTML2013/Web/NSDUHresults2013.pdf.

Sampson, R. J., & Laub, J. H. (1993). *Crime in the Making: Pathways and Turning Points Through Life*. Cambridge, MA: Harvard Press.

Sampson, R. J., & Laub, J. H. (2003). Life-course desisters? Trajectories of crime among delinquent boys followed to age 70. *Criminology, 41*(3), 555-592.

Sampson, R. J., & Laub, J. H. (2005). A life-course view of the development of crime. *The Annals of the American Academy of Political and Social Science, 602*(1), 12–45.

Sampson, R. J., Laub, J. H., & Wimer, C. (2006). Does marriage reduce crime? A counterfactual approach to within-individual causal effects. *Criminology, 44*(3), 465-508.

Sampson, R. J., & Lauritsen, J. L. (1997). Racial and ethnic disparities in crime and criminal justice in the united states. *Crime and Justice, 21*, 311-374.

Sampson, R. J., Morenoff, J. D., & Raudenbush, S. (2005). Social anatomy of racial and ethnic disparities in violence. *American Journal of Public Health, 95*, 224-232.

Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science, 277*(5328), 918-924.

Sampson, P. D., Streissguth, A. P., Barr, H. M., & Bookstein, F. L. (1989). Neurobehavioral effects of prenatal alcohol: Part II. Partial Least Squares Analysis. *Neurotoxicology and Teratology, 11*(5), 477-491.

Samuelson, Y. M., Hodgins, S., Larsson, A., Larm, P., & Tengstrom, A. (2010). Adolescent antisocial behavior as predictor of adverse outcomes to age 50: a follow-up study of 1,947 individuals. *Criminal Justice and Behavior, 37*, 158– 174.

Sattar, G. (2001). Rates and Causes of death among prisoners and offenders under community supervision. *Home Office Research Study 231*. Retrieved from http://www.ohrn.nhs.uk/resource/policy/ratesdeath.pdf.

Sattar, G. (2003). The death of offenders in England and Wales. *Crisis, 24*, 17–23.

Sattar, G., & Killias, M. (2005). The death of offenders in Switzerland. *European Journal of Criminology, 2*, 317-340.

Scarr, S., & McCartney, K. (1983). How people make their own environments: A theory of genotype → environment effects. *Child Development, 54*, 424–435.

Schmitz, N., Garipy, G., Smith, K. J., Malla, A., Boyer, R., Strychar, I., ... Wang, J. (2013). Trajectories of self-rated health in people with diabetes: Associations with functioning in a prospective community sample. *PLoS One, 8*(12), e83088.

Schmucker, M., & Lösel, F. (2012). *Meta-analysis as a method of systematic reviews*. In D. Gadd, S.Karstedt, & S. F. Messner (Eds.), The sage handbook of criminological research methods (pp. 425–443). Thousand Oaks: Sage.

Schnittker, J., & John, A. (2007). Enduring Stigma: The Long-Term Effects of Incarceration on Health. *Journal of Health and Social Behavior, 48*(2), 115–130.

Schnittker, J., Massoglia, M., & Uggen, C. (2012). Out and Down: Incarceration and Psychiatric Disorders. *Journal of Health and Social Behavior, 53*(4), 448–464.

Schreier, H. M. C., & Chen, E. (2013). Socioeconomic status and the health of youth: A multilevel, multidomain approach to conceptualizing pathways. *Psychological Bulletin, 139*(3), 606-654.

Schroeder, R. D., Hill, T. D., Haynes, S. H., & Bradley, C. (2011). Physical health and crime among low-income urban women: An application of general strain theory. *Journal of Criminal Justice, 39*(1), 21–29.

Schubert, C. A., Mulvey, E. P., & Glasheen, C. (2011). Influence of mental health and substance use problems and criminogenic risk on outcomes in serious juvenile offenders. *Journal of the American Academy of Child and Adolescent Psychiatry, 50*(9), 925–937.

Schwartz, J. A., & Beaver, K. M. (2014). A biosocial analysis of the sources of missing data in criminological research. *Journal of Criminal Justice, 42*, 452–461.

Schwartz, J. A., Savolainen, J., Granger, D. A., & Calvi, J. L. (2020). Is crime bad for your health? The link between delinquent offending and cardiometabolic risk. *Crime & Delinquency, 66*(10), 1–22.

Semenza, D. C. (2018). Health behaviors and juvenile delinquency. *Crime and Delinquency, 64*(11), 1394–1416.

Semenza, D. C., & Grosholz, J. M. (2019). Mental and physical health in prison: How cooccurring conditions influence inmate misconduct. *Health & Justice, 7*, 1-12.

Semenza, D. C., & Link, N. (2019). How does re-entry get under the skin? Cumulative reintegration barriers and health in a sample of recently incarcerated men. *Social Science & Medicine, 243*, 112618.

Semenzaa, D. C., Scott, D. A. I., Grosholzc, J. M., & Jackson, D. B. (2020). Disentangling the health-crime relationship among adults: The role of healthcare access and health behaviors. Social Science & Medicine. Advance Online Publication. https://pubmed.ncbi.nlm.nih.gov/32006755/.

Shaw, J., Appleby, L., & Baker, D. S. (2003). *After prisons: A national study of prison suicides 1999–2000 by the National Confidential Inquiry into Suicide and Homicide by People with Mental Illness*. London: Department of Health.

Shaw, J., Baker, D., Hunt, I. M., Moloney, A., & Appleby, L. (2004). Suicide by prisoners: A national clinical survey. *British Journal of Psychiatry*, 184, 263–267.

Shepherd, J. P., & Farrington, D. P. (1993). Assault as a public health problem: A discussion paper. Journal of the Royal Society of Medicine, 86, 89-92.

Shepherd, J. P., & Farrington, D. P. (2003). The impact of antisocial lifestyle on health: Family, school, and police interventions can reduce health risks. *BMJ, 326*(7394), 834-835.

Shepherd, J., Farrington, D. P., & Potts, A. J. C. (2002). Relations between offending, injury and illness. *Journal of the Royal Society of Medicine, 95*, 539–544.

Shepherd, J. P., Farrington, D. P., & Potts, A. J. C. (2004). Impact of antisocial lifestyle on health. *Journal of Public Health, 26*, 347-352.

Shepherd, J. P., Shepherd, I., Newcombe, R. G., & Farrington, D. P. (2009). Impact of antisocial lifestyle on health: chronic disability and death by middle age. *Journal of Public Health, 31*, 506-511.

Sherman, L. W., & Harris, H. M. (2013). Increased homicide victimization of suspects arrested for domestic assault: A 23-year follow-up of the Milwaukee Domestic Violence Experiment (MilDVE). *Journal of Experimental Criminology*, *9*(4), 491-514.

Singleton, N., Pendry, E., Taylor, C., Farrell, M., Marsden, J. (2003). Drug-related mortality among newly-released offenders. Home Office Online Report 16/03. Retrieved from: https://www.researchgate.net/publication/282657881_Drug-Related_Mortality_Among_Newly-Released_Offenders.

Shook, J. J., Vaughn, M. G., & Salas-Wright, C. P. (2013). Exploring the variation in drug selling among adolescents in the United States. *Journal of Criminal Justice, 41*(6), 365–374.

Shor, E., Roelfs, D., & Vang, Z. M. (2017). The "Hispanic mortality paradox" revisited: Meta-analysis and meta-regression of life-course differentials in Latin American and Caribbean immigrants' mortality. *Social Science & Medicine, 186*, 20-33.

Short, M. E., Goetzel, R. Z., Pei, X., Tabrizi, M. J., Ozminkowski, R. J., Gibson, T. B., Dejoy, D. M., & Wilson, M. G. (2009). How accurate are self-reports? An analysis of self-reported healthcare utilization and absence when compared to administrative data. *Journal of Occupational and Environmental Medicine, 51*(7), 786–796.

Shufelt, J. L., & Cocozza, J . J. (2006). Youth with mental health disorders in the juvenile justice system: Results from a mutli-state prevalence study. *National Centre for Mental Health and Juvenile Justice*. Retrieved from: https://www.unicef.org/tdad/usmentalhealthprevalence06.pdf.

Skalamera, J., & Hummer, R. A. (2016). Educational attainment and the clustering of health-related behavior among U.S. young adults. *Preventive Medicine, 84*, 83-89.

Skardhamar, T., & Skirbekk, V. (2013). Relative mortality among criminal in Norway and the relation to drug and alcohol related offenses. *PLoS ONE, 8*(11), e78893.

Skinner, G. C. M., & Farrington, D. P. (2020a). A systematic review and meta-analysis of offending versus suicide in community (non-psychiatric and non-prison) samples. *Aggression & Violent Behaviour, 52*, 1359-1789.

Skinner, G. C. M., & Farrington, D. P. (2020b). A Systematic Review and Meta-Analysis of Premature Mortality in Offenders. *Aggression & Violent Behaviour, 53*, 1359-1789.

Skinner, G. C. M., & Farrington, D. P. (2020c). Antisocial Personality Versus GP Reported and Self-reported Health Outcomes. *Journal of Forensic Psychiatry & Psychology*. doi: 10.1080/14789949.2020.1864451.

Skinner, G. C. M., & Farrington, D. P. (2021). Self-reported and general practitioner recorded indicators of lifetime health up to age 48 according to offender type in the Cambridge Study in Delinquent Development. *Criminal Behaviour & Mental Health*, 31(3), 211-219.

Skinner, G. C. M., & Farrington, D. P. (*Under Review*). Health in Offenders Versus Non-Offenders in the Third Generation of the Longitudinal Cambridge Study in Delinquent Development. *International Journal of Offender Therapy and Comparative Criminology.*

Skinner, G. C. M., & Farrington, D. P. (*Under Review*). What we know and need to know about physical health versus offending: A literature review. *Aggression & Violent Behavior*.

Skinner, G. C. M,. Farrington, D. P., & Shepherd, J. P. (2020). Offender trajectories, health and hospital admissions: Relationships and risk factors in the longitudinal Cambridge Study in Delinquent Development. *Journal of the Royal Society of Medicine*, *113*(3), 110-118.

Singh, J. P., Yang, S., Mulvey, E., & RAGEE group. (2015). Reporting guidance for violence risk assessment predictive validity studies: the RAGEE statement. *Law and Human Behavior, 39*, 15–22.

Sirdifield, C., Brooker, C., & Marples, R. (2020). Suicide and probation: A systematic review of the literature. *Forensic Science International: Mind and Law*. Advance Online Publication. Retrieved from: https://www.sciencedirect.com/science/article/pii/S2666353820300059.

Slocum, L. A. (2010). General Strain Theory and continuity in offending over time: Assessing and extending GST explanations of persistence. *Journal of Contemporary Criminal Justice*, *26*(2), 204-223.

Sokol, R. L., Gottfredson, N. C., Shanahan, M. E., & Halpern, C. T. (2018). Relationship between child maltreatment and adolescent body mass index trajectories. *Children and Youth Services Review, 93*, 196–202.

Sourander, A., Elonheimo, H., Niemelä, S., Nuutila, A-M., Helenius, H., Sillanmaki, L., Piha, J., & Kivivuori, J. (2000). Delinquent behavior, psychosomatic symptoms and the idea of "healthy delinquency." *Journal of Scandinavian Studies in Criminology and Crime Prevention, 1*, 121–139.

Spaulding, A. C., Seals, R. M., McCallum, V. A., Perez, S. D., Brzozowski, A. K., & Steenland, N. K. (2011). Prisoner survival inside and outside of the institution: Implications for health-care planning. *American Journal of Epidemiology, 173*, 479-487.

Springer, J. F., Sale, E., Hermann, J., Sambrano, S., Kasim, R., & Nistler, M. (2004). Characteristics of effective substance abuse prevention programs for high-risk youth. *Journal of Primary Prevention, 25*(2), 171–194.

Stattin, H., & Magnusson, D. (1996). Antisocial development: a holistic approach. *Development and Psychopathology, 8*, 617–645.

Stattin, H., & Romelsjo¨, A. (1995). Adult mortality in the light of criminality, substance abuse, and behavioural and family-risk factors in adolescence. *Criminal Behaviour and Mental Health, 5*, 279-311.

Stenbacka, M., & Jansson, B. (2014). Unintentional injury mortality: the role of criminal offending. A Swedish longitudinal population-based study. *International Journal of Injury Control and Safety Promotion, 21*, 127–135.

Stenbacka, M., Moberg, T., & Jokinen, J. (2019). Adolescent criminality: Multiple adverse health outcomes and mortality pattern in Swedish men. *BMC Public Health, 19*, 400.

Stenbacka, M., Moberg, T., Romelsjo, A., & Jokinen, J. (2012). Mortality and causes of death among violent offenders and victims – A Swedish population based longitudinal study. *BMC Public Health, 12*, 38.

Stewart, L., Henderson, C., Hobbs, M. S. T., Ridout, S. C., & Knuiman, M. W. (2004). Risk of death in prisoners after release from jail. *Australian and New Zealand Journal of Public Health, 33*, 223-227.

Stewart, L., A., & Tierney, J. F. (2002). To IPD or not to IPD? Advantages and disadvantages of systematic reviews using individual participant data. *Evaluation & the Health Professions, 25*(1), 76-97.

Stogner, J. (2015). General Strain Theory and Biosocial Criminology: Pathways to Successful Theoretical Integration. In K. M. Beaver, J. C. Barnes, B. B. Boutwell (Eds.), *The Nurture Versus Biosocial Debate in Criminology: On the Origins of Criminal Behavior and Criminality* (pp. 199-217). Sage: Thousand Oaks, California.

Stogner, J., & Gibson, C. L. (2010). Healthy, wealthy, and wise: Incorporating health issues as a source of strain in Agnew's general strain theory. *Journal of Criminal Justice, 38*, 1150–1159.

Stogner, J., & Gibson, C. L. (2011). The influence of health strain on the initiation and frequency of substance use in national sample of adolescents. *Journal of Drug Issues, 11*, 69–94.

Stogner, J., & Gibson, C. L. (2013). Stressful life events and adolescent drug use: Moderating influences of the MAOA gene. *Journal of Criminal Justice, 41*(5), 357-363.

Stogner, J., Gibson, C. L., & Miller, J. M. (2014). Examining the reciprocal nature of the health-violence relationship: Results from a nationally representative sample. *Justice Quarterly, 31*(3), 473–499.

Stoddard-Dave, P. A., Tedor, M. F., Quinn, L. M., & Mallett, C. A. (2014). An assessment of risk factors for early death among a sample of previously incarcerated youth. *Social Work Faculty Publications, 20*. Retrieved from: https://engagedscholarship.csuohio.edu/clsowo_facpub/20.

Streissguth, A. P., Barr, H. M., Sampson, P. D., Bookstein, F. L., & Darby, B. L. (1989). Neurobehavioral effects of prenatal alcohol: Part I. Research Strategy. *Neurotoxicology and Teratology, 11*(5), 461-476.

Streissguth, A. P., Bookstein, F. L., Sampson, P. D., & Barr, H. M. (1989). Neurobehavioral effects of prenatal alcohol: Part III. PLS analyses of neuropsychologic tests. *Neurotoxicology and Teratology, 11*(5), 493-507.

Stringhini, S., Carmeli, C., Jokela, M., Avendano, M., Muennig, P., Guida, F., … et al. (2017). Socioeconomic status and the 25 x 25 risk factors as determinants of premature mortality: a multicohort study and meta-analysis of 1.7 million men and women. *Lancet, 389*(10075), 1229-1237.

Stuckler, D., Basu, S., Suhrcke, M., & McKee, M. (2009). The health implications of financial crisis: A review of the evidence. *Ulster Medical Journal, 78*(3), 142-145.

Sykes, B. L., & Piquero, A. R. (2009). Structuring and re-creating inequality: Health testing policies, race, and the criminal justice system. *The ANNALS of the American Academy of Political and Social Science, 623*(1), 214-227.

Tabita, B., Santi, M. G., & Kjellin, L. (2012). Criminal recidivism and mortality among patients discharged from a forensic medium secure hospital. *Nordic Journal of Psychiatry, 66*(4), 283-289.

Tahamont, S., Yan, S., Bushway, S. D., & Liu, J. (2015). Pathways to prison in New York state. *Criminology & Public Policy, 14*(3), 431–453.

Tamminen, T., Kumpulainen, K., Moilanen, I., & Almqvist, F. (2006). Childhood predictors of male criminality: a prospective population-based follow-up study from age 8 to late adolescence. *Journal of the American Academy of Child & Adolescent Psychiatry, 45*, 578–86.

TenEyck, M., & Barnes, J. C. (2015). Examining the impact of peer group selection on self reported delinquency: A consideration of active gene-environment correlation. *Criminal Justice and Behavior, 42*, 741–762.

Teplin, L. A., Abram, K. M., McClelland, G. M., Dulcan, M. K., & Mericle, A. A. (2002). Psychiatric disorders in youth in juvenile detention. *Archives of General Psychiatry, 59*(12), 1133–1143.

Teplin, L. A., Jakubowski, J. A., Abram, K. M., Olson, N. D., Stokes, M. L., & Welty, L. J. (2014). Firearm homicide and other causes of death in delinquents: A 16-year prospective study. *Paediatrics, 134*(1), 63-73.

Teplin, L. A., McClelland, G. M., Abram, K. M., & Mileusnic, D. (2005). Early violent death among delinquent youth: A prospective longitudinal study. *Pediatrics, 115*, 1586-1593.

Testa, A., & Jackson, D. B. (2020). Adverse childhood experiences and food insecurity in adulthood: Evidence from the National Longitudinal Study of Adolescent to Adult Health. *Journal of Adolescent Health, 67*(2), 218-224.

Testa, A., & Porter, L. C. (2017). No rest for the wicked? The consequences of incarceration for sleep problems. *Society and Mental Health, 7*(3), 196-208.

Testa, A., Porter, L., & Nakamura, K. (2017). Examining all-cause and cause-specific mortality among former prisoners in Pennsylvania. *Justice Quarterly, 35*(2), 1-34.

Testa, A., & Semenza, D. (2020). Criminal offending and health over the life-course: A dual-trajectory approach. *Journal of Criminal Justice*. Advance Online Publication. Retrieved from: https://doi.org/10.1016/j.jcrimjus.2020.101691.

Thoits, P. A. (2010). Stress and health: major findings and policy implications. *Journal of Health and Social Behavior, 51*, 1-S53.

Thomas, J. C., & Torrone, E. (2008). Incarceration as Forced Migration: Effects on Selected Community Health Outcomes. *American Journal of Public Health, 96*(10), 1762-1765.

Tibbetts, S. G. (2014). Prenatal and perinatal predictors of antisocial behavior: review of research and interventions. In M. DeLisi & K. M. Beaver (Eds.), *Criminological Theory: A Life-Course Approach* (pp. 27-33). Sudbury, MA: Jones & Bartlett Publishers.

Tibbetts, S. G., & Piquero, A. R. (1999). The influence of gender, low birth weight and disadvantaged environment on predicting early onset of offending: A test of Moffitt's Interactional Hypothesis. *Criminology, 37*, 843-878.

Tierney, J. F., Stewart, L. A., & Clarke, M. (2021). Chapter 26: Individual participant data. In: J. P. T. Higgins, J. Thomas, J. Chandler, M. Cumpston, T. Li, M. J. Page & V. A. Welch (Eds.), *Cochrane Handbook for Systematic Reviews of Interventions* version 6.2. Cochrane. Retrieved from: www.training.cochrane.org/handbook.

Tikkanen, R., Holi, M., Lindberg, N., Tiihonen, J., & Virkkunen, M. (2008). Recidivistic offending and mortality in alcoholic violent offenders: A prospective follow-up study. *Psychiatry Research, 168*, 18-25.

Tillyer, R., Tillyer, M. S., McCluskey, J., Cancino, J., Todaro, J., & McKinnon, L. (2014). Researcher practitioner partnerships and crime analysis: a case study in action research. *Police Practice and Research, 15*(5), 404-418.

Timonen, M., Ma¨kikyro, T., Miettunen, J., Hakko, H., Zitting, P., Kinnunen, J., & Rasanen, P. (2003). Somatic morbidity and criminality: The northern Finland 1966 birth cohort study. *Forensic Science International, 132*, 68-75.

Towl, G. J., & Crightom, D. A. (2000). *Psychology in Prisons*. UK: Blackwell.

Towl, G., Snow, L., & McHugh, M. (2002). *Suicide in prisons*. Oxford: BPS/Blackwell.

Tremblay, P., & Pare, P-P. (2003). Crime and Destiny: Patterns in serious offenders' mortality rates. *Canadian Journal of Criminology and Criminal Justice, 45*(3), 299-326.

Trumbetta, S. L., Seltzer, B. K., Gottesman, I. I., & McIntyre, K. M. (2010). Mortality predictors in a 60-year follow-up of adolescent males: Exploring delinquency, socioeconomic status, IQ, high-school drop-out status, and personality. *Psychosomatic Medicine, 72*(1), 46.

Turney, K. (2014a). The intergenerational consequences of mass incarceration: Implications for children's coresidence and contact with grandparents. *Social Forces, 93*(1), 299–327.

Turney, K. (2014b). Stress proliferation across generations? Examining the relationship between parental incarceration and childhood health. *Journal of Health and Social Behavior, 55*(3), 302–319.

Turney, K. (2017a). The unequal consequences of mass incarceration for children. *Demography, 54*(1), 361–389.

Turney, K. (2017b). Unmet health care needs among children exposed to parental incarceration. *Maternal and Child Health Journal, 21*(5), 1194–1202.

Turney, K., & Goodsell, R. (2018). Parental incarceration and children's wellbeing. *The Future of Children, 28*(1), 147-164.

Turney, K., & Haskins, A. (2019). Parental incarceration and children's wellbeing: Findings from the Fragile Families and Child Wellbeing Study. In J. M. Eddy & J. Poehlmann-Tynan (Eds.), *Children of incarcerated parents: A handbook for researchers and practitioners* (Second Edition) (pp. 53-64). New York: Springer.

Turner, R. J., & Lloyd, D. A. (1995). Lifetime traumas and mental health: the significance of cumulative adversity. *Journal of Health and Social Behavior, 36*(4), 360-376.

Turney, K., Schnittker, J., & Wildeman, C. (2012). Those they leave behind: Paternal incarceration and maternal instrumental support. *Journal of Marriage and Family, 74*(5), 1149–1165.

Turney, K., & Wildeman, C. (2013). Redefining relationships: Explaining the countervailing consequences of paternal incarceration for parenting. *American Sociological Review, 78*(6), 949–979.

Turney, K., & Wildeman, C. (2015a). Detrimental for some? Heterogeneous effects of maternal incarceration on child wellbeing. *Criminology & Public Policy, 14*(1), 125–156.

Turney, K., & Wildeman, C. (2015b). Self-reported health among recently incarcerated mothers. *American Journal of Public Health, 105*(10), 2014–2020.

Ullrich, S., Farrington, D. P., & Coid, J. W. (2008). Psychopathic personality traits and life-success. *Personality and Individual Differences, 44*(5), 1162–1171.

Van de Weijer, S., Bijleveld, C., & Huschek, D. (2016). Offending and mortality. *Advances in Life Course Research, 28*, 91-99.

Van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Duschinsky, R., Fox, N. A., Goldman, P. S., Gunnar, M. R., Johnson, D. E., Nelson, C. A., Reijman, S., Skinner, G. C. M., Zeanah, C. H., & Sonuga-Barke, E. J. S. (2020). Institutionalization and deinstitutionalization on children: A systematic and integrative review of evidence regarding effects on development. *The Lancet Psychiatry, 7*(8), 703-720.

Vandecar-Burdin, T & Payne, B. K. (2010). Risk factors for victimization of younger and older persons: Assessing differences in isolation, intra-individual characteristics, and health factors. *Journal of Criminal Justice, 38*, 160-165.

Vaske, J. C., Newsome, J., Boisvert, D. L., Piquero, A. R., Paradis, A. D., & Buka, S. L. (2015). The impact of low birth weight and maternal age on adulthood offending. *Journal of Criminal Justice, 43*(1), 49-56.

Vaughn, M. G. (2011). Addiction and criminal justice: Empirical findings and theory for advancing public safety and health. *Journal of Criminal Justice, 39*, 205-206.

Vaughn, M. G., DeLisi, M., Beaver, K. M., Perron, B. E., Abdon, A. (2012). Toward a criminal justice epidemiology: Behavioral and physical health of probationers and parolees in the United States. *Journal of Criminal Justice, 40*(3), 165-173.

Vaughn, M. G., DeLisi, M., Beaver, K. M., & Wright, J. P. (2009). DAT1 and 5HTT are associated with pathological criminal behavior in a nationally representative sample of youth. *Criminal Justice and Behavior, 36*, 1113–1124.

Vaughn, M. G., DeLisi, M., Gunter, T., Fu, Q., Beaver, K. M., Perron, B. E., & Howard, M. O. (2011). The severe 5%: A latent class analysis of the externalizing behavior spectrum in the United States. *Journal of Criminal Justice, 39*(1), 75–80.

Vaughn, M., Jackson, D. B., Testa, A., Holzer, K. J., Jaegers, L., & Semenza, D. (2020a). Health Criminology: New Developments in an Emerging Paradigm. *The Criminologist, 45*(3), 9-13.

Vaughn, M. G., Litschge, C., DeLisi, M., Beaver, K. M., & McMillen, C. J. (2008). Psychopathic personality features and risks for criminal justice system involvement among emancipating foster youth. *Children and Youth Services Review, 30*(10), 1101–1110.

Vaughn, M. G., Salas-Wright, C. P., Cordova, D., Nelson, E. J., & Jaegers, L. (2018). Racial and ethnic trends in illicit drug use and binge drinking among adolescent and young adult offenders in the United States. *Journal of Criminal Justice, 59*, 71–80.

Vaughn, M. G., Sala-Wright, C. P., & Jackson, D. B. (2020b). *Routledge International Handbook of Delinquency and Health*. Routledge: New York.

Vaughn, M. G., Salas-Wright, C. P., DeLisi, M., & Piquero, A. R. (2014). Health associations of drug-involved and criminal-justice involved adults in the United States. *Criminal Justice and Behavior, 41*(3), 318-336.

Vazsonyi, A. T., & Huang, L. (2010). "Where self-control comes from: On the development of self-control and its relationship to deviance over time". *Developmental Psychology, 46*(1), 245-257.

Verger, P., Rotily, M., Prudhomme, J., & Bird, S. (2003). High mortality rates among inmates during the year following their discharge from a French prison. *Journal of Forensic Science, 48*(3), 1-3.

Verhage, M. L., Schuengel, C., Madigan, S., Fearon, R. M. P., Oosterman, M., Cassibba, R…et al. (2016). Narrowing the transmission gap: A synthesis of three decades of research on intergenerational transmission of attachment. *Psychological Bulletin, 142*(4), 337-366.

Visher, C. A., & Travis, J. (2003). Transitions from prison to community: understanding individual pathways. *Annual review of sociology, 29*(1), 89-113.

Vitaro, F., Brendgen, M., Girard, A., Dionne, G., Tremblay, R. E., & Boivin, M. (2016). Links between friends' physical aggression and adolescents' physical aggression: What happens if gene-environment correlations are controlled? *International Journal of Behavioral Development, 40*, 234–242.

Vize, C. E., Miller, J. D., & Lynam, D. R. (2018). FFM facets and their relations with different forms of antisocial behavior: An expanded meta-analysis. *Journal of Criminal Justice, 57*, 67–75.

Vogel, M., Porter, L. C., & McCuddy, T. (2017). Hypermobility, destination effects, and delinquency: Specifying the link between residential mobility and offending. *Social Forces, 95*(3), 1261–1284.

Wakefield, S., & Wildeman, C. (2014). *Children of the prison boom: Mass incarceration and the future of American inequality*. New York, NY: Oxford University Press.

Wallace, D., & Papachristos, A. V. (2014). Recidivism and the availability of health care organizations. *Justice Quarterly, 31*(3), 588–608.

Wallerstein, N. B., & Duran, B. (2006). Using community-based participatory research to address health disparities. *Health Promotion Practice, 7*(3), 312-323.

Wallerstein, N.B., Duran, B., Minkler, & M., Foley, K. (2005). Developing and maintain partnerships with communities. In B. A. Israel, E. Eng, A. J. Schulz, E. A. Parker (Eds.), *Methods in community-based participator research for health* (pp. 31-51). John Wiley & Sons, Inc.

Walsh, A. (2002a). *Biosocial criminology: Introduction and integration*. Cincinnati, OH: Anderson.

Walsh, A. (2002b). Companions in crime: A biosocial perspective. *Human Nature Review, 2*, 169–178.

Walsh, A., & Beaver, K. M. (2009). Biosocial Criminology: *New Directions in Theory and Research*. New York: Routledge.

Waltermaurer, E., & Akers, T. A. (2013). *Epidemiological Criminology*. New York: Routledge.

Wang, E. A., Wang, Y., & Krumholz, H. M. (2013). A high risk of hospitalization following release from correctional facilities in Medicare beneficiaries: a retrospective match cohort study, 2002 to 2010. *Journal of the American Medical Association International Medicine, 173*(17), 1621-8.

Wasserman, G. A., & McReynolds, L. S. (2011). Contributors to traumatic exposure and posttraumatic stress disorder in juvenile justice youths. *Journal of Traumatic Stress, 24*(4), 422–429.

Wasserman, G. A., McReynolds, L. S., Schwalbe, C. S., Keating, J. M., & Jones, S. A. (2010). Psychiatric disorder, comorbidity, and suicidal behavior in juvenile justice youth. *Criminal Justice and Behavior, 37*(12), 1361–1376.

Webb, R. T., Qin, P., Stevens, H., Mortensen, P. B., Appleby, L., & Shaw, J. (2011). National study of suicide in all people with a criminal justice history. *Archives of General Psychiatry, 68*(6), 591-599.

Welsh, B. C., Zane, S. N., Zimmerman, G. M., & Yohros, A. (2019). Association of a crime prevention program for boys with mortality 72 years after the intervention: follow-up of a randomized clinical trial. *Journal of the American Medical Association, 2*(3), e190782.

Wen, M., Browning, C. R., & Cagney, K. A. (2003). Poverty, affluence, and income inequality: Neighborhood economic structure and its implications for health. *Social Science & Medicine, 57*(5), 843–860.

West, D. J. (1969), *Present conduct and future delinquency*. London: Heinemann.

West, D. J. (1982), *Delinquency: Its roots, careers and prospects*. London: Heinemann.

West, D. J., & Farrington DP (1973) *Who becomes delinquent?* London: Heinemann.

West, D. J., & Farrington, D. P. (1977). *The delinquent way of life*. London: Heineman.

White, H. R. (2016). Substance use and crime. *The Oxford Handbook of Substance Use and Substance Use Disorders, 2*, 347–378.

Wibbelink, C. J. M., Hoeve, M., Stams, G. J. J. M., & Oort, F. J. (2017). A meta-analysis of the association between mental disorders and juvenile recidivism. *Aggression and Violent Behavior, 33*, 78–90.

Wickrama, K. A. S., Wickrama, T., & Lott, R. (2009). Heterogeneity in youth depressive symptom trajectories: Social stratification and implications for young adult physical health. *Journal of Adolescent Health, 45*(4), 335–343.

Widom, C. S., Fisher, J. H., Nagin, D. S., & Piquero, A. R. (2018). A prospective examination of criminal career trajectories in abused and neglected males and females followed up into middle adulthood. *Journal of Quantitative Criminology, 34*(3), 831–852.

Wiesner, M., & Kim, H. K. (2006). Co-occurring delinquency and depressive symptoms of adolescent boys and girls: A dual trajectory modelling approach. *Developmental Psychology, 42*(6), 1220.

Wildeman, C., Goldman, A. W., & Turney, K. (2018). Parental incarceration and child health in the United States. *Epidemiologic Reviews, 40*(1), 146-156.

Wildeman, C., & Muller, C. (2012). Mass imprisonment and inequality in health and family life. *Annual Review of Law and Social Science, 8*, 11–30.

Wildeman, C., & Wang, E. A. (2017). Mass incarceration, public health, and widening inequality in the USA. *The Lancet, 389*(10077), 1464-1474.

Wilkins, J., & Coid, J. (1991). Self-mutilation in female remanded prisoners: I. An indicator of severe psychopathology. *Criminal Behaviour and Mental Health, 1(*3), 247-267.

Williams, D. R., & Collins, C. (1995). US socioeconomic and racial differences in health: Patterns and explanations. *Annual Review of Sociology, 21*, 349-386.

Wilson, D. B., & Lipsey, M. W. (2001). *Practical Meta-Analysis*. SAGE Publications: California.

World Health Organization (WHO). (2014). Prisons and Health. Retrieved from: https://www.euro.who.int/__data/assets/pdf_file/0005/249188/Prisons-and-Health.pdf.

World Health Organization (WHO). (2018). Suicide data. Retrieved from: https://www.who.int/mental_health/prevention/suicide/suicideprevent/en/.

Wright, J. P., & Beaver, K. M. (2005). Do parents matter in creating self-control in their children? A genetically informed test of Gottfredson and Hirschi's theory of low self-control. *Criminology, 43*, 1169–1202.

Wright, J. P., & Boisvert, D. (2009). What Biosocial Criminology Offers Criminology. Criminal Justice and Behavior, 36(11), 1228-1240.

Wright, B. R. E., Caspi, A., Moffitt, T. E., & Silva, P. A. (2006). The effects of social ties on crime vary by criminal propensity: A life-course model of interdependence. *Criminology, 39*(2), 321-348.

Wright, J. P., & Cullen, F. T. (2006). Employment, peers, and life-course transitions. *Justice Quarterly, 21*, 183-205.

Wu, L. T., Gersing, K., Burchett, B., Woody, G. E., & Blazer, D. G. (2011). Substance use disorders and comorbid Axis I and II psychiatric disorders among young psychiatric patients: Findings from a large electronic health records database. *Journal of Psychiatric Research, 45*(11), 1453–1462.

Yeager, A., and Lewis, D. O. (1990). Mortality in a group of formerly incarcerated juvenile delinquents. *American Journal of Psychiatry, 147*, 612-614.

Zane, S. N., Welsh, B. C., & Zimmerman, G. M. (2018). Criminal offending and mortality over the full life-course: a 70-year follow-up of the Cambridge-Somerville Youth Study. *Journal of Quantitative Criminology, 35*, 691-713.

Zara G, & Farrington, D. P. (2009). Childhood and adolescent predictors of late onset criminal careers. *Journal of Youth and Adolescence, 38*, 287-300.

Zara, G., & Farrington, D. P. (2007). Early predictors of late onset offenders. *International Annals of Criminology, 45*, 37–56.

Zeng, Z., Noonan, M., Carson, E. A., Binswanger, I. A., Blatchford, P., Smiley-McDonald, H., & Ellis, C. (2016). Assessing inmate cause of death: Deaths in custody reporting program and National Death Index. *World Health, 46,* 1-14.

Zhu, K., McKnight, B., Stergachis, A., Daling, J. R., & Levine, R. S. (1999). Comparison of self-report data and medical records data: results from a case-control study on prostate cancer. *International Journal of Epidemiology*, *28*(3), 409-417.

Zlodre, J., & Fazel, S. (2012). All-cause and external mortality in released prisoners: Systematic review and meta-analysis. *American Journal of Public Health, 102*(12), 67-75.

# Appendix A

## Table 1. Prevalence of Drug and Alcohol Abuse, Dependency and Treatment up to Age 48

| Drug / Alcohol Abuse | NO | LO | AL | LCP |
|---|---|---|---|---|
| Alcohol Abuse | 17 (10.1%) | 8 (27.5%) | 15 (25.4%) | 19 (44.2%) |
| Amphetamine Abuse | 3 (1.8%) | 1 (3.4%) | 3 (5.1%) | 6 (14.0%) |
| Cannabis Abuse | 7 (4.2%) | 1 (3.4%) | 3 (5.1%) | 5 (11.6%) |
| Cocaine Abuse | 1 (0.6%) | 1 (3.4%) | 0 (0.0%) | 9 (20.9%) |
| Hallucinogen Abuse | 1 (0.6%) | 0 (0.0%) | 2 (3.4%) | 7 (16.3%) |
| Opioid Abuse | 1 (0.6%) | 1 (3.4%) | 0 (0.0%) | 2 (4.6%) |
| Amphetamine Dependence | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 1 (2.3%) |
| Cannabis Dependence | 2 (1.2%) | 0 (0.0%) | 2 (3.4%) | 1 (2.3%) |
| Cocaine Dependence | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 4 (9.3%) |
| Hallucinogen Dependence | 0 (0.0%) | 0 (0.0%) | 1 (1.7%) | 0 (0.0%) |
| Opioid Dependence | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 1 (2.3%) |
| Sedative Dependence | 1 (0.6%) | 0 (0.0%) | 0 (0.0%) | 3 (7.0%) |
| Treatment for Alcohol Abuse | 1 (0.6%) | 2 (6.9%) | 3 (5.1%) | 8 (18.6%) |
| Treatment for Drug Abuse | 1 (0.6%) | 0 (0.0%) | 1 (1.7%) | 4 (9.3%) |

*Note. Gross numbers and prevalence calculated from the 300 individuals who had full data for all self-report variables.*

**Table 2. Odds Ratios of Drug and Alcohol Abuse, Dependency and Treatment up to Age 48**

| Drug / Alcohol Abuse | LO | AL | LCP |
|---|---|---|---|
| Alcohol Abuse | 2.72<br>(2.13-3.48) | 2.51<br>(1.97-3.22) | 4.38<br>(3.47-5.53) |
| Amphetamine Abuse | 1.89<br>(1.06-3.37) | 2.83<br>(1.64-4.88) | 0.78<br>(0.38-1.52) |
| Cannabis Abuse | 0.81<br>(0.51-1.28) | 1.21<br>(0.80-1.84) | 2.76<br>(1.92-3.97) |
| Cocaine Abuse | 5.67<br>(2.37-13.56) | 0.08<br>(0.00-1.37) | 34.83<br>(15.40-8.96) |
| Hallucinogen Abuse | 0.08<br>(0.00-1.37) | 5.67<br>(2.37-13.56) | 27.17<br>(11.97-61.65) |
| Opioid Abuse | 5.67<br>(2.37-13.56) | 0.08<br>(0.00-1.37) | 7.67<br>(3.26-18.03) |
| Amphetamine Dependence | 1.00<br>(0.02-50.45) | 1.00<br>(0.02-50.45) | 2.30<br>(0.18-22.09) |
| Cannabis Dependence | 0.04<br>(0.00-0.68) | 2.83<br>(1.46-5.50) | 1.92<br>(0.95-3.87) |
| Cocaine Dependence | 1.00<br>(0.02-50.45) | 1.00<br>(0.02-50.45) | 9.30<br>(1.14-71.17) |
| Hallucinogen Dependence | 1.00<br>(0.02-50.45) | 1.70<br>(0.18-22.09) | 1.00<br>(0.02-50.45) |
| Opioid Dependence | 1.00<br>(0.02-50.45) | 1.00<br>(0.02-50.45) | 2.30<br>(0.18-22.09) |
| Sedative Dependence | 0.08<br>(0.00-1.37) | 0.08<br>(0.00-1.37) | 11.67<br>(5.04-26.98) |
| Treatment for Alcohol Abuse | 11.50<br>(4.97-26.61) | 8.50<br>(3.63-19.90) | 31.00<br>(13.69-0.22) |
| Treatment for Drug Abuse | 0.08<br>(0.00-1.37) | 2.83<br>(1.11-2.16) | 15.50<br>(6.76-35.55) |

*Note. Odds Ratios are based upon the Table II's prevalence calculated from the 300 individuals who had full data for all self-report variables.*

# Appendix B

## Table 1. Logistic Regression Analysis Predicting GP Reported G2 Offender Health

| Risk Factor | Physical Illness | | | | Ever Hospitalised | | | | Surgical Admission | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* |
| **G1 Female Convicted Before Age 32** | | | | | 5.091 | .024 | .175 (.042-.729) | .017 | 3.966 | .047 | .224 (.056-.904) | .036 |
| **Large Family Size** | | | | | 3.938 | .047 | .288 (.084-.993) | .049 | | | | |
| **High Dishonesty** | 4.743 | .029 | 2.900 (1.071-7.852) | .036 | | | | | | | | |

*N* = 100.

**Table 1 (cont.) Logistic Regression Analysis Predicting GP Reported G2 Offender Health**

| Risk Factor | Drug Use | | | | Alcohol Use | | | | Violent Involvement in Incidents | | | | Self-Harm | | | | Disabling Medical Condition | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* |
| **High Daring** | | | | | | | | | 5.264 | .022 | 3.400 (1.156-10.000) | .026 | | | | | | | | |
| **Disrupted Family** | 4.324 | .038 | 5.431 (.994-29.663) | .050 | 4.074 | .044 | 2.678 (1.029-6.970_ | .044 | 6.657 | .010 | 3.963 (1.368-11.479) | .011 | | | | | 5.754 | .016 | 3.092 (1.224-7.811) | .017 |
| **Low Family Income** | | | | | 3.733 | .050 | 2.670 (.997-7.151) | .050 | | | | | 6.408 | .011 | 12.348 (1.313-116.126) | .028 | 5.975 | .015 | 3.314 (1.272-8.634) | .014 |
| **Large Family Size** | | | | | | | | | | | | | 5.092 | .024 | 9.429 (1.008-88.163) | .049 | | | | |
| **Poor Supervision** | | | | | | | | | 6.160 | .013 | 4.444 (1.363-14.497) | .013 | | | | | | | | |
| **Poor Housing** | | | | | | | | | 6.399 | .011 | 4.162 (1.261-13.738) | .019 | | | | | | | | |
| **High Dishonesty** | | | | | 4.944 | .026 | 3.171 (1.145-8.781) | .026 | | | | | | | | | 4.111 | .043 | 2.824 (1.036-7.692) | .042 |

*N* = 100.

**Table 2. Logistic Regression Analysis Predicting GP Reported G2 Non-Offender Health**

| Risk Factor | Alcohol Use | | | | Violent Involvement in Incidents | | | | Self-Harm | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LRCS Change | *p* | *OR* | *p* | LRCS Change | *p* | *OR* | *p* | LRCS Change | *p* | *OR* | *p* |
| **Low Nonverbal IQ** | | | | | | | | | 4.818 | .028 | 8.132 (1.272-51.970) | .027 |
| **Poor Supervision** | 8.237 | .004 | 8.167 (2.061-32.362) | .003 | 4.007 | .045 | 3.353 (1.076-10.443) | .037 | | | | |
| **Large Family Size** | 9.833 | .002 | 7.219 (2.149-24.246) | .001 | | | | | 9.676 | .002 | 21.895 (2.319-206.738) | .007 |
| **Low SES** | 5.486 | .019 | 4.904 (1.394-17.247) | .013 | | | | | | | | |
| **High Daring** | 6.269 | .012 | 4.616 (1.415-15.059) | .011 | | | | | | | | |
| **G1 Young Mother** | | | | | | | | | 6.079 | .014 | 11.375 (1.226-105.577) | .032 |
| **Poor Supervision** | | | | | | | | | 7.971 | .005 | 21.857 (2.124-224.892) | .010 |
| **Low Family Income** | | | | | | | | | 4.859 | .027 | 8.211 (1.285-52.469) | .026 |
| **High Dishonesty** | | | | | | | | | 5.897 | .015 | 13.737 (1.354-139.357) | .027 |

*N = 128.*

**Table 3. Logistic Regression Analysis Predicting GP Reported G2 LCP Health**

| Risk Factor | Physical Illness | | | | Alcohol Use | | | | Disabling Medical Condition | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* |
| **Low Attainment** | | | | | 4.199 | .040 | 6.000 (1.003-35.908) | .050 | 4.199 | .040 | 6.000 (1.003-35.098) | .050 |
| **G1 Uninvolved Father** | 6.904 | .009 | .024 (.048-.665) | .024 | | | | | | | | |

*N = 27.*

**Table 4. Logistic Regression Analysis Predicting GP Reported G2 LO Health**

| Risk Factor | Alcohol Use | | | | Violent Involvement in Incidents | | | |
|---|---|---|---|---|---|---|---|---|
| | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* |
| **High Daring** | | | | | 5.585 | .018 | 17.000 (1.295-223.136) | .031 |
| **Disrupted Family** | | | | | 7.062 | .008 | 27.000 (1.826-399.235) | .016 |
| **High Dishonesty** | 6.239 | .012 | 22.500 (1.510-335.338) | .024 | 6.239 | .012 | 22.500 (1.510-335.338) | .024 |

*N = 24.*

**Table 5. Logistic Regression Analysis Predicting GP Reported G2 AL Health**

| Risk Factor | Physical Illness | | | | Ever Hospitalised | | | | Surgical Admission | | | | Alcohol Usage | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* |
| **Low Nonverbal IQ** | 5.254 | .022 | 4.286 (1.150-15.974) | .030 | | | | | | | | | 7.034 | .008 | 8.167 (1.476-45.189) | .016 |
| **G1 Female Convicted Before Age 32** | | | | | 5.728 | .017 | .085 (.011-.642) | .017 | 5.728 | .017 | .085 (.011-.642) | .017 | | | | |
| **Large Family Size** | | | | | 4.890 | .027 | .169 (.034-.845) | .030 | 4.890 | .027 | .169 (.034-.845) | .030 | | | | |
| **Poor Supervision** | | | | | | | | | | | | | 3.778 | .050 | 4.531 (.981-20.929) | .050 |
| **High Dishonesty** | 5.095 | .024 | 5.714 (1.066-30.633) | .042 | | | | | | | | | | | | |

*N = 49.*

**Table 5 (cont.) Logistic Regression Analysis Predicting GP Reported G2 AL Health**

| Risk Factor | Violent Involvement in Incidents | | | | Disabling Medical Condition | | | |
|---|---|---|---|---|---|---|---|---|
| | LRCS Change | *p* | OR | *p* | LRCS Change | *p* | OR | *p* |
| **G1 Young Father** | | | | | 4.488 | .034 | 6.286 (1.143-34.570) | .035 |
| **Poor Supervision** | 9.473 | .002 | 13.286 (2.200-80.233) | .005 | | | | |
| **High Dishonesty** | | | | | 3.784 | .050 | 4.643 (.978-22.035) | .050 |

*N = 49.*