

Parental Imprisonment: A systematic review of its effects on child antisocial behavior, crime and mental health

Systematic Review Protocol (Version 3)

June 2008

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Sources of Support

Nordic Campbell Center, Norway

Economic and Social Research Council, UK

British Academy, UK

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1. Background for the review

With rates of imprisonment growing rapidly in many Western industrialized countries (Walmsley, 2005), the effects of parental imprisonment on children is an issue of increasing social concern. In many countries, it is not known how exactly how many children have parents in prison. However, national inmate surveys in the United States show that 1.5 million children had a parent in State or Federal prison in 1999 (2.1 percent of the nation's children under eighteen), over half a million more than in 1991 (Mumola, 2000).

Four key criminological theories suggest that parental imprisonment might cause an increase in child antisocial and criminal behavior (Hagan & Dinovitzer, 1999; Murray & Farrington, in press). First, social bonding theory suggests that parental imprisonment might harm children because parent-child separation disrupts children's attachment relations. Second, strain theory suggests that the loss of family income and other negative life events after parental imprisonment might cause offending behavior. Third, social control theory suggests that parental imprisonment might cause delinquency via reduced quality of care and supervision. And fourth, labeling theory suggests that social stigma and official bias following parental imprisonment may cause an increased probability of being charged and convicted for criminal behavior. These processes of attachment disruption, strain, poor quality child care, and stigma are also associated with adverse mental health outcomes for children (Garber, 2000; Harrington, 2002; Hinshaw & Cicchetti, 2000; Klein & Pine, 2002). Hence parental imprisonment might cause antisocial and criminal behavior and mental health problems for children.

Two alternative theories suggest that parental imprisonment does not cause negative outcomes for children. First, even if children of prisoners have worse outcomes than their peers, this may be because of parental criminality and disadvantage prior to imprisonment, not because parental imprisonment itself is causal. Second, imprisonment of an abusive or antisocial parent might actually decrease children's likelihood of developing behavior problems because it removes a disruptive and antisocial influence from their lives. Existing evidence needs to be synthesized to evaluate these competing hypotheses.

Parental imprisonment is not an intervention as typically studied in Campbell systematic reviews. It is not a deliberately implemented program aimed at reducing or preventing child delinquency. Instead it is a policy for convicted adults that may have unintended consequences for their children. Moreover, it has not been evaluated in randomized experiments, as have other criminal justice interventions. Instead, studies have been observational, using matched control groups and statistical balancing techniques to investigate possible effects on children. We think that, like other risk factors in criminology, parental imprisonment should be studied by investigating what is known about prediction and causation, and then investigating moderators of its effects. Thus, three key questions for research are:

1. Does parental imprisonment predict negative outcomes for children (is it a risk factor)?
2. Might parental imprisonment cause adverse outcomes for children (might it be a causal risk factor)?
3. What moderates the relationship between parental imprisonment and child outcomes?

The implications for policy are as follows. If parental imprisonment is a predictor of negative life outcomes, children of prisoners may be recognized as a vulnerable population in need of support. If parental imprisonment is a cause of negative child outcomes, a range of sentencing changes and prison and social policies may be implemented to prevent its harmful effects (Murray & Farrington, 2006). By identifying moderators of prison effects, children most at risk of harm by parental imprisonment can be identified for more intensive support. By investigating moderators, resilience processes for children might also be identified. This could suggest specific kinds of support to increase children's resilience after parental imprisonment.

Four existing reviews summarize research on the effects of parental imprisonment on children. Johnston (1995) reviewed 17 studies of children of prisoners and offenders. She reported that the rate of "behavioral problems" among children of prisoners and offenders ranged from 19% to 69% in these studies. However, the association between parental imprisonment and child outcomes was not reviewed, and study quality was not assessed in the review. Also, Johnston did not distinguish between studies of parental imprisonment and studies of parental criminality. Parental antisocial behavior is an important risk factor for children's own delinquency (Lipsey & Derzon, 1998). A key issue is whether parental imprisonment has additional effects on children.

Hagan and Dinovitzer (1999) discussed theories that might link parental imprisonment and adverse child outcomes, and reviewed some of the empirical studies on this topic. They concluded that little is known about the effects of parental imprisonment on children, but speculated that the consequences may be severe, especially when mothers are imprisoned.

Murray (2005) reviewed the effects of parental imprisonment on children reported in 43 empirical studies of diverse methodological quality. He found a range of problem behavior reported in the literature including: depression, anxiety, withdrawal, regression, clinging behavior, sleep problems, eating problems, hyperactivity, aggressive behavior, running away, truancy, poor school grades and delinquency. However, few studies used appropriate comparison groups, well-validated measures, or longitudinal follow-up to draw firm conclusions about the risks associated with parental imprisonment or its possible causal effects.

Murray and Farrington (in press) conducted the most thorough review to date of the effects of parental imprisonment on children. They only included studies with comparison groups and sufficient information to calculate an effect size. They found eleven studies that met their inclusion criteria. They separated findings according to whether studies used (1) control groups selected to be representative of the general population, (2) matched control groups, or (3) samples in which children of prisoners and controls were both recruited from courts or clinics. Based on five studies using general population samples, they found that parental imprisonment was associated with about three times the odds of child antisocial-delinquent behavior and about twice the odds of mental health problems (compared to no parental imprisonment).

The findings were mixed on whether parental imprisonment predicted adverse outcomes independently of background risks, and hence whether it might have a causal effect on children. Five studies used reasonably representative samples of prisoners' children and controls to estimate the effects of parental imprisonment on children independently of

background risks. Three studies found an effect of parental imprisonment on child antisocial behavior independently of background risks (Stanton, 1980; Murray and Farrington, 2005; Huebner and Gustafson, 2007), but two did not find an independent effect (Bor, McGee, and Fagan, 2004; Murray, Janson, and Farrington, 2007). Only one study examined the effects of parental imprisonment on child mental health using suitable controls (Murray and Farrington 2008). In this study, the association between parental imprisonment and poor mental health outcomes remained after controlling for parental criminality and child, family and socioeconomic risks. Murray and Farrington (in press) speculated that parental imprisonment might cause child antisocial behavior and mental health problems, but argued that firm causal conclusions could not be drawn from existing evidence.

Murray and Farrington (in press) also reviewed possible moderators of the effects of parental imprisonment on children, but they found very few studies that analyzed how the effects of parental imprisonment differed according to child, family or social factors. Theory and existing evidence suggested that parental imprisonment might have more harmful effects for girls, children of ethnic minority, younger children, children experiencing maternal imprisonment (as opposed to paternal imprisonment), and children whose parents are imprisoned for longer periods or in more punitive social contexts.

We are very clear that tight causal conclusions cannot be drawn from observational studies that are typical of this area of research. However, a distinction can be drawn between observational studies that simply assess the zero-order association between parental imprisonment and child outcomes, and studies that control for important confounding factors. Studies that control for important confounding factors provide some evidence for considering

possible causal effects. While conclusions about causal effects must be very tentative based on such observational evidence, it is important to extract and summarize the best evidence available.

In summary, according to existing reviews, most existing studies of parental imprisonment are mainly small-scale and of poor methodological quality, with low internal validity, and often lacking a comparison group. An important issue is whether it is worth conducting a systematic review when it appears there are few high quality studies. We think it is worthwhile for the following reasons. First, a systematic review may uncover high quality studies that were not found using less thorough searching methods. Second, more high quality studies may take a long time to appear, and policy-makers need interim evidence on which to consider their decisions. Third, if a systematic review demonstrates that high quality studies are lacking, this could encourage a new generation of primary research. Hence, even though it seems there are few high quality studies of parental imprisonment, it is still worth conducting the proposed review.

2. Objectives of the review

The two main aims for the review are to assess evidence on whether parental imprisonment is a risk factor for negative child outcomes, and to assess evidence on the causal effects of parental imprisonment on children. A third aim of the review is to investigate how associations between parental imprisonment and child outcomes differ according to study features and participant characteristics (moderators).

Whether or not parental imprisonment is a risk factor for child outcomes will be investigated by aggregating zero-order associations from studies comparing children of prisoners and children from the general population. The possible causal effects of parental imprisonment will be investigated by aggregating findings from studies using matched control group designs, or statistical controls for critical covariates.

The main moderators we hope to investigate are: maternal versus paternal imprisonment, length of parental imprisonment, child sex, child age at parental imprisonment, short versus long term outcomes, the type of delinquent outcome (juvenile antisocial behavior, adult antisocial behavior, juvenile crime, adult crime), the type of mental health outcome (anxiety, depression, or general internalizing problems), and country of study. We will also analyze methodological factors as possible moderators (such as type of study design, study methodological quality and publication type).

Based on the studies we have collected so far, further moderator analyses will not be possible. However, if enough studies are retrieved with results on other variables that might increase child resilience after parental imprisonment, we will include them in our analyses. For example, moderators such as social support, quality of parenting, family income, and frequency of child-parent contact during imprisonment could be investigated.

The proposed systematic review will extend the narrative review of Murray and Farrington (in press) on these topics in three main ways. First, the systematic review will use a more thorough search strategy to locate all relevant studies. Second, studies will be more

systematically evaluated regarding their methodological quality. Third, meta-analysis will be used to synthesize the findings across the studies and to investigate moderators.

In the proposed review, parental imprisonment is defined as any kind of custodial confinement of a parent, apart from being held in police cells. For example, imprisonment can refer to confinement in jails or prisons (state or federal) in the United States, and open or closed prisons (local or training) in the United Kingdom.

The three child outcomes that will be investigated are antisocial behavior, criminal behavior and mental health problems. In this review, antisocial behavior is a broad term referring to behavior that violates social norms and the rights of others but does not necessarily break the law. Criminal behavior refers to behavior that violates the penal code and could result in criminal conviction. Mental health problems refer to depression, anxiety, and general internalizing problems.

3. Methodology

3.1 Criteria for inclusion of studies in the review

Studies meeting all the following six criteria will be included in the review. (Note that additional criteria will be used to select studies for sub-analyses of particular review questions; see section 3.6.)

1. The study must include children of prisoners (“experimental group”) and at least one group of children without imprisoned parents (a “control group”).

2. In the experimental group, parental imprisonment must occur between the child's birth and eighteenth birthday.
3. The study must include a measure of children's antisocial behavior, crime or mental health.
4. Parental imprisonment must have occurred before the child outcome. Studies will be excluded if the time-ordering of parental imprisonment and the child outcome is ambiguous, for example if the child outcome measure refers to the period before parental imprisonment.
5. The study must use the same measure of child outcome for the experimental group and the control group.
6. Numerical information: Effect sizes must be reported, or there must be enough numerical information to calculate effect sizes. Studies that do not meet this eligibility criterion but report the direction of findings (whether or not parental imprisonment was deemed to be associated with worse child outcomes) will be described in a separate table.

Publication. Both published and unpublished studies will be included.

Country of origin. Studies may be conducted in any country and may be reported in English, German, Dutch, French, Spanish, Swedish, Danish, or Norwegian. We are not aware of studies reported in other languages, and anticipate that colleagues will help interpret results reported in these languages for the review.

Timeframe. Studies may be published between 1960 and 2008. Existing reviews suggest that most studies of children of prisoners were conducted since 1980. A few studies were conducted in the 1970's (e.g., Moerk, 1973, and Sack, Seidler & Thomas, 1976) and we are aware of only one study that was conducted in the 1960's (Friedman & Esselstyn, 1965). However, these early studies were nearly all exploratory in nature, and would not meet eligibility requirements for this review. Therefore, we will set 1960 as the lower limit for our searches.

3.2 Search strategies

Initial Library. An initial set of 150 full reports about children of prisoners were retrieved for the Murray and Farrington (in press) review. These will be used as an initial library for the proposed systematic review.

Electronic databases will be searched for the years 1960 to 2008. We will search the following electronic databases using the following keywords:

Prison*/ Jail*/ Penitentiary/ Imprison*/ Incarcerat*/ Detention

AND

Child*/ Son*/ Daughter*/ Parent*/ Mother*/ Father*

AND

Antisocial*/ Delinquen*/ Crim*/ Offend*/ Violen*/ Aggressi*/

Mental health/ Mental Illness/ Internaliz*/ Depress*/ Anxiety/ Anxious

List of databases

Australian Criminology Database (CINCH)

Australian Institute of Criminology Library (J V Barry Library)

Bibliography of Nordic Criminology

Cochrane Controlled Trials Register

C2-SPECTR

Criminal Justice Abstracts

Dissertation Abstracts

Education-line

Embase

ERIC

Google (with extra search terms: research/ evaluation/ study/ pdf)

Google Scholar

Ingenta

JSTOR

MEDLINE

Newton (University of Cambridge Library book search)

National Criminal Justice Reference Service (NCJRS)

National Institute of Corrections Information Center (NICIC)

Prison Health Research Network

PsychInfo/Psychlit

Sage Family Studies Abstracts

Sociological Abstracts

Social Sciences Citation Index (SSCI) - Web of Science

System for Information on Grey Literature in Europe (SIGLE)

We will search reference lists of review articles and primary studies.

To identify other studies, we will contact international colleagues in England, the United States, Canada, Australia, New Zealand, Germany, France, Norway, Sweden, Denmark, and the Netherlands.

Large-scale longitudinal studies might include results relevant to this review but not refer to parental imprisonment in report titles or abstracts. We will contact directors of leading longitudinal studies in child development to inquire whether they have existing results on parental imprisonment that we have not found.

3.3 *Description of methods used in the primary research*

Most studies compare children of prisoners and a control group either during parental imprisonment or shortly after it (e.g., Stanton, 1980; Trice & Brewster, 2004). Only a few studies have examined outcomes in adulthood (e.g., Huebner & Gustafson, 2007; Kandel et al., 1988; Murray & Farrington, 2005; Murray, Janson, & Farrington, 2007). Although a few

randomized experiments have been conducted on the effects of imprisonment on prisoners (Killias & Villetaz, 2008), according to existing reviews, no study has used randomized assignment to investigate effects of parental imprisonment on children.

Some studies compare children of prisoners with children of the same age selected from the general population (e.g., Bor, McGee, & Fagan, 2004; Huebner & Gustafson, 2007). These studies provide estimates of the zero-order risk associated with parental imprisonment for children. Other studies use matched control groups to try to test the causal effects of parental imprisonment on children. For example, Stanton (1980) compared children of imprisoned mothers and children of mothers on probation to control for background maternal criminality and social disadvantage (although the two groups were not equivalent on these dimensions). In several studies, statistical control techniques were used to try to disentangle the effects of parental imprisonment from background disadvantage (e.g., Bor et al., 2004; Huebner & Gustafson, 2007; Murray & Farrington, 2005; Murray et al., 2007).

In the absence of randomized experiments, ideally studies should compare children of prisoners and controls on change in outcomes from before to after parental imprisonment, while balancing the two groups on critical covariates. We are aware of only two ongoing studies of this type, and hope to find more in our searches. Assuming that the studies we locate in our searches have similar designs to those described above, only very speculative conclusions about causal effects can be drawn from existing research.

3.4 *Criteria for determination of independent findings*

Some studies report multiple findings based on a single sample. For example, a study might report on more than one child outcome (e.g., both crime and mental health) or might use multiple measures for a single outcome (e.g., official convictions and self-reported criminal behavior). All findings will be coded and entered into the data file. Findings from the same study may sometimes be included in more than one meta-analysis. For example, from one study, findings on antisocial behavior, crime and mental health may be included in separate meta-analyses on these topics. However, because effect sizes should be independent within a meta-analysis, only one measure will be included from each sample in each meta-analysis. Within each meta-analysis, one measure will be selected from each study, using the following criteria:

- a. Measures should be tested for reliability and validity and have good psychometric properties (as defined on the Cambridge Quality Checklist; see Appendix B, and Murray, Farrington, and Eisner, forthcoming).
- b. Short and long term outcomes will be analyzed separately. For meta-analyses of short-term outcomes (assessed up to 2 years after initial imprisonment), the first measure of child adjustment will be selected. For long-term outcomes (assessed at least 2 years after imprisonment), the last measure will be selected (so long as attrition since the previous measure is not over 10%).

- c. Any remaining multiple effect sizes (e.g., multiple measures taken at the same point in time) will be averaged and the average will serve as the effect size for the meta-analysis.

3.5 *Details of study coding categories*

We will code the following topics at least:

Author(s)

Date of research

Date of publication(s)

Country and location of research

Age of children (Experimental, Control)

Gender composition (E, C)

Ethnic composition (E, C)

Initial sample size (E, C)

Final sample size (E, C)

Response rate/ Attrition rate

Maternal/ Paternal imprisonment

Length of parental imprisonment

Control condition (e.g., children with parents on probation)

Follow-up time period

Measures of each outcome (caregiver ratings, self-report questionnaires, teacher ratings, school records, criminal records, psychiatric records)

Methodological quality

Effect size data

A draft coding schedule is shown in Appendix D. At least 10 studies will be coded by two persons in order to measure reliability and to agree coding criteria.

3.6 Statistical procedures and conventions

We will pool study results in meta-analyses. Nearly all the studies we have collected so far reported outcomes as proportions or percentages (see Appendix A). The measure of effect size to be used in analyses is the log odds ratio (LOR), calculated by comparing the percentage of cases among children of prisoners and controls, and taking the natural logarithm of the odds ratio. However, final results will be converted back to odds ratios for ease of interpretation.

Where scores and standard deviations are reported, the standardized mean difference (d) will be calculated and then converted into LOR using the equation: $LOR = d / .5513$ (see Lipsey & Wilson, 2001, p. 202). Where correlations (r) are reported, d will be estimated (see Lipsey & Wilson, 2001, p. 199), and then d will be converted into LOR. If marginal cell proportions are reported as well as r, the LOR will be calculated directly from r (see Lipsey & Wilson, p. 197). Where LOR can be computed from other statistics, this will be done using the conversion formulae in Lipsey and Wilson (2001, Appendix B).

Analyses will proceed in three stages, as described below. Each set of analyses will be repeated for the three child outcomes: antisocial behavior, crime and mental health.

1) The first set of analyses will investigate if parental imprisonment is a risk factor for child outcomes. To do this, we will pool all zero-order effect sizes comparing children of prisoners and children from the general population. Weighted mean effect size measures and their confidence intervals will be calculated using the procedures described in Lipsey and Wilson (2001). The key hypothesis to be tested is whether the weighted mean LOR is significantly different to zero. We will investigate heterogeneity in effect sizes using the Q statistic. We will fit a random effects model if the Q statistic reveals heterogeneity, or if the number of effect sizes (or typical number of study participants) is small. Otherwise we will fit a fixed effects model.

2) The second set of analyses will investigate whether parental imprisonment might be a causal risk factor for child outcomes. We will do this by separately pooling effect sizes that are adjusted for critical covariates of the outcome (critical covariates are listed in Appendix C).

Three types of study will be included in these analyses:

- i. Studies that compare children of prisoners and a control group matched on critical covariates
- ii. Studies that compare children of prisoners and a control group matched on propensity scores (where propensity scores are calculated based on critical covariates)

- iii. Studies that use regression analyses or analyses of covariance to control for critical covariates

From these studies, weighted mean effect size measures (adjusted for covariates) will be calculated using the procedures described in Lipsey and Wilson (2001). Covariate-adjusted means and unstandardized B's from OLS regression will be converted to d using the unadjusted pooled standard deviation (see Lipsey & Wilson, p. 180), and then d will be converted to LOR. The key hypothesis to be tested is whether the weighted mean LOR (adjusted for critical covariates) is significantly different to zero. We are aware that aggregating effect sizes based on studies that controlled for different covariates is problematic, and we aim to treat the covariates as a moderator variable (in separate analyses), providing that we identify enough studies.

We will also investigate possible causal effects of parental imprisonment by separately analyzing studies that control for pretest scores of child outcomes (gain scores). The standardized mean difference in change from before to after parental imprisonment (d) will be calculated using the pooled standard deviation at posttest, and then d will be converted into a LOR. It will be tested whether the mean LOR (adjusted for pretest child outcome measures) is significantly different to zero.

As in the first set of analyses, if the number of effect sizes is small, or effect sizes are based on very few study participants, or the Q statistic is significant, we will fit a random effects model. Otherwise we will fit a fixed effects model.

If there are many covariate-adjusted study findings that cannot be converted to the common metric of LOR, we will list the direction of findings reported in these studies (whether parental imprisonment predicted adverse child outcomes after controlling for critical covariates or pretest scores).

3) In a third set of analyses, we will investigate possible moderators of the relationship between parental imprisonment and child outcomes. Analyses of moderators will be repeated for both zero-order effect sizes and covariate-adjusted effect sizes. We will investigate associations between effect sizes and study design features (e.g., the precise technique used to control for covariates), publication type (whether or not the study was published), methodological quality (as coded on the Cambridge Quality Checklist; see Appendix B), and other characteristics of studies (e.g., the age and sex of participants, whether the father or mother was imprisoned, operational definitions, measurement of key concepts, and the covariates that were controlled). Then we will carry out meta-regression analyses (Lipsey & Wilson, 2001) to investigate independent influences on effect sizes. Effect sizes will be coded separately for distinct sub-groups within studies (e.g., for boys and girls) to conduct these analyses.

All eligible studies will be coded on paper, and then entered into SPSS. SPSS macros developed by David Wilson (Lipsey & Wilson, 2001) will be used to perform the meta-analyses.

3.7 *Treatment of qualitative research*

The review will be focused on quantitative studies but will include qualitative information (e.g., on prison or social context) when this is helpful in discussing explanations for findings or conflicting results.

4. Time frame

A substantial amount of work has already been done in searching and retrieving studies of parental imprisonment. Over 150 full-text articles have already been retrieved. We still need to conduct a more comprehensive search for studies, code the studies, run new analyses, and write a report conforming to Campbell Collaborative guidelines. We aim to submit the first draft of the report to the Campbell Collaboration within six months of the protocol being approved.

5. Plans for updating the review

We plan to update the review every three years. The lead reviewer will take responsibility for arranging this.

6. Acknowledgements

We anticipate help conducting the searches from Ivana Sekol, PhD researcher, Cambridge University, and Anne-Marie Klint Jørgensen, NC2 Librarian. Liz Ayre, Eurochips, will help with translating results from studies reported in French. Jukka Savolainen, Visiting Associate Professor, University of Minnesota, and Senior Research Analyst, National Research Institute of Legal Policy, Finland, may also join the review research team.

7. Statement concerning conflict of interest

The only possible (minor) conflict of interest is that we have conducted two studies of the effects of parental imprisonment on children, and we have argued in a recent review that parental imprisonment is associated with adverse outcomes for children (Murray & Farrington, in press). The two studies that we conducted had different findings regarding the causal effects of parental imprisonment on children: one suggested parental imprisonment might have causal effects (Murray & Farrington, 2005, 2008); the other suggested parental imprisonment had no causal effects (Murray et al., 2007). Hence we are not tied by these results to either conclusion. Also, neither of us stands to benefit in any way from any source that has any interest in the conclusions of the review. We are not aware of any personal, political, academic, or financial conflicts that might influence our judgment.

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Appendix A: Key studies of parental imprisonment

Studies of parental imprisonment and child antisocial-criminal behavior (continued on next page)

Study	Study design	Imprisoned parents	Children (age at outcome)	Controls matched?	Outcome measure	Effect Size: OR (95% CI)
Huebner & Gustafson (2007) United States	General population Prospective	Mothers (any imprisonment 1979 to 2000)	E = 31 C = 1,666 (aged 18 to 24)	Mother's age	Convicted between 1994 and 2000 (self-report)	3.1* (1.4, 7.1) ^a
Murray et al. (2007) Stockholm, Sweden	General population Prospective	Primarily fathers (any imprisonment, child 0 to 19)	E = 283 C = 14,589 (aged 30)	Child age, city of residence	Offended 19-30 (official records)	2.4* (1.9, 3.2)
Murray & Farrington (2005) London, England	General population Prospective	Fathers and mothers (any imprisonment, child 0 to 10)	E = 23 C = 227 (14 to 50)	Child age, sex (male), area of residence (note: this comparison group not separated from parents up to age 10)	Average of 11 Antisocial-delinquent outcomes	5.7* (4.3, 7.6)
Bor et al. (2004) Australia	General population Prospective	Mothers' current partners (any imprisonment, up to child age five)	E = 265 C = 4,591 (aged 14)	Child age	Delinquency (mother rating)	1.3* ^d
Kandel et al. (1988) Denmark	General population Retrospective	Fathers (imprisoned at any time)	E = 92 C = 513 (aged 35)	Child age (note: fathers of controls had no criminal record)	Jailed + one additional offence (official records)	8.5* (5.0, 14.6) ^a
Moerk (1973) Probably United States	Matched-control Retrospective	Fathers (imprisoned for at least one month after birth of child)	E = 24 C = 24 (aged 11 to 20)	Father absence (divorce), SES, ethnicity, age at separation, age at study	"Behavior problems" (mother rating)	0.8 (0.3, 2.7) ^b
Stanton (1980) California, U.S.	Matched-control Cross-sectional	Mothers (in County jails)	E = 22 C = 18 (aged 4 to 18)	Maternal criminality (probation)	Poor behavior in school (teacher rating)	3.5 (0.9, 14.1) ^a
	Matched-control Prospective	Mothers (in County jails)	E = 24 C = 17 (aged 4 to 18)	Maternal criminality (probation)	Trouble with police/school /neighbors (mother rating)	2.3 (0.6, 9.3) ^a

Studies of parental imprisonment and child antisocial-criminal behavior (continued)

Study	Study design	Imprisoned parents	Children (age at outcome)	Controls matched?	Outcome measure	Effect Size: OR (95% CI)
Trice & Brewster (2004) Virginia, U.S.	Matched-control Cross-sectional	Mothers (in State prisons)	E = 47 C = 41 (aged 13 to 20)	Controls = best friends of prisoners' children	Arrested (guardian report)	3.0* (1.1, 8.7) ^b
Dannerbeck (2005) Missouri, U.S.	Court-based Retrospective	Mothers and fathers (ever imprisoned)	E = 346 C = 766 (age not known)	Both groups were "adjudicated youths"	Prior referral to court (self-report & official records)	2.2* (1.6, 3.0) ^a
Gabel & Shindledecker (1993) New York, U.S.	Clinic-based Retrospective	Mothers and fathers (ever imprisoned)	E = 11 C = 20 (aged 6 to 12)	Both groups attended day hospital	Externalizing problems (teacher rating)	2.3 (0.6, 8.9) ^c
Bryant & Rivard (1995) South Carolina, U.S.	Clinic-based Retrospective	Mothers and fathers (no details)	E = 66 C = 114 (aged 5 to 17)	Both groups were clients of social services and clinics for emotional disturbance	Offended (official records)	1.9* (1.0, 3.5) ^b
Phillips et al. (2002) Arkansas & Texas, U.S.	Clinic-based Retrospective	Mothers and fathers (ever in any jail/ prison)	E = 98 C = 149 (aged 11 to 18)	Both groups attended mental health clinics	Conduct disorder (clinical diagnosis)	1.9* (1.1, 3.2) ^b

Notes. E = children of prisoners; C = controls. OR = Odds ratio; 95% CI = 95% confidence interval around odds ratio; * Significant at $\alpha = .05$ level. ^a Our calculation of odds ratio from contingency table; ^b Our calculations of numbers in E and C groups, and odds ratios; ^c Our calculation of odds ratio from means and standard deviations. ^d Our calculation of odds ratio from r .

Studies of parental imprisonment and child mental health

Study	Study design	Imprisoned parents	Children (age at outcome)	Controls matched?	Outcome measure	Effect Size: OR (95% CI)
Murray & Farrington (2008) London, England	General population Prospective	Fathers and mothers (any imprisonment, child 0 to 10)	E = 23 C = 227 (14 to 48)	Child age, sex (male), area of residence (note: this comparison group not separated from parents up to age 10)	Average of 4 internalizing outcomes	2.5* (1.6, 4.0)

Friedman & Esselstyn (1965) Santa Clara, U.S.	General population Cross-sectional	Fathers (in Elmwood Rehabilitation Center, at least 6 months)	E = 90 C = 154 (kindergarten to 7 th grade)	School registers	"Self-concept" (teacher rating)	2.5* (1.4, 4.3) ^b
Moerk (1973) Probably U.S.	Matched-control Retrospective	Fathers (imprisoned for at least 1 month after birth of child)	E = 24 C = 24 (aged 11 to 20)	Father absence (divorce), SES, ethnicity, time of separation, time of study	Neurosis (self-report)	Mean E = 84.8 Mean C = 80.4
Stanton (1980) California, U.S.	Matched-control Cross-sectional	Mothers (in county jails)	E = 22 C = 18 (aged 4 to 18)	Maternal criminality (probation)	Low self-esteem (teacher/counselor ratings)	5.1* (1.2, 20.5) ^a
Gabel & Shindlecker (1993) New York, U.S.	Clinic-based Retrospective	Mothers and fathers (ever imprisoned)	E = 11 C = 20 (aged 6 to 12)	Both groups attended day hospital	Internalizing problems (teacher rating)	0.6 (0.1, 2.2) ^c
Phillips, et al. (2002) Arkansas & Texas, U.S.	Clinic-based Retrospective	Mothers and fathers (ever in any jail/prison)	E = 99 C = 137 (aged 11 to 18)	Both groups attended mental health services	Major depressive disorder (clinical diagnosis)	0.3* (0.1, 0.7) ^b
			E = 104 C = 148 (aged 11 to 18)		Separation anxiety disorder (clinical diagnosis)	1.2 (0.7, 2.0) ^b
			E = 94 C = 135 (aged 11 to 18)		Generalized anxiety disorder (clinical diagnosis)	0.6 (0.2, 1.7) ^b

Notes. E = children of prisoners; C = controls. OR = Odds ratio; 95% CI = 95% confidence interval around odds ratio; * Significant at $\alpha = .05$ level. ^a Our calculation of odds ratio from contingency table; ^b Our calculations of numbers in E and C groups, and odds ratios. ^c Our calculation of odds ratio from means and standard deviations

Appendix B: Cambridge Quality Checklist

(Note that final adjustments to the checklist may be made before coding the studies.)

This checklist should be used in conjunction with the scoring instructions described in Murray, et al. (forthcoming). Studies receive three quality scores on the checklist for drawing conclusions about correlates, risk factors, and causal risk factors. Higher scores reflect increasing confidence in study results. To draw confident conclusions about correlates, the correlate score (out of 4) should be high.

Correlate Sum Score (out of 4): ____	
Representative sampling method	
1	Total population sampling <i>OR</i> Random sampling
0	Convenience sampling <i>OR</i> Case-control sampling
Adequate response rates	
1	Response and retention rates $\geq 70\%$ <i>AND</i> Differential attrition $\leq 10\%$
0	Response rate $< 70\%$ <i>OR</i> Retention rate $< 70\%$ <i>OR</i> Differential attrition $> 10\%$
Good measure of correlate	
1	Reliability coefficient $\geq .75$ <i>AND</i> Reasonable face validity <i>OR</i> Criterion or convergent validity coefficient $\geq .3$ <i>OR</i> More than one instrument or information source used to assess correlate
0	None of the above
Good measure of outcome	
1	Reliability coefficient $\geq .75$ <i>AND</i> Reasonable face validity <i>OR</i> Criterion or convergent validity coefficient $\geq .3$ <i>OR</i> More than one instrument or information source used to assess outcome
0	None of the above

To draw confident conclusions about risk factors, studies need to have high correlate scores and high risk factor scores.

Risk Factor Score (out of 3) ____
1 Cross-sectional study
2 Retrospective study
3 Prospective study

To draw confident conclusions about causal risk factors studies need to have high correlate, risk factor, and causal risk factor scores. (See notes on causal risk factor scores on next page.)

Causal Risk Factor Score (out of 5) ____
1 Uncontrolled study No analysis of change in outcome
2 Uncontrolled study With analysis of change in outcome
3 Controlled non-experimental study No analysis of change in outcome
4 Controlled non-experimental study With analysis of change in outcome
5 Randomized experiment With risk factor as mediator

To score causal risk factor studies, reviewers need to code whether or not studies are “controlled”, and whether or not studies “analyze change in the outcome” from before to after risk exposure. We briefly explain this here (see Murray et al., forthcoming, for details). By “controlled” studies we mean studies that use matching or statistical balancing techniques to adjust for critical third-variables that might act as confounds between the risk factor and the outcome. Because confounds are topic specific, they need to be listed for the specific risk factor and outcome being studied (see our list of critical confounds for parental imprisonment and child outcomes in Appendix C). By “analyze change in outcome” we mean that studies should include a pretest measure of the child outcome, and investigate whether there is change in outcome from before to after risk exposure (using change scores or regression analyses, for example).

Appendix C: List of critical covariates

Critical covariates should be controlled when analyzing the causal effects of parental imprisonment on children. We propose to categorize studies as “controlled” if they estimate the effects of imprisonment controlling for at least three risk factors in the list below. The list specifies correlates of parental imprisonment found in previous research (for a review, see Murray and Farrington, in press) and well-known predictors of child problem behaviors.

Child risk factors:

- a) Impulsivity
- b) Attention deficits
- c) Low IQ
- d) Poor school attainment

Parent risk factors:

- e) Parental criminality/ antisocial behavior
- f) Poor parental mental health
- g) Parental substance abuse
- h) Low parental education
- i) Low parental supervision
- j) Harsh parental discipline
- k) Abuse/neglect of child
- l) Parental conflict

Family risk factors:

- m) Teenage parent
- n) Large-family size
- o) Low socio-economic status
- p) Low family income

Wider environmental risk factors:

- q) Deprived neighborhood
- r) High crime neighborhood
- s) High crime school
- t) Delinquent peers

Appendix D: Draft coding protocol

Initials of coder _____

Date of coding _____

1) Study

Study no. identifier

Author(s) name

Author(s) affiliation

Date of research

Date of publication

Place of research

Country of research

Title of report

Publication type: Journal article___ Technical report___ Unpublished ms___
Book___ Dissertation___

Source of funding_____

2) Eligibility criteria

Are the following *inclusion criteria* present? (If not clear, attempt to find out from author.)

Yes No

- | | | |
|-------|-------|---|
| _____ | _____ | The report describes a study with a group of children of prisoners (E) and a group of children without imprisoned parents (C), OR the study includes pretests and posttests of child outcome for E. |
| _____ | _____ | For E, parental imprisonment occurred between the child's birth and age 18. |
| _____ | _____ | A measure of antisocial behavior, crime or mental health was used. |
| _____ | _____ | The child outcome measure clearly refers to a time period after parental imprisonment. |
| _____ | _____ | The same measure of child outcome was used for both E & C. |
| _____ | _____ | Enough numeric information is reported to calculate an effect size. |
| _____ | _____ | The research was published since 1960. |

FOR EACH EFFECT SIZE CODE SECTIONS 3-9 SEPARATELY

Effect size no. identifier _____

3) Sample

Sampling technique used: Total population sampling___ Random sampling___
 Convenience sampling___ Case-control sampling___ Other (___) Unknown___

Age of children (mean, range):

Experimental _____
 Control _____

Gender composition: Experimental % female _____ % male _____
 Control % female _____ % male _____

Ethnic composition: Experimental _____
 Control _____

Eligible sample size: Experimental _____
 Control _____

Initial sample size: Experimental _____
 Control _____

% Initial Response Experimental _____
 Control _____

Final sample size: Experimental _____
 Control _____

% Attrition Experimental _____
 Control _____

4) Children of prisoners (E)

Which parents were imprisoned?

- a) Biological mothers
- b) Biological fathers
- c) Biological mothers/fathers
- d) Biological/ step mothers
- e) Biological/ step fathers
- f) Any parent
- g) Not known

What was the length of parental imprisonment (mean, SD, range)? _____

- a) < 6 months
- b) 6 months – 2 years
- c) > 2 year
- d) Not known

What measures of parental imprisonment were used?

- a) Parents sampled at a prison
- b) Official records
- c) Self-report
- d) Child-report
- e) Other-report (e.g., mother reporting about father's imprisonment)
- f) Other (_____)
- g) Not known

Approximately how old were the children when parental imprisonment occurred:

- a) Preschool (0-4)
- b) Primary school (5-9)
- c) Secondary school (10-17)
- d) Preschool-primary school mix (0-9)
- e) Primary-secondary school mix (10-17)
- f) Any age (0-17)
- g) Parent "ever imprisoned" (up to 18 & including parental imprisonment before birth)
- h) Not known

5) Control group (C)

What population was the control group drawn from?

- a) General population of children
- b) Children of parents receiving other criminal sanction
- c) Children separated from parents for other reason
- d) Children of parents who were imprisoned before the child's birth but not afterwards
- e) Other (_____)
- f) No control group
- g) Not known

How was it determined that the control group had not experienced parental imprisonment?

- a) Search of official records of parents
- b) Self-report
- c) Child-report
- d) Other-report (e.g., mother about father)
- e) Other (_____)
- f) Parental imprisonment status of control group not verified
- g) Not known

6) Balancing of E and C

What methods were used to balance E and C on pretests of child outcome (before parental imprisonment)?

- a) Tested whether E and C significantly different on pretests (and no differences found).
(Note. We do not assume that this method adequately demonstrates groups are equivalent. However, because it may be a commonly used technique, we will code these studies, and investigate whether their results differ systematically from studies using other balancing methods.)
- b) E and C matched on pretest scores
- c) Pretest scores included in propensity score
- d) Pretests used to calculate change scores (from before to after parental imprisonment), which were used in analyses of prison effects
- e) Statistical control of pretests scores in analysis of outcome (e.g., in regression analysis)
- f) E and C not balanced on pretest of outcome
- g) Not known

What methods were used to balance other background differences between E and C?

- a) Tested whether E and C significantly different on covariates
- b) E and C matched on specific covariates
- c) E and C matched on propensity scores
- d) Statistical control of covariates (e.g., regression/covariance) during analysis of outcome
- e) Other (_____)
- f) No balancing of background covariates
- g) Not known

7) Methodological quality

On the Cambridge Quality Checklist (Appendix B, Murray et al., forthcoming) score:

- a) Correlate quality score ___/4

	Yes	No	Not known
i) Representative sampling	_____	_____	_____
ii) High response rate & low differential attrition	_____	_____	_____
iii) Good measure of correlate	_____	_____	_____
iv) Good measure outcome	_____	_____	_____
- b) Risk factor quality score ___/3
- c) Causal risk factor quality score ___/5

8) Outcome measures

Antisocial outcome (___) Crime outcome (___) Mental health outcome (___)

What type of antisocial outcome was measured?

- a) Juvenile (< 18 years old) antisocial/ externalizing behavior
- b) Adult (18+ years old) antisocial/ externalizing behavior

What type of crime outcome was measured?

- a) Juvenile (< 18 years old) crime
- b) Adult (18+ years old) crime

What type of mental health outcome was measured?

- a) Juvenile (< 18 years old) internalizing problems (general)
- b) Adult (18+ years old) internalizing problems (general)
- c) Juvenile (< 18 years old) depression
- d) Adult (18+ years old) depression
- e) Juvenile (< 18 years old) anxiety
- f) Adult (18+ years old) anxiety

When was the measure taken? Months after the parent was imprisoned _____

- a) Short-term (< 2 years)
- b) Long-term (≥ 2 years)

Was the measure taken while the parent was in prison or after release?

- a) During parental imprisonment
- b) After release

What measure was used?

a	Self report	
b	Outside caregiver report	
c	Imprisoned parent report	
d	Teacher rating	
e	Criminal record (arrest, conviction, other _____)	
f	Psychiatric record	
g	Other _____	

What reference period for the outcome was used? _____

What scale was used to measure the outcome? _____

9) Effect size measures

9.1 Zero-order effect sizes

a) Prevalence of child outcomes (cases vs. noncases)

	Experimental	Control
No. of cases		
No. of noncases		

Odds Ratio _____ Confidence Interval _____

b) Child outcome scores

	Experimental	Control
Mean		
SD		
n		

d _____ SE _____

c) Other numerical information used to calculate effect size

- r (point biserial) _____ proportion of children of prisoners in sample _____
- t value _____ n (E) _____ n (C) _____
- F ratio _____ n (E) _____ n (C) _____
- X² value _____ Total N _____
- B (unadjusted for covariates) _____ SE _____
- SE of mean _____ N _____ (for any one group: _____)
- p value (for test: _____) _____
- Other statistic (_____) _____

Estimated d _____ SE _____

a) Effect size from adjusted for covariates by matching E & C

i) Prevalence of child outcomes (cases vs. noncases)

	Experimental	Control
No. of cases		
No. of noncases		

Odds Ratio _____ Confidence Interval _____

ii) Child outcome scores

	Experimental	Control
Mean		
SD		
n		

d _____ SE _____

iii) Other numerical information used to calculate effect size

- r (point biserial) _____ proportion of children of prisoners in sample _____
- t value _____ n (E) _____ n (C) _____
- F ratio _____ n (E) _____ n (C) _____
- X² value _____ Total N _____
- B _____ SE _____
- SE of mean _____ N _____ (for any one group: _____)
- p value (for test: _____) _____
- Other statistic (_____) _____

Estimated d _____ SE _____

b) Effect size adjusted for covariates in regression analyses

Adjusted B (from regression analyses) _____ SE _____

Adjusted OR (from logistic regression analyses) _____ CI _____

c) Effect size adjusted for covariates in analysis of covariance

	Experimental	Control
Mean		
SD		
n		

F _____

d _____ SE _____

d) Other covariate-adjusted effect size

- Other statistic (_____) _____

Estimated d _____ SE _____