

Supplementary Information

Childhood individual and family modifiable risk factors for criminal conviction: A seven-year cohort study from Brazil

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Supplementary Text

The Brazilian High-Risk Cohort Study for Psychiatric Conditions (BHRCS) is a school-based community cohort enriched for high family risk for psychiatric conditions (Salum et al, 2015). The study presented a two-stage design, with screening and assessment phases. At screening phase, on compulsory school registration days in 2010, all parents at public schools (22 schools in Porto Alegre and 35 in São Paulo) were invited to participate. Of 12,500 approached, 8,012 caregivers (87.3% mothers) of 9,937 eligible children aged 5-12 agreed to be screened with a modified version of the Family History Screen (FHS) by lay interviewers (Weissman et al., 2000). The FHS is a structured interview used to screen all family members for psychiatric conditions based on DSM-IV criteria. The version used had 29 main questions plus 19 conditional questions on main psychiatric syndromes. From these syndromes, attention deficit/hyperactivity disorder, anxiety disorders, obsessive-compulsive disorder, psychotic-like symptoms, learning and language problems and the child's number of symptoms of the same conditions were used in a risk prioritisation procedure. Based on the percentage of members in the family that screened positively for each of the disorders assessed, we created a family liability index adjusted for relatedness. Therefore, among the 9,937 eligible children, we recruited two subgroups: a random subsample (n=957) and a high-risk sub-sample (n=1,554) based on the family liability index. The purpose of this procedure is to observe higher incidence of psychiatric conditions over time. These subjects (N=2,511) were selected for full household assessment phase by lay interviewers (parent interview) and trained psychologists (subject's interview) at baseline (5 to 14 years).

References

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Supplementary Table 1. Longitudinal studies on modifiable childhood risk factors of criminal convictions in low- and middle-income countries.

| Study name and country | Design and participants | Childhood exposures | Outcome | Data analysis | Main Findings |
|--|---|---|--|---|---|
| Prague study, Czech Republic Kubička <i>et al</i> 1995 ¹ David, 2006 ² | Cohort of 220 subjects born to mothers who in 1961-63 were refused abortion and 220 matched controls | Unwanted pregnancy | Official registers on prison sentences were retrieved at 21-23, 28, 30-31, and 35 years. | Logistic regression models adjusted by gender. | Unwanted pregnancy subjects had a double prevalence of prison sentences than controls at age 21-23 ¹ . No significant association at older ages ² . |
| Quatre Bornes and Vacoas Birth cohorts, Mauritius Gao <i>et al</i> 2010 ³ | All children born in 1969 and 1970 in two towns (Quatre Bornes and Vacoas) were recruited at age 3 years (n=1,795). Participants of this study were 137 cohort members with criminal records and 274 matched on age, gender, ethnicity, and social adversity index score controls | Electrodermal fear conditioning at age 3 | Official court records of offenses: property, drug, violence, and serious driving offenses at 23 years | Repeated-measures analysis of variance | Criminal offender group failed to show fear conditioning at age 3 compared to the controls (F=4.554, df=1, 409, p=0.033) |
| Gao <i>et al</i> 2013 ⁴ | 73 criminals and 123 noncriminal controls at age of 23. | Reduced P3 amplitude (information-processing deficit) at age 11. Antisocial behaviour and hyperactivity at age 11. | | P3 amplitude: ANOVA and ANCOVA analysis including antisocial behaviour at age 11 and alcohol use at age 23 as covariates Antisocial behaviour and hyperactivity: T-tests | Criminal offenders had significantly smaller P3 amplitudes than the controls (ANOVA= $p = .03$ $d = 0.32$), ANCOVA $p = .048$, $\eta^2 = 0.028$) Criminals and controls did not differ on age 11 antisocial |

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| | | | | | behavior, and hyperactivity. |
| 1982 Pelotas Birth Cohort, Brazil Caicedo <i>et al</i> 2010 ⁵ | Birth cohort of 5914 livebirths in the urban area of the Pelotas city (middle-size city in Southern Brazil) in 1982. | Variables collected at childbirth: Mother's skin colour Maternal age <20 Single mother Low family income (<1 minimum wages) Smoking during pregnancy Obstetric complications Low birthweight Collected at 1, 2 and 4 years: Duration of partial breastfeeding Duration of predominant breast feeding Collected at age of 4 years: Number of younger siblings Number of older siblings | City and State's official records on criminal conviction due to a violent act between ages 12 and 25 years (available for 5228 participants) | Multivariable Poisson regression analyses stratified by gender. | Increased the incidence of criminal conviction at the age of 25 years: Non-white maternal skin color (females CIR [cumulative incidence ratio]=2.3, 95%CI=1.08, 5.2; males CIR=1.8, 95%CI=1.1, 2.9) and lower income at birth (males CIR=10.6, 95%CI=1.4, 78.8; females CIR=9.2, 95%CI=1.1, 74.4). Adolescent mother increased the risk only among females (CIR=2.9, 95%CI=1.3, 6.4), and having one younger sibling was associated with criminal conviction only among males (CIR=1.9, 95%CI=1.2, 3.0). |

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|---|--|--|---|--|---|
| 1993 Pelotas Birth cohort, Brazil Murray <i>et al</i> 2015a ⁶ | Birth cohort of 5249 livebirths in the urban area of the Pelotas city in 1993. | Perinatal exposures: unplanned pregnancy, smoking in pregnancy, alcohol use in pregnancy, maternal urinary infection during pregnancy, intrauterine growth restriction; and premature birth. Cumulative number of perinatal risk factors was summed (0-6). Sociodemographic risk factors: maternal age low maternal education; single mother, three or more siblings; lowest quintile of income. Cumulative sociodemographic risk factors 0-5. | Self-reported crimes committed in the previous 12 months and official records on criminal conviction between 16 and 18 years (n=3618) The association between self-reported violence and official record of violent crime at age 18 was strong (risk ratio = 5.2). | Risk ratios were computed (not clear if only bivariate analyses are presented). | Unplanned pregnancy (RR=1.5, 95%CI=1.1–2.1, mother smoked in pregnancy (RR=1.7, 95%CI=1.2–2.2) and low maternal education (RR=1.4, 95%CI=1.0–1.9) were associated with crime among females. Alcohol use in pregnancy (RR=1.5, 95%CI=1.1–2.1) was the unique predictor of crime among males. The cumulative number of perinatal (RR=1.2, 95%CI=1.1–1.4) and sociodemographic (RR=1.2, 95%CI=1.1–1.4) risk factors were associated with crime only among females. |
| Murray <i>et al</i> 2015b ⁷ | | Conduct problems and hyperactivity (Strengths and Difficulties Questionnaire) at age 11 | Only self-reported crime was considered. Nonviolent crimes included any of the following= stole from shops/stores, damaged property, stole from vehicle, stole vehicle, sold drug, burgled, sold | Multivariable Poisson regression models with robust standard errors. Adjusted by unplanned pregnancy, smoking during pregnancy, alcohol use in pregnancy, maternal | Conduct problems at age 11 predicted both non-violent and violent crime at age of 18 among both genders (females RR=2.4, CI95% 1.3–4.3; males RR=1.4 95%CI=1.0–2.0). |

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|---------------------------------------|---------------------------------------|--|---|--|
| Murray <i>et al</i> 2016 ⁸ | | stolen good, arson, stole from person without threat/force; and violent crime included any positive response to: stole from person with threat/force, assault, carried a weapon for fights or self-defence, used weapon. | age, number of siblings, maternal education and family income in perinatal period; parental crime birth-age 11, and child age in months at time of crime assessment. | Hyperactivity at age of 11 only predicted violent crimes for both genders (female RR=1.8, 95%CI=1.3–2.5; males RR 1.3, 95%CI=1.1–1.6). |
| | Heart rate at age of 11 ^{8a} | Self-reported crimes committed in the previous 12 months and official records on criminal conviction between 16 and 18 years (n=3613) | Multivariate logistic regression models, stratified by gender and adjusted by unplanned pregnancy, smoking during pregnancy, alcohol use in pregnancy, maternal age, number of siblings, maternal education and family income in perinatal period; child skin colour, smoking, drinking, physical activity, height, weight, blood pressure; mother's mental health. | Lower heart rate at age of 11 predicted crimes at age of 18 only among males (OR=1.46, 95%CI=1.01–1.65). ⁸ |

^aHeart rate were also collected at 15 and 18 years, but would not be considered childhood exposure

References

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Supplementary Table 2. Differences between original sample and second follow-up participants (BHRC, N=2,511)

| N or M (% or SD) | Missing n=606 | | Non-missing n=1,905 | | OR | P value | | |
|--------------------------------------|------------------|---------|------------------------|---------|-------------|----------------|------------------|-------|
| | | | | | | Before IPSW | After IPSW | |
| Age | 10.05 | (1.88) | 10.25 | (1.91) | 0.95 | 0.030 | 0.876 | |
| Gender | 342 | (56.4) | 1,033 | (54.2) | 0.91 | 0.341 | - | |
| Male | | | | | | | | |
| Site | Porto Alegre | 253 | (41.8) | 1,002 | (52.6) | 1.55 | <0.001 | 0.791 |
| Skin color | White | 357 | (58.9) | 1,162 | (61.0) | Ref | | - |
| | Black | 56 | (9.2) | 208 | (10.9) | 0.88 | 0.416 | - |
| | Mixed | 189 | (31.2) | 517 | (27.1) | 1.19 | 0.096 | - |
| | Indigenous | 2 | (0.3) | 9 | (0.5) | 0.72 | 0.680 | - |
| | Asian | 1 | (0.2) | 4 | (0.2) | 0.81 | 0.854 | - |
| Planned pregnancy | 190 | (31.4) | 593 | (31.1) | 1.01 | 0.904 | - | |
| Adolescent mother at childbirth | 55 | (9.2) | 168 | (8.9) | 1.04 | 0.822 | - | |
| Smoking during pregnancy | 140 | (23.1) | 431 | (22.7) | 1.03 | 0.802 | - | |
| Alcohol consumption during pregnancy | 116 | (19.2) | 429 | (22.6) | 0.81 | 0.077 | - | |
| Preterm childbirth | 72 | (12.2) | 293 | (15.6) | 0.75 | 0.039 | 0.932 | |
| Birthweight | 3212.3 | (600.4) | 3212.2 | (586.3) | 1.00 | 0.997 | - | |
| Exclusive breastfeeding duration | 4.0 | (3.6) | 3.9 | (3.3) | 1.01 | 0.412 | - | |
| Childcare attendance | 302 | (49.8) | 1,089 | (57.3) | 0.74 | 0.001 | 0.986 | |
| Poverty | 75 | (12.4) | 220 | (11.6) | 1.08 | 0.582 | - | |
| No contact with father | 198 | (32.7) | 477 | (25.0) | 1.45 | 0.001 | 0.752 | |
| Maternal psychiatric diagnosis | 157 | (25.9) | 584 | (30.7) | 0.79 | 0.026 | 0.944 | |
| Child: Any diagnosis | 129 | (21.3) | 523 | (27.5) | 0.72 | 0.003 | 0.864 | |
| Externalizing diagnosis | 78 | (14.3) | 280 | (14.7) | 0.86 | 0.263 | - | |
| Internalizing diagnosis | 60 | (9.9) | 285 | (15.0) | 0.63 | 0.002 | 0.230 | |
| Intelligence Quotient | 102.5 | (15.97) | 101.4 | (17.0) | 1.00 | 0.198 | - | |
| Family cohesion score | 7.51 | (1.93) | 7.49 | (1.90) | 1.00 | 0.844 | - | |
| Family conflict score | 3.37 | (2.34) | 3.42 | (2.24) | 0.99 | 0.633 | - | |
| Family control score | 4.58 | (1.67) | 4.59 | (1.60) | 1.00 | 0.893 | - | |
| Child maltreatment | | | | | | | | |
| | Low level | 413 | (78.1) | 1,318 | (76.9) | Ref | | |
| | High level | 116 | (21.9) | 396 | (23.1) | 0.94 | 0.573 | - |
| Bullying | No | 333 | (59.8) | 1,028 | (58.2) | Ref | | |
| | Victim | 130 | (23.3) | 435 | (24.6) | 0.92 | 0.495 | - |
| | Perpetrator | 24 | (4.3) | 85 | (4.8) | 0.87 | 0.566 | - |
| | Both | 70 | (12.6) | 218 | (12.3) | 0.99 | 0.954 | - |
| Academic performance | | | | | | | | |
| | Below average | 80 | (13.4) | 273 | (14.6) | Ref | | |
| | Average | 428 | (71.8) | 1,336 | (71.3) | 1.11 | 0.445 | - |
| | Above average | 88 | (14.8) | 265 | (14.1) | 1.23 | 0.211 | - |
| School failure | 123 | (20.3) | 374 | (19.7) | 1.04 | 0.733 | - | |
| School dropout | 12 | (2.0) | 40 | (2.1) | 0.94 | 0.851 | - | |

IPSW=Inverse propensity score weighting

Supplementary Table 3. Perinatal and childhood risk factors of criminal conviction excluding participants with conduct disorders at baseline (N=1,875)

| Risk Factors | Adjusted ^a | | |
|--------------------------------------|--------------------------|----------------------|----------------------------|
| | OR (99.8% CI) | P value ^b | PARF ^c (95% CI) |
| <i>Perinatal</i> | | | |
| Unplanned pregnancy | 1.83 (0.48-6.98) | 0.16 | |
| Adolescent mother at childbirth | 2.53 (0.67-9.60) | 0.03 | |
| Smoking during pregnancy | 1.09 (0.25-4.68) | 0.86 | |
| Alcohol consumption during pregnancy | 1.08 (0.31-3.76) | 0.85 | |
| Preterm childbirth | 0.53 (0.11-2.67) | 0.23 | |
| Birth weight | 1.04 (0.66-1.66) | 0.79 | |
| <i>Early childhood</i> | | | |
| Exclusive breastfeeding duration | 1.04 (0.93-1.17) | 0.26 | |
| No childcare attendance | 1.36 (0.44-4.21) | 0.41 | |
| <i>Childhood (baseline)</i> | | | |
| Poverty | 4.17 (1.34-13.02) | <0.001 | 22.4 (5.1-36.6) |
| No contact with father/deceased | 1.77 (0.59-5.36) | 0.11 | |
| Maternal psychiatric diagnosis | 0.96 (0.33-2.81) | 0.91 | |
| Child: Any diagnosis | 1.84 (0.61-5.54) | 0.09 | |
| Externalizing diagnosis | 1.96 (0.52-7.39) | 0.12 | |
| Internalizing diagnosis | 2.21 (0.54-9.02) | 0.08 | |
| Family cohesion score | 1.01 (0.82-1.23) | 0.95 | |
| Family conflict score | 1.11 (0.87-1.40) | 0.18 | |
| Family control score | 0.98 (0.75-1.29) | 0.82 | |
| High maltreatment | 1.69 (0.52-5.48) | 0.17 | |
| Bullying | 1 | | |
| No | 1 | | |
| Victim | 0.72 (0.17-3.11) | 0.49 | |
| Perpetrator | 2.98 (0.52-16.92) | 0.05 | |
| Both | 1.64 (0.30-9.12) | 0.37 | |
| Academic performance | | | |
| Below average | 3.07 (0.87-10.89) | 0.01 | |
| Average/above average | 1 | | |
| School dropout | 3.34 (0.30-36.74) | 0.12 | |
| School failure | 1.62 (0.38-6.93) | 0.30 | |

^a The association between each factor and crime was adjusted by sex, age, city, ethnicity, and intelligence quotient.

^b P-values were considered significant with a conservative Bonferroni-corrected significance threshold of 0.05 divided by 24 tests= 0.002.

^c PARF=population attributable risk fraction is the proportional reduction in crime that might be eliminated if exposure to the risk factor were reduced to an alternative ideal scenario of non-poverty

Supplementary Table 4. Perinatal and childhood risk factors of criminal conviction among males (N=1,033)

| Risk Factors | Adjusted ^a | | PARF ^c (95% CI) |
|--------------------------------------|--------------------------|----------------------|----------------------------|
| | OR (99.8% CI) | P value ^b | |
| <i>Perinatal</i> | | | |
| Unplanned pregnancy | 2.21 (0.46-10.70) | 0.12 | |
| Adolescent mother at childbirth | 3.09 (0.78-12.35) | 0.01 | |
| Smoking during pregnancy | 1.05 (0.20-5.49) | 0.93 | |
| Alcohol consumption during pregnancy | 1.08 (0.26-4.39) | 0.87 | |
| Preterm childbirth | 0.58 (0.10-3.42) | 0.34 | |
| Birth weight | 0.93 (0.54-1.61) | 0.70 | |
| <i>Early childhood</i> | | | |
| Exclusive breastfeeding duration | 1.00 (0.86-1.16) | 0.98 | |
| No childcare attendance | 1.44 (0.39-5.26) | 0.39 | |
| <i>Childhood (baseline)</i> | | | |
| Poverty | 4.91 (1.41-17.08) | <0.001 | 25.1 (5.8-40.4) |
| No contact with father/deceased | 1.57 (0.46-5.38) | 0.26 | |
| Maternal psychiatric diagnosis | 0.64 (0.18-2.31) | 0.28 | |
| Child: Any diagnosis | 1.73 (0.53-5.61) | 0.15 | |
| Externalizing diagnosis | 2.21 (0.58-8.45) | 0.07 | |
| Internalizing diagnosis | 1.24 (0.17-8.91) | 0.74 | |
| Family cohesion score | 0.99 (0.80-1.24) | 0.94 | |
| Family conflict score | 1.09 (0.84-1.42) | 0.31 | |
| Family control score | 0.92 (0.69-1.22) | 0.36 | |
| High maltreatment | 1.45 (0.42-5.05) | 0.36 | |
| Bullying | | | |
| No | 1 | | |
| Victim | 0.86 (0.18-4.06) | 0.76 | |
| Perpetrator | 2.53 (0.38-16.99) | 0.13 | |
| Both | 1.53 (0.25-9.43) | 0.47 | |
| Academic performance | | | |
| Below average | 2.14 (0.50-9.22) | 0.11 | |
| Average/above average | 1 | | |
| School dropout | 4.74 (0.31-72.66) | 0.08 | |
| School failure | 2.65 (0.50-14.01) | 0.07 | |

^a The association between each factor and crime was adjusted by age, city, ethnicity, and intelligence quotient.

^b P-values were considered significant with a conservative Bonferroni-corrected significance threshold of 0.05 divided by 24 tests= 0.002.

^c PARF=population attributable risk fraction is the proportional reduction in crime that might be eliminated if exposure to the risk factor were reduced to an alternative ideal scenario of non-poverty

Supplementary Table 5. Multivariable analysis: False discovery rate-adjusted p values

| Risk Factors | Adjusted- <i>P</i> value ^a |
|--------------------------------------|---------------------------------------|
| <i>Perinatal</i> | |
| Unplanned pregnancy | 0.26 |
| Adolescent mother at childbirth | 0.18 |
| Smoking during pregnancy | 0.64 |
| Alcohol consumption during pregnancy | 0.87 |
| Preterm childbirth | 0.31 |
| Birth weight | 0.94 |
| <i>Early childhood</i> | |
| Exclusive breastfeeding duration | 0.57 |
| No childcare attendance | 0.57 |
| <i>Childhood (baseline)</i> | |
| Poverty | 0.02 |
| No contact with father/deceased | 0.19 |
| Maternal psychiatric diagnosis | 0.94 |
| Child: Any diagnosis | 0.12 |
| Externalizing diagnosis | 0.10 |
| Internalizing diagnosis | 0.17 |
| Family cohesion score | 0.71 |
| Family conflict score | 0.19 |
| Family control score | 0.56 |
| High maltreatment | 0.20 |
| Bullying | |
| Victim | 0.85 |
| Perpetrator | 0.16 |
| Both | 0.56 |
| Academic performance | |
| Below average | 0.12 |
| School dropout | 0.26 |
| School failure | 0.24 |

^a Each risk factor was adjusted by sex, age, ethnicity, city and Intelligence Quotient. *P* values were adjusted using the False Discovery Rate method proposed by Benjamini and Hochberg (1995). We set the significance level at 5% and raw *P* values from the logistic regression models were ranked in ascending order. Each *P* value was multiplied by the number of tests computed (24) and divided by their order in the ranking. Only adjusted *P* values <.05 were considered significant.

Supplementary Table 6. Multivariable analysis: Results without inverse-propensity score weights

| Risk Factors | Adjusted ^a | | |
|--------------------------------------|--------------------------|----------------------|----------------------------|
| | OR (99.8% CI) | P value ^b | PARF ^c (95% CI) |
| <i>Perinatal</i> | | | |
| Unplanned pregnancy | 1.84 (0.49-6.90) | 0.15 | |
| Adolescent mother at childbirth | 2.05 (0.56-7.53) | 0.09 | |
| Smoking during pregnancy | 1.32 (0.37-4.68) | 0.50 | |
| Alcohol consumption during pregnancy | 1.16 (0.36-3.77) | 0.70 | |
| Preterm childbirth | 0.49 (0.10-2.32) | 0.15 | |
| Birth weight | 1.02 (0.69-1.58) | 0.89 | |
| <i>Early childhood</i> | | | |
| Exclusive breastfeeding duration | 1.04 (0.92-1.17) | 0.32 | |
| No childcare attendance | 1.01 (0.45-2.26) | 0.97 | |
| <i>Childhood (baseline)</i> | | | |
| Poverty | 4.20 (1.41-12.56) | <0.001 | 22.7 (6.1-36.3) |
| No contact with father/deceased | 1.79 (0.63-5.09) | 0.08 | |
| Maternal psychiatric diagnosis | 1.08 (0.39-2.97) | 0.82 | |
| Child: Any diagnosis | 2.26 (0.81-6.29) | 0.01 | |
| Externalizing diagnosis | 2.50 (0.77-8.04) | 0.02 | |
| Internalizing diagnosis | 2.34 (0.62-8.89) | 0.05 | |
| Family cohesion score | 0.97 (0.80-1.17) | 0.58 | |
| Family conflict score | 1.14 (0.91-1.43) | 0.08 | |
| Family control score | 0.91 (0.69-1.21) | 0.32 | |
| High maltreatment | 2.08 (0.70-6.24) | 0.04 | |
| Bullying | | | |
| No | 1 | | |
| Victim | 0.93 (0.24-3.64) | 0.87 | |
| Perpetrator | 3.53 (0.70-17.89) | 0.02 | |
| Both | 1.48 (0.29-7.55) | 0.47 | |
| Academic performance | | | |
| Below average | 2.81 (0.84-9.43) | 0.01 | |
| Average/above average | 1 | | |
| School dropout | 3.08 (0.29-32.69) | 0.14 | |
| School failure | 2.07 (0.53-8.05) | 0.10 | |

^a The association between each factor and crime was adjusted by age, city, ethnicity, and intelligence quotient.

^b P-values were considered significant with a conservative Bonferroni-corrected significance threshold of 0.05 divided by 24 tests= 0.002.

^c PARF=population attributable risk fraction is the proportional reduction in crime that might be eliminated if exposure to the risk factor were reduced to an alternative ideal scenario of non-poverty

Supplementary Table 7. Modifiable risk factors of criminal conviction: Multilevel analysis including the random effect of the districts where the participants resided at baseline^a

| Risk Factors | Adjusted ^b | | |
|--------------------------------------|--------------------------|----------------------|----------------------------|
| | OR (99.8% CI) | P value ^c | PARF ^d (95% CI) |
| <i>Perinatal</i> | | | |
| Unplanned pregnancy | 1.86 (0.61-5.64) | 0.09 | |
| Adolescent mother at childbirth | 2.98 (0.83-10.70) | 0.01 | |
| Smoking during pregnancy | 1.19 (0.33-4.34) | 0.68 | |
| Alcohol consumption during pregnancy | 0.98 (0.36-2.72) | 0.96 | |
| Preterm childbirth | 0.43 (0.09-2.09) | 0.01 | |
| Birth weight | 1.04 (0.63-1.69) | 0.83 | |
| <i>Early childhood</i> | | | |
| Exclusive breastfeeding duration | 1.04 (0.92-1.19) | 0.32 | |
| No childcare attendance | 1.47 (0.40-5.41) | 0.37 | |
| <i>Childhood (baseline)</i> | | | |
| Poverty | 4.67 (1.18-18.42) | 0.001 | 19.5 (4.8-31.9) |
| No contact with father/deceased | 1.98 (0.49-7.97) | 0.13 | |
| Maternal psychiatric diagnosis | 1.02 (0.24-4.29) | 0.97 | |
| Child: Any diagnosis | 2.20 (0.72-6.74) | 0.03 | |
| Externalizing diagnosis | 2.36 (0.63-8.92) | 0.05 | |
| Internalizing diagnosis | 2.42 (0.64-9.13) | 0.04 | |
| Family cohesion score | 0.97 (0.76-1.23) | 0.67 | |
| Family conflict score | 1.16 (0.92-1.46) | 0.05 | |
| Family control score | 0.88 (0.60-1.29) | 0.31 | |
| High maltreatment | 2.50 (0.86-7.24) | 0.01 | |
| Bullying | 1 | | |
| No | 1 | | |
| Victim | 0.88 (0.22-3.48) | 0.77 | |
| Perpetrator | 4.18 (0.60-28.89) | 0.02 | |
| Both | 1.67 (0.30-9.16) | 0.35 | |
| Academic performance | | | |
| Below average | 3.73 (0.97-14.36) | 0.003 | |
| Average/above average | 1 | | |
| School dropout | 2.67 (0.18-38.73) | 0.26 | |
| School failure | 2.04 (0.37-11.22) | 0.20 | |

^a Number of Clusters: 223 districts; Intraclass correlation=0.39, 95% CI: 0.26-0.53. Model Fit information: Log pseudolikelihood = -568.84, AIC 1141.68; BIC=1152.73.

^bThe association between each factor and crime was adjusted by sex, age, city, ethnicity, and intelligence quotient.

^c P-values were considered significant with a conservative Bonferroni-corrected significance threshold of 0.05 divided by 24 tests= 0.002.

^d PARF=population attributable risk fraction is the proportional reduction in crime that might be eliminated if exposure to the risk factor were reduced to an alternative ideal scenario of non-poverty

Supplementary Table 8. Modifiable risk factors of criminal conviction: multilevel models including the random effect of the schools where the children were recruited ^a

| Risk Factors | Adjusted ^b OR (99.8% CI) | P value ^c | PARF ^d (95% CI) |
|--------------------------------------|--|----------------------|----------------------------|
| <i>Perinatal</i> | | | |
| Unplanned pregnancy | 1.96 (0.74-5.18) | 0.03 | |
| Adolescent mother at childbirth | 2.43 (0.65-9.07) | 0.04 | |
| Smoking during pregnancy | 1.26 (0.40-3.93) | 0.54 | |
| Alcohol consumption during pregnancy | 1.20 (0.41-3.49) | 0.60 | |
| Preterm childbirth | 0.44 (0.09-2.24) | 0.12 | |
| Birth weight | 1.07 (0.70-1.62) | 0.63 | |
| <i>Early childhood</i> | | | |
| Exclusive breastfeeding duration | 1.04 (0.95-1.13) | 0.22 | |
| No childcare attendance | 1.22 (0.33-4.45) | 0.64 | |
| <i>Childhood (baseline)</i> | | | |
| Poverty | 3.99 (1.40-11.37) | <0.001 | 19.0 (6.7-29.7) |
| No contact with father/deceased | 1.72 (0.59-5.02) | 0.12 | |
| Maternal psychiatric diagnosis | 0.97 (0.26-3.59) | 0.93 | |
| Child: Any diagnosis | 2.29 (0.71-7.40) | 0.03 | |
| Externalizing diagnosis | 2.56 (0.56-11.64) | 0.06 | |
| Internalizing diagnosis | 2.56 (0.52-12.55) | 0.07 | |
| Family cohesion score | 0.97 (0.76-1.24) | 0.72 | |
| Family conflict score | 1.16 (0.94-1.43) | 0.03 | |
| Family control score | 0.91 (0.63-1.30) | 0.40 | |
| High maltreatment | 2.76 (0.93-8.18) | 0.004 | |
| Bullying | | | |
| No | 1 | | |
| Victim | 0.96 (0.24-3.74) | 0.92 | |
| Perpetrator | 3.46 (0.54-22.29) | 0.04 | |
| Both | 1.86 (0.42-8.25) | 0.20 | |
| Academic performance | | | |
| Below average | 4.11 (0.81-21.00) | 0.01 | |
| Average/above average | 1 | | |
| School dropout | 1.81 (0.12-27.27) | 0.50 | |
| School failure | 1.84 (0.50-6.83) | 0.15 | |

^a Number of Clusters: 63 schools; Intraclass correlation=0.22, 95% CI: 0.12-0.37. Model Fit information: Log pseudolikelihood = -580.67, AIC=1165.34, BIC=1176.41. Children were recruited from 57 schools, however, some children changed schools between the screening phase and the interview phase of the baseline assessment. This increased the number of schools to 63.

^bThe association between each factor and crime was adjusted by sex, age, city, ethnicity, and intelligence quotient.

^c P-values were considered significant with a conservative Bonferroni-corrected significance threshold of 0.05 divided by 24 tests= 0.002.

^d PARF=population attributable risk fraction is the proportional reduction in crime that might be eliminated if exposure to the risk factor were reduced to an alternative ideal scenario of non-poverty