Kennedy, E., Heron, J., & Munafo, M. (2017). Substance use, criminal behaviour and psychiatric symptoms following childhood traumatic brain injury: findings from the ALSPAC cohort. European Child and Adolescent Psychiatry, 26(10), 1197-1206. https://doi.org/10.1007/s00787-017-0975-1
Supplementary Table 1. Descriptive statistics for participants with injury information included in analyses and participants excluded from analyses due to missing injury information.

|                        | Included  | Excluded | p value* |
|------------------------|-----------|----------|----------|
|                        | (n=11412) | (n=4033) |          |
| N (%)                  |           |          |          |
| Male                   | 5849 (51.3) | 1786 (51.8) | 0.553    |
| Social class IV – V a  | 4111 (41.9) | 926 (53.6) | <0.001   |
| Rented subsidised housing | 1208 (11.4) | 731 (25.0) | <0.001   |
| Mother completed secondary school | 6496 (62.1) | 1587 (78.1) | <0.001   |
| Maternal daily smoking | 3034 (28.2) | 763 (41.2) | <0.001   |
| Maternal daily alcohol use | 1408 (13.1) | 103 (5.6) | <0.001   |
| Three or more early life events b | 5797 (54.4) | 330 (27.1) | <0.001   |
| M (SD)                 |           |          |          |
| Maternal age at birth (years) | 28.51 (4.76) | 26.16 (5.23) | <0.001   |
| Bonding at 8 months c  | 28.23 (3.65) | 28.46 (3.87) | 0.040    |
| Positive parenting experience at 21 months d | 20.78 (2.74) | 20.94 (2.90) | 0.145    |
| Negative parenting experience at 21 months d | 5.99 (1.52) | 6.00 (1.58) | 0.850    |

Injury from birth to age 16 years (data present n = 11412; data missing n = 4033); * p values calculated using chi square or analysis of variance; a highest social class of either parent is skilled non-manual or lower occupation based on the Registrar General’s classification of occupations; b parent-reported questionnaire relating to upsetting events in the child’s life completed when offspring was 6, 30, 42 and 81 months old; c parent-report questionnaire completed when offspring was 8 months old; d positive and negative parenting experiences based on parent-completed questionnaire when offspring was 21 months old.
Supplementary Table 2 Descriptive statistics for covariates on complete case sample for all covariates and all substance use (alcohol, tobacco, cannabis) measures.

|                                | No Injury (n=1,363) | TBI (n=207) | OI (n=504) | p value* |
|--------------------------------|---------------------|-------------|------------|----------|
|                                | N (%)               | N (%)       | N (%)      |          |
| Male                           | 553 (40.6)          | 112 (54.1)  | 258 (51.2) | <0.001   |
| Social Class IV – V a          | 450 (33.0)          | 65 (31.4)   | 168 (33.3) | 0.878    |
| Rented subsidised housing      | 69 (5.1)            | 10 (4.8)    | 18 (3.6)   | 0.575    |
| Mother completed secondary school | 657 (48.2)         | 93 (44.9)   | 256 (50.8) | 0.338    |
| Maternal daily smoking         | 241 (17.7)          | 45 (21.7)   | 92 (18.3)  | 0.371    |
| Maternal daily alcohol use     | 208 (15.3)          | 36 (17.4)   | 73 (14.5)  | 0.619    |
| Three or more early life events b | 764 (56.0)       | 132 (63.8)  | 284 (56.3) | 0.120    |
| Maternal age at birth (years)  | 29.84 (4.29)        | 29.42 (4.26) | 29.61 (4.49) | 0.600    |
| Bonding at 8 months c          | 27.93 (3.57)        | 28.06 (3.20) | 27.99 (3.49) | 0.844    |
| Positive parenting experience at 21 months d | 5.95 (1.39)  | 5.94 (1.34)  | 5.87 (1.34) | 0.518    |
| Negative parenting experience at 21 months d | 20.84 (2.67) | 20.55 (2.80) | 20.90 (2.58) | 0.272    |

TBI: traumatic brain injury; OI: orthopaedic injury; * p values calculated using chi square or analysis of variance; a highest social class of either parent is skilled non-manual or lower occupation based on the Registrar General’s classification of occupations; b parent-reported questionnaire relating to upsetting events in the child’s life completed when offspring was 6, 30, 42 and 81 months old; c parent-report questionnaire completed when offspring was 8 months old; d positive and negative parenting experiences based on parent-completed questionnaire when offspring was 21 months old.
### Supplementary Table 3

| Substance Use | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|---------------|------------------------|---------------------|---------------------|---------------------|
| **Alcohol**   |                        |                     |                     |                     |
| n              | n = 2074               | n = 2074            | n = 2074            | n = 2074            |
| TBI vs no Injury | 1.54 (1.15 - 2.06)     | 1.51 (1.13 - 2.03)  | 1.48 (1.10 - 2.00)  | 1.31 (0.94 - 1.82)  |
| OI vs no Injury  | 0.88 (0.72 - 1.09)     | 0.87 (0.70 - 1.07)  | 0.87 (0.70 - 1.08)  | 0.77 (0.61 - 0.98)  |
| TBI vs OI       | 1.74 (1.26 - 2.41)     | 1.75 (1.26 - 2.42)  | 1.71 (1.23 - 2.38)  | 1.69 (1.17 - 2.45)  |
| Omnibus p       | 0.541                  | 0.408               | 0.412               | 0.080               |
| **Tobacco**    |                        |                     |                     |                     |
| n              | n = 2074               | n = 2074            | n = 2074            | n = 2074            |
| TBI vs no Injury | 1.36 (0.98 - 1.89)     | 1.43 (1.02 - 1.99)  | 1.37 (0.98 - 1.93)  | 1.09 (0.74 - 1.62)  |
| OI vs no Injury  | 1.09 (0.85 - 1.39)     | 1.12 (0.87 - 1.43)  | 1.13 (0.88 - 1.46)  | 1.15 (0.86 - 1.55)  |
| TBI vs OI       | 1.25 (0.86 - 1.81)     | 1.27 (0.88 - 1.85)  | 1.21 (0.83 - 1.77)  | 0.95 (0.61 - 1.47)  |
| Omnibus p       | 0.341                  | 0.238               | 0.227               | 0.331               |
| **Cannabis**   |                        |                     |                     |                     |
| n              | n = 2074               | n = 2074            | n = 2074            | n = 2074            |
| TBI vs no Injury | 1.60 (1.18 - 2.16)     | 1.56 (1.15 - 2.11)  | 1.51 (1.11 - 2.05)  | 1.23 (0.87 - 1.74)  |
| OI vs no Injury  | 1.10 (0.88 - 1.37)     | 1.09 (0.87 - 1.37)  | 1.09 (0.87 - 1.37)  | 1.02 (0.79 - 1.33)  |
| TBI vs OI       | 1.46 (1.04 - 2.03)     | 1.43 (1.02 - 2.00)  | 1.39 (0.99 - 1.95)  | 1.20 (0.82 - 1.77)  |
| Omnibus p       | 0.200                  | 0.236               | 0.254               | 0.718               |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; **generalised ordinal regression; * alcohol measured using the Alcohol Use Disorder Identification Test (AUDIT); b tobacco measured using the Fagerström Test for Nicotine Dependence; c cannabis measured using the Cannabis Abuse Screening Test.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use and crime variables
### Supplementary Table 4 Associations between traumatic brain injury from birth to age 16 years, with no additional orthopaedic injury, and substance use at age 17 years compared to orthopaedic injury

| Substance Use | Unadjusted | Model 1 | Model 2 | Model 3 |
|---------------|------------|---------|---------|---------|
|               | OR (95% CI) | OR (95% CI) | OR (95% CI) | OR (95% CI) |
| Alcohol a*    |            |         |         |         |
| n             | n = 3564   | n = 3148 | n = 2778 | n = 1992 |
| TBI only vs OI| 1.48 (1.10 - 1.99) | 1.44 (1.05 - 1.98) | 1.57 (1.13 - 2.18) | 1.98 (1.28 - 3.09) |
| Omnibus p     | 0.056      | 0.313    | 0.306    | 0.081    |
| Tobacco b**   |            |         |         |         |
| n             | n = 2991   | n = 2642 | n = 2326 | n = 1992 |
| TBI only vs OI| 1.14 (0.78 - 1.66) | 1.12 (0.75 - 1.68) | 1.04 (0.67 - 1.62) | 0.96 (0.56 - 1.63) |
| Omnibus p     | 0.094      | 0.072    | 0.078    | 0.374    |
| Cannabis c*** |            |         |         |         |
| n             | n = 3843   | n = 3384 | n = 2978 | n = 1992 |
| TBI only vs OI| 1.20 (0.88 - 1.62) | 1.09 (0.79 - 1.52) | 1.08 (0.76 - 1.53) | 1.14 (0.71 - 1.82) |
| Omnibus p     | 0.007      | 0.078    | 0.109    | 0.588    |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; **generalised ordinal regression; a alcohol measured using the Alcohol Use Disorder Identification Test (AUDIT); b tobacco measured using the Fagerström Test for Nicotine Dependence; c cannabis measured using the Cannabis Abuse Screening Test.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis

Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)

Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)

Model 3: As Model 2 with additional adjustment for substance use and crime variables
Supplementary Table 5 Associations between traumatic brain injury from birth to age 16 years, with no additional orthopaedic injury, and substance use at age 17 years compared to orthopaedic injury on complete case sample

| Substance Use | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|---------------|------------------------|---------------------|---------------------|---------------------|
| Alcohol a*    |                        |                     |                     |                     |
| n             | n = 1992               | n = 1992            | n = 1992            | n = 1992            |
| TBI only vs OI| 1.81 (1.22 - 2.68)     | 1.82 (1.22 - 2.70)  | 1.81 (1.22 - 2.70)  | 1.98 (1.28 - 3.09)  |
| Omnibus p     | 0.435                  | 0.328               | 0.344               | 0.081               |
| Tobacco b**   |                        |                     |                     |                     |
| n             | n = 1992               | n = 1992            | n = 1992            | n = 1992            |
| TBI only vs OI| 1.08 (0.68 - 1.71)     | 1.12 (0.71 - 1.78)  | 1.10 (0.69 - 1.76)  | 0.96 (0.56 - 1.63)  |
| Omnibus p     | 0.446                  | 0.324               | 0.302               | 0.374               |
| Cannabis c**  |                        |                     |                     |                     |
| n             | n = 1992               | n = 1992            | n = 1992            | n = 1992            |
| TBI only vs OI| 1.24 (0.82 - 1.87)     | 1.23 (0.81 - 1.86)  | 1.22 (0.80 - 1.85)  | 1.14 (0.71 - 1.82)  |
| Omnibus p     | 0.319                  | 0.355               | 0.365               | 0.588               |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; **generalised ordinal regression; a alcohol measured using the Alcohol Use Disorder Identification Test (AUDIT); b tobacco measured using the Fagerström Test for Nicotine Dependence; c cannabis measured using the Cannabis Abuse Screening Test.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use and crime variables
Supplementary Table 6: Associations between traumatic brain injury and orthopaedic injuries from birth to age 16 years and criminal behaviours at age 17 years on complete case sample

| Criminal Behaviour | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|--------------------|------------------------|---------------------|---------------------|---------------------|
| **Offences** ^a^** |                        |                     |                     |                     |
| **n**              | n = 2115               | n = 2115            | n = 2115            | n = 2115            |
| TBI vs no Injury   | 1.82 (1.30 - 2.54)     | 1.62 (1.15 - 2.28)  | 1.58 (1.13 - 2.23)  | 1.29 (0.09 - 1.88)  |
| OI vs no Injury    | 1.71 (1.34 - 2.18)     | 1.57 (1.22 - 2.01)  | 1.56 (1.22 - 2.00)  | 1.67 (1.27 - 2.19)  |
| TBI vs OI          | 1.06 (0.74 - 1.53)     | 1.03 (0.72 - 1.49)  | 1.01 (0.70 - 1.47)  | 0.77 (0.52 - 1.16)  |
| **Omnibus p**      | <0.001                 | <0.001              | <0.001              | <0.001              |

| **Trouble with the Police** ^b^** |                     |                     |                     |                     |
| **n**              | n = 2077               | n = 2077            | n = 2077            | n = 2077            |
| TBI vs no Injury   | 1.73 (1.20 - 2.48)     | 1.52 (1.05 - 2.21)  | 1.49 (1.02 - 2.17)  | 1.17 (0.77 - 1.77)  |
| OI vs no Injury    | 1.15 (0.87 - 1.53)     | 1.01 (0.75 - 1.35)  | 1.02 (0.76 - 1.36)  | 1.03 (0.75 - 1.42)  |
| TBI vs OI          | 1.50 (1.00 - 2.25)     | 1.51 (1.00 - 2.30)  | 1.46 (0.96 - 2.23)  | 1.14 (0.71 - 1.81)  |
| **Omnibus p**      | 0.158                  | 0.707               | 0.678               | 0.765               |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; **generalised ordinal regression; ^a^ offences measured by self-report questionnaire at age 17 years; ^b^ trouble with the police measured by self-report questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use variables.
Supplementary Table 7 Associations between traumatic brain injury from birth to age 16 years, with no additional orthopaedic injury, and criminal behaviour at age 17 years compared to orthopaedic injury

| Criminal Behaviour | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|--------------------|------------------------|---------------------|---------------------|---------------------|
| Offences a**       |                        |                     |                     |                     |
| n                  | n = 3719               | n = 3283            | n = 2886            | n = 2031            |
| TBI only vs OI     | 1.14 (0.81 - 1.60)     | 1.15 (0.80 - 1.66)  | 1.18 (0.81 - 1.73)  | 0.76 (0.46 - 1.26)  |
| Omnibus p          | <0.001                 | 0.001               | 0.001               | <0.001              |

| Trouble with the Police b** |
|----------------------------|
| n                          | n = 3657               | n = 3228            | n = 2844            | n = 1995            |
| TBI only vs OI             | 0.94 (0.63 - 1.40)     | 0.86 (0.55 - 1.34)  | 0.90 (0.57 - 1.44)  | 0.80 (0.44 - 1.47)  |
| Omnibus p                  | 0.001                  | 0.096               | 0.102               | 0.930               |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; **generalised ordinal regression; a offens measured by self-report questionnaire at age 17 years; b trouble with the police measured by self-report questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use variables
Supplementary Table 8 Associations between traumatic brain injury from birth to age 16 years, with no additional orthopaedic injury, and criminal behaviour at age 17 years compared to orthopaedic injury on complete case sample

| Criminal Behaviour | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|--------------------|------------------------|---------------------|---------------------|---------------------|
| Offences a**       |                        |                     |                     |                     |
| n                  | n = 2031               | n = 2031            | n = 2031            | n = 2031            |
| TBI only vs OI     | 0.94 (0.60 - 1.46)     | 0.95 (0.60 - 1.49)  | 0.95 (0.60 - 1.50)  | 0.76 (0.46 - 1.26)  |
| Omnibus p          | <0.001                 | <0.001              | <0.001              | <0.001              |
| Trouble with the Police b** |                |                     |                     |                     |
| n                  | n = 1995               | n = 1995            | n = 1995            | n = 1995            |
| TBI only vs OI     | 1.02 (0.60 - 1.74)     | 1.03 (0.60 - 1.79)  | 1.02 (0.59 - 1.76)  | 0.80 (0.44 - 1.47)  |
| Omnibus p          | 0.299                  | 0.956               | 0.921               | 0.930               |

Complete cases had no missing data for the exposure, outcome or covariates TBI: traumatic brain injury; OI: orthopaedic injury; **generalised ordinal regression; a offences measured by self-report questionnaire at age 17 years; b trouble with the police measured by self-report questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use variables
Supplementary Table 9 Associations between traumatic brain injury and orthopaedic injuries from birth to age 16 years and psychiatric symptoms based on the Strengths and Difficulties Questionnaire at age 17 years on complete case sample

| SDQ                  | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|----------------------|------------------------|---------------------|---------------------|
| **Conduct problems a** |                        |                     |                     |
| n                    | n = 4493               | n = 4493            | n = 4493            |
| TBI vs no Injury     | 1.64 (1.11 – 2.43)     | 1.72 (1.16 – 2.55)  | 1.62 (1.08 – 2.41)  |
| OI vs no Injury      | 1.08 (0.79 – 1.48)     | 1.10 (0.80 – 1.50)  | 1.07 (0.78 – 1.47)  |
| TBI vs OI            | 1.52 (0.97 - 2.36)     | 1.57 (1.01 - 2.45)  | 1.51 (0.96 - 2.37)  |
| Omnibus p            | 0.391                  | 0.340               | 0.445               |
| **Peer Problems b**  |                        |                     |                     |
| n                    | n = 4483               | n = 4483            | n = 4483            |
| TBI vs no Injury     | 0.92 (0.62 – 1.37)     | 0.88 (0.59 – 1.31)  | 0.85 (0.57 – 1.26)  |
| OI vs no Injury      | 0.84 (0.64 – 1.11)     | 0.81 (0.61 – 1.07)  | 0.79 (0.60 – 1.05)  |
| TBI vs OI            | 1.10 (0.71 - 1.71)     | 1.09 (0.70 - 1.69)  | 1.07 (0.68 - 1.67)  |
| Omnibus p            | 0.206                  | 0.127               | 0.090               |

Complete cases had no missing data for the exposure, outcome or covariates TBI: traumatic brain injury; OI: orthopaedic injury; a logistic regression; a conduct problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years; b peer problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis

Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)

Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
## Supplementary Table 10

Associations between traumatic brain injury from birth to age 16 years, with no additional orthopaedic injury, and psychiatric symptoms at age 17 years compared to orthopaedic injury

| SDQ                  | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|----------------------|------------------------|---------------------|---------------------|
| **Conduct problems** |                        |                     |                     |
| n                    | n = 2437               | n = 4818            | n = 4328            |
| TBI only vs OI       | 1.51 (0.96 - 2.38)     | 1.74 (1.07 - 2.84)  | 1.80 (1.08 - 3.00)  |
| Omnibus p            | 0.201                  | 0.285               | 0.458               |

| **Peer Problems**    |                        |                     |                     |
| n                    | n = 5427               | n = 4806            | n = 4316            |
| TBI only vs OI       | 1.17 (0.75 - 1.83)     | 1.17 (0.71 - 1.93)  | 1.15 (0.68 - 1.96)  |
| Omnibus p            | 0.829                  | 0.121               | 0.100               |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; a* conduct problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years; b peer problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis

Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)

Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Supplementary Table 11 Associations between traumatic brain injury from birth to age 16 years, with no additional orthopaedic injury, and psychiatric symptoms at age 17 years compared to orthopaedic injury on complete case sample

| SDQ                  | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|----------------------|------------------------|---------------------|---------------------|
| **Conduct problems a**  |                        |                     |                     |
| n                    | n = 4328               | n = 4328            | n = 4328            |
| TBI only vs OI       | 1.76 (1.06 - 2.91)     | 1.85 (1.12 - 3.07)  | 1.80 (1.08 - 3.00)  |
| Omnibus p            | 0.412                  | 0.366               | 0.458               |
| **Peer Problems b**  |                        |                     |                     |
| n                    | n = 4316               | n = 4316            | n = 4316            |
| TBI only vs OI       | 1.15 (0.68 - 1.95)     | 1.16 (0.68 - 1.96)  | 1.15 (0.68 - 1.96)  |
| Omnibus p            | 0.217                  | 0.133               | 0.100               |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; a logistic regression; a conduct problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years; b peer problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Supplementary Table 12 Association between traumatic brain injury and orthopaedic injuries from birth to age 11 years and substance use at age 17 years

| Substance Use | Unadjusted | Model 1 | Model 2 | Model 3 |
|---------------|------------|---------|---------|---------|
|               | OR (95% CI) | OR (95% CI) | OR (95% CI) | OR (95% CI) |
| **Alcohol**   |            |         |         |         |
| n             | n = 3188   | n = 2812 | n = 2381 | n = 1788 |
| TBI vs no Injury | 1.26 (0.89 - 1.78) | 1.28 (0.89 - 1.85) | 1.37 (0.93 – 2.02) | 1.13 (0.68 - 1.88) |
| OI vs no Injury  | 1.16 (0.97 - 1.38) | 1.10 (0.91 – 1.33) | 1.13 (0.92 - 1.38) | 0.81 (0.61 - 1.07) |
| TBI vs OI       | 1.09 (0.75 - 1.57) | 1.16 (0.78 - 1.72) | 1.22 (0.81 - 1.85) | 1.40 (0.80 - 2.44) |
| **Omnibus p**   | 0.072      | 0.231   | 0.266   | 0.167   |
| **Tobacco**    |            |         |         |         |
| n             | n = 2675   | n = 2364 | n = 2084 | n = 1788 |
| TBI vs no Injury | 1.35 (0.88 – 2.08) | 1.31 (0.83 – 2.07) | 1.15 (0.69 - 1.92) | 1.00 (0.53 - 1.87) |
| OI vs no Injury  | 1.01 (0.80 – 1.28) | 1.02 (0.79 – 1.32) | 1.00 (0.76 - 1.32) | 0.83 (0.58 - 1.19) |
| TBI vs OI       | 1.34 (0.84 - 2.15) | 1.28 (0.78 - 2.12) | 1.16 (0.66 - 2.01) | 1.20 (0.60 - 2.39) |
| **Omnibus p**   | 0.786      | 0.739   | 0.940   | 0.328   |
| **Cannabis**   |            |         |         |         |
| n             | n = 3436   | n = 3023 | n = 2668 | n = 1788 |
| TBI vs no Injury | 1.61 (1.14 - 2.28) | 1.44 (0.99 - 2.08) | 1.45 (0.98 - 2.15) | 1.47 (0.88 - 2.47) |
| OI vs no Injury  | 1.17 (0.98 - 1.41) | 1.12 (0.92 – 1.37) | 1.10 (0.89 - 1.36) | 1.03 (0.76 - 1.40) |
| TBI vs OI       | 1.38 (0.95 - 2.00) | 1.28 (0.86 - 1.91) | 1.32 (0.86 - 2.02) | 1.43 (0.81 - 2.52) |
| **Omnibus p**   | 0.041      | 0.162   | 0.254   | 0.671   |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; **generalised ordinal regression; a alcohol measured using the Alcohol Use Disorder Identification Test (AUDIT); b tobacco measured using the Fagerström Test for Nicotine Dependence; c cannabis measured using the Cannabis Abuse Screening Test.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use and crime variables
Supplementary Table 13 Associations between traumatic brain injury from birth to age 11 years, with no additional orthopaedic injury, and substance use at age 17 years compared to orthopaedic injury

| Substance Use      | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|--------------------|------------------------|---------------------|---------------------|---------------------|
| Alcohol *          |                        |                     |                     |                     |
| n                  | 3144                   | 2776                | 2454                | 1762                |
| TBI only vs OI     | 1.37 (0.89 - 2.11)     | 1.40 (0.89 - 2.20)  | 1.47 (0.91 - 2.37)  | 1.64 (0.87 - 3.13)  |
| Omnibus p          | 0.059                  | 0.207               | 0.243               | 0.181               |
| Tobacco **         |                        |                     |                     |                     |
| n                  | 2640                   | 2333                | 2055                | 1762                |
| TBI only vs OI     | 1.30 (0.74 - 2.27)     | 1.31 (0.73 - 2.35)  | 1.16 (0.61 - 2.21)  | 0.98 (0.43 - 2.20)  |
| Omnibus p          | 0.851                  | 0.774               | 0.968               | 0.275               |
| Cannabis ***       |                        |                     |                     |                     |
| n                  | 3391                   | 2986                | 2635                | 1762                |
| TBI only vs OI     | 1.53 (1.00 - 2.36)     | 1.43 (0.91 - 2.25)  | 1.47 (0.91 - 2.37)  | 1.51 (0.79 - 2.87)  |
| Omnibus p          | 0.044                  | 0.164               | 0.259               | 0.214               |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; **generalised ordinal regression; †alcohol measured using the Alcohol Use Disorder Identification Test (AUDIT); ‡tobacco measured using the Fagerström Test for Nicotine Dependence; ‡cannabis measured using the Cannabis Abuse Screening Test.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use and crime variables
Supplementary Table 14 Associations between traumatic brain injury and orthopaedic injuries from birth to age 11 years and criminal behaviour at age 17 years

| Criminal Behaviour | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|--------------------|-------------------------|----------------------|----------------------|----------------------|
| Offences **       |                         |                      |                      |                      |
| n                  | n = 3325                | n = 2931             | n = 2584             | n = 1818             |
| TBI vs no Injury   | 1.26 (0.82 - 1.94)      | 1.15 (0.72 - 1.83)   | 1.25 (0.77 - 2.02)   | 0.97 (0.53 - 1.79)   |
| OI vs no Injury    | 1.30 (1.05 - 1.62)      | 1.31 (1.03 - 1.66)   | 1.37 (1.06 - 1.75)   | 1.78 (1.30 - 2.45)   |
| TBI vs OI          | 0.97 (0.61 - 1.53)      | 0.88 (0.53 - 1.44)   | 0.91 (0.54 - 1.53)   | 0.54 (0.28 - 1.04)   |
| Omnibus p          | 0.013                   | 0.025                | 0.012                | 0.001                |

| Trouble with the Police b** |                               |                      |                      |                      |
| n                  | n = 3275                 | n = 2886             | n = 2549             | n = 1790             |
| TBI vs no Injury   | 1.44 (0.90 - 2.28)       | 1.20 (0.73 - 1.98)   | 1.31 (0.78 - 2.21)   | 1.17 (0.62 - 2.22)   |
| OI vs no Injury    | 1.34 (1.05 - 1.70)       | 1.28 (0.99 - 1.67)   | 1.27 (0.96 - 1.69)   | 1.15 (0.79 - 1.69)   |
| TBI vs OI          | 1.06 (0.66 - 1.76)       | 0.94 (0.55 - 1.60)   | 1.03 (0.59 - 1.81)   | 1.02 (0.50 - 2.06)   |
| Omnibus p          | 0.012                   | 0.056                | 0.078                | 0.432                |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; **generalised ordinal regression; *offences measured by self-report questionnaire at age 17 years; b** trouble with the police measured by self-report questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use variables
Supplementary Table 15 Associations between traumatic brain injury from birth to age 11 years, with no additional orthopaedic injury, and criminal behaviour at age 17 years compared to orthopaedic injury

| Criminal Behaviour | Unadjusted | Model 1 | Model 2 | Model 3 |
|--------------------|------------|---------|---------|---------|
|                    | OR (95% CI)| OR (95% CI)| OR (95% CI)| OR (95% CI) |
| Offences a**       | n = 3285  | n = 2898 | n = 2555 | n = 1792 |
| TBI only vs OI     | 1.08 (0.64 - 1.83) | 1.00 (0.58 - 1.75) | 1.07 (0.60 - 1.91) | 0.65 (0.31 - 1.34) |
| Omnibus p          | 0.012      | 0.021   | 0.010   | <0.001   |
| Trouble with the Police b** | n = 3235  | n = 2852 | n = 2519 | n = 1764 |
| TBI only vs OI     | 1.14 (0.65 - 2.00) | 0.98 (0.53 - 1.79) | 1.08 (0.57 - 2.05) | 1.04 (0.47 - 2.29) |
| Omnibus p          | 0.012      | 0.055   | 0.080   | 0.434    |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; **generalised ordinal regression; a offences measured by self-report questionnaire at age 17 years; b trouble with the police measured by self-report questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use variables
### Supplementary Table 16 Associations between traumatic brain injury and orthopaedic injuries from birth to age 11 years and psychiatric symptoms based on the Strengths and Difficulties Questionnaire at age 17 years

| SDQ                  | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|----------------------|------------------------|---------------------|---------------------|
| **Conduct problems a** |                        |                     |                     |
| n                    | n = 4923               | n = 4372            | n = 3937            |
| TBI vs no Injury     | 2.40 (1.37 - 3.53)     | 2.33 (1.41 - 3.85)  | 1.90 (1.11 - 3.26)  |
| OI vs no Injury      | 1.05 (0.76 - 1.44)     | 0.99 (0.69 - 1.41)  | 0.96 (0.66 - 1.39)  |
| TBI vs OI            | 2.10 (1.23 - 3.57)     | 2.35 (1.33 - 4.17)  | 1.98 (1.08 - 3.65)  |
| Omnibus p            | 0.442                  | 0.656               | 0.884               |
| **Peer Problems b**  |                        |                     |                     |
| n                    | n = 4912               | n = 4359            | n = 3924            |
| TBI vs no Injury     | 1.51 (0.95 - 2.39)     | 1.30 (0.79 - 2.13)  | 0.99 (0.57 - 1.21)  |
| OI vs no Injury      | 1.01 (0.77 - 1.31)     | 0.91 (0.68 - 1.22)  | 0.89 (0.65 - 1.21)  |
| TBI vs OI            | 1.51 (0.91 - 2.49)     | 1.42 (0.83 - 2.45)  | 1.12 (0.61 - 2.05)  |
| Omnibus p            | 0.780                  | 0.666               | 0.456               |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. **TBI**: traumatic brain injury; **OI**: orthopaedic injury; **a**logistic regression; **b**conduct problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years; peer problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis

Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)

Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Supplementary Table 17 Associations between traumatic brain injury from birth to age 11 years, with no additional orthopaedic injury, and psychiatric symptoms at age 17 years compared to orthopaedic injury

| SDQ                  | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|----------------------|------------------------|---------------------|---------------------|
| Conduct problems a*  |                        |                     |                     |
| n                    | n = 4854               | n = 4310            | n = 3880            |
| TBI only vs OI       | 2.65 (1.48 - 4.74)     | 3.04 (1.64 - 5.64)  | 2.77 (1.45 - 5.31)  |
| Omnibus p            | 0.450                  | 0.651               | 0.826               |
| Peer Problems b*     |                        |                     |                     |
| n                    | n = 4842               | n = 4296            | n = 3866            |
| TBI only vs OI       | 1.58 (0.88 - 2.84)     | 1.47 (0.78 - 2.77)  | 1.28 (0.64 - 2.54)  |
| Omnibus p            | 0.828                  | 0.639               | 0.481               |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; a logistic regression; a conduct problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years; b peer problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Supplementary Table 18 Associations between traumatic brain injury and orthopaedic injuries from birth to age 11 years and psychiatric symptoms based on the Development and Well-Being Assessment (DAWBA) at age 15 years

|                        | DAWBA | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|------------------------|-------|------------------------|---------------------|---------------------|
| **Externalising Behaviour a** |       |                        |                     |                     |
| TBI vs no Injury       | 2.25 (1.32 – 3.81) | 2.35 (1.35 – 4.11) | 1.83 (0.98 – 3.41) |
| OI vs no Injury        | 0.85 (0.57 – 1.27)  | 0.90 (0.59 – 1.39)  | 0.87 (0.55 – 1.38)  |
| TBI vs OI              | 2.65 (1.43 – 4.91)  | 2.61 (1.36 – 4.98)  | 2.11 (1.03 – 4.32)  |
| Omnibus p              | 0.779 | 0.970                  | 0.796               |
| **ODD b**              |       |                        |                     |                     |
| TBI vs no Injury       | 2.28 (1.28 – 4.07)  | 2.42 (1.31 – 4.55)  | 1.78 (0.89 – 3.58)  |
| OI vs no Injury        | 0.81 (0.51 – 1.28)  | 0.98 (0.61 – 1.56)  | 0.98 (0.60 – 1.61)  |
| TBI vs OI              | 2.82 (1.42 – 5.59)  | 2.48 (1.22 – 5.02)  | 1.82 (0.82 – 4.01)  |
| Omnibus p              | 0.673 | 0.730                  | 0.851               |
| **CD c**               |       |                        |                     |                     |
| TBI vs no Injury       | 1.09 (0.34 – 3.55)  | 0.83 (0.20 – 3.53)  | 0.72 (0.17 – 3.10)  |
| OI vs no Injury        | 0.66 (0.31 – 1.40)  | 0.78 (0.36 – 1.70)  | 0.85 (0.39 – 1.86)  |
| TBI vs OI              | 1.66 (0.44 – 6.33)  | 1.06 (0.22 – 5.10)  | 0.94 (0.17 – 4.13)  |
| Omnibus p              | 0.301 | 0.523                  | 0.636               |
| **ADHD d**             |       |                        |                     |                     |
| TBI vs no Injury       | 3.15 (1.07 – 9.28)  | 2.86 (0.94 – 8.70)  | 3.02 (0.97 – 9.36)  |
| OI vs no Injury        | 1.42 (0.62 – 3.21)  | 0.91 (0.34 – 2.47)  | 0.57 (0.16 – 1.98)  |
| TBI vs OI              | 2.23 (0.66 – 7.48)  | 3.14 (0.82 – 12.02) | 5.28 (1.14 – 24.51) |
| Omnibus p              | 0.274 | 0.891                  | 0.623               |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; * logistic regression; a externalising disorder symptoms based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years;
b ODD: oppositional defiant disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years; c CD: conduct disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years; d ADHD: attentional defiant hyperactivity disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Table 19: Associations between traumatic brain injury from birth to age 11 years, with no additional orthopaedic injury, and psychiatric symptoms based on the Development and Well-Being Assessment (DAWBA) at age 15 years compared to orthopaedic injury.

| DAWBA                      | Unadjusted (OR (95% CI)) | Model 1 (OR (95% CI)) | Model 2 (OR (95% CI)) |
|----------------------------|--------------------------|-----------------------|-----------------------|
|                            | n = 3931                 | n = 3460              | n = 3063              |
| Externalising Behaviour a**|                          |                       |                       |
| TBI only vs OI             | 2.34 (1.11 - 4.92)       | 2.20 (1.00 - 4.83)    | 1.99 (0.85 - 4.64)    |
| Omnibus p                  | 0.609                    | 0.833                 | 0.698                 |
| ODD b**                    | n = 3920                 | n = 3451              | n = 3056              |
| TBI only vs OI             | 2.76 (1.25 - 6.12)       | 2.29 (0.99 - 5.28)    | 1.94 (0.79 - 4.79)    |
| Omnibus p                  | 0.553                    | 0.876                 | 0.901                 |
| CD c**                     | n = 3919                 | n = 3450              | n = 3055              |
| TBI only vs OI             | 1.69 (0.35 - 8.06)       | 0.83 (0.10 - 6.77)    | 0.67 (0.08 - 5.60)    |
| Omnibus p                  | 0.294                    | 0.512                 | 0.652                 |
| ADHD                       | n = 3931                 | n = 3460              | n = 3063              |
| TBI only vs OI             | 1.68 (0.35 - 8.03)       | 2.53 (0.48 - 13.39)   | 4.03 (0.65 - 25.14)   |
| Omnibus p                  | 0.345                    | 0.990                 | 0.514                 |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; ** logistic regression; a externalising disorder symptoms based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years; b ODD: oppositional defiant disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years; c CD: conduct disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years; ADHD: attentional defiant hyperactivity disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
### Supplementary Table 20 Association between traumatic brain injury and orthopaedic injuries from birth to age 11 years and substance use at age 17 years on complete case sample

| Substance Use | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|---------------|-------------------------|---------------------|---------------------|---------------------|
| **Alcohol**   |                         |                     |                     |                     |
| n             | n = 1788                | n = 1788            | n = 1788            | n = 1788            |
| TBI vs no Injury | 1.25 (0.80 - 1.96)     | 1.24 (0.79 - 1.94)  | 1.18 (0.75 - 1.86)  | 1.13 (0.68 - 1.88)  |
| OI vs no Injury   | 0.88 (0.69 - 1.13) | 0.88 (0.69 - 1.12)  | 0.87 (0.68 - 1.12)  | 0.81 (0.61 - 1.07)  |
| TBI vs OI       | 1.42 (0.87 - 2.31)     | 1.41 (0.86 - 2.30)  | 1.35 (0.82 - 2.21)  | 1.40 (0.80 - 2.44)  |
| Omnibus p       | 0.429                   | 0.388               | 0.360               | 0.167               |
| **Tobacco**    |                         |                     |                     |                     |
| n             | n = 1788                | n = 1788            | n = 1788            | n = 1788            |
| TBI vs no Injury | 1.09 (0.64 - 1.87)     | 1.08 (0.63 - 1.85)  | 0.99 (0.57 - 1.72)  | 1.00 (0.53 - 1.87)  |
| OI vs no Injury   | 0.90 (0.66 - 1.21) | 0.91 (0.68 - 1.24)  | 0.91 (0.67 - 1.23)  | 0.83 (0.58 - 1.19)  |
| TBI vs OI       | 1.22 (0.68 - 2.19)     | 1.18 (0.65 - 2.13)  | 1.09 (0.60 - 2.00)  | 1.20 (0.60 - 2.39)  |
| Omnibus p       | 0.518                   | 0.596               | 0.532               | 0.328               |
| **Cannabis**   |                         |                     |                     |                     |
| n             | n = 1788                | n = 1788            | n = 1788            | n = 1788            |
| TBI vs no Injury | 1.45 (0.92 - 2.29)     | 1.47 (0.92 - 2.32)  | 1.37 (0.86 - 2.18)  | 1.47 (0.88 - 2.47)  |
| OI vs no Injury   | 1.03 (0.79 - 1.33) | 1.05 (0.80 - 1.36)  | 1.04 (0.80 - 1.36)  | 1.03 (0.76 - 1.40)  |
| TBI vs OI       | 1.41 (0.86 - 2.33)     | 1.40 (0.85 - 2.32)  | 1.32 (0.79 - 2.19)  | 1.43 (0.81 - 2.52)  |
| Omnibus p       | 0.659                   | 0.557               | 0.615               | 0.671               |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; **generalised ordinal regression; *alcohol measured using the Alcohol Use Disorder Identification Test (AUDIT); **tobacco measured using the Fagerström Test for Nicotine Dependence; **cannabis measured using the Cannabis Abuse Screening Test.

**Unadjusted**: Injuries from birth to age 16 years with main substance use variable in each analysis

**Model 1**: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)

**Model 2**: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)

**Model 3**: As Model 2 with additional adjustment for substance use and crime variables
Supplementary Table 21 Associations between traumatic brain injury from birth to age 11 years, with no additional orthopaedic injury, and substance use at age 17 years compared to orthopaedic injury on complete case sample

| Substance Use | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|---------------|------------------------|---------------------|---------------------|---------------------|
|               |                        |                     |                     |                     |
| Alcohol a*    |                        |                     |                     |                     |
| n             | n = 1762               | n = 1762            | n = 1762            | n = 1762            |
| TBI only vs OI| 1.72 (0.98 - 3.04)     | 1.70 (0.96 - 3.02)  | 1.61 (0.91 - 2.87)  | 1.64 (0.87 - 3.13)  |
| Omnibus p     | 0.453                  | 0.412               | 0.383               | 0.181               |
| Tobacco b**   |                        |                     |                     |                     |
| n             | n = 1762               | n = 1762            | n = 1762            | n = 1762            |
| TBI only vs OI| 1.18 (0.59 - 2.35)     | 1.17 (0.58 - 2.34)  | 1.07 (0.53 - 2.17)  | 0.98 (0.43 - 2.20)  |
| Omnibus p     | 0.495                  | 0.577               | 0.511               | 0.275               |
| Cannabis c**  |                        |                     |                     |                     |
| n             | n = 1762               | n = 1762            | n = 1762            | n = 1762            |
| TBI only vs OI| 1.58 (0.89 - 2.81)     | 1.58 (0.88 - 2.81)  | 1.47 (0.82 - 2.63)  | 1.51 (0.79 - 2.87)  |
| Omnibus p     | 0.672                  | 0.568               | 0.622               | 0.214               |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; a logistic regression; b**generalised ordinal regression; a alcohol measured using the Alcohol Use Disorder Identification Test (AUDIT); b tobacco measured using the Fagerström Test for Nicotine Dependence; c cannabis measured using the Cannabis Abuse Screening Test.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use and crime variables
Supplementary Table 22 Associations between traumatic brain injury and orthopaedic injuries from birth to age 11 years and criminal behaviour at age 17 years on complete case sample

| Criminal Behaviour | Unadjusted | Model 1 | Model 2 | Model 3 |
|--------------------|------------|---------|---------|---------|
| Offences           |            |         |         |         |
| n                  | n = 1818   | n = 1818| n = 1818| n = 1818|
| TBI vs no Injury   | 1.28 (0.74 - 2.21) | 1.12 (0.64 - 1.96) | 1.06 (0.60 - 1.86) | 0.97 (0.53 - 1.79) |
| OI vs no Injury    | 1.57 (1.18 - 2.08) | 1.57 (1.18 - 2.10) | 1.57 (1.17 - 2.09) | 1.78 (1.30 - 2.45) |
| TBI vs OI          | 0.82 (0.46 - 1.46) | 0.71 (0.39 - 1.29) | 0.68 (0.37 - 1.23) | 0.54 (0.28 - 1.04) |
| Omnibus p          | 0.002      | 0.002   | 0.003   | 0.001   |

| Trouble with the Police |            |         |         |         |
|-------------------------|------------|---------|---------|---------|
| n                       | n = 1790   | n = 1790| n = 1790| n = 1790|
| TBI vs no Injury        | 1.50 (0.85 - 2.63) | 1.24 (0.69 - 2.22) | 1.17 (0.65 - 2.11) | 1.17 (0.62 - 2.22) |
| OI vs no Injury         | 1.11 (0.79 - 1.54) | 1.06 (0.75 - 1.50) | 1.07 (0.76 - 1.51) | 1.15 (0.79 - 1.69) |
| TBI vs OI               | 1.35 (0.73 - 2.51) | 1.16 (0.61 - 2.21) | 1.09 (0.57 - 2.08) | 1.02 (0.50 - 2.06) |
| Omnibus p               | 0.422      | 0.654   | 0.635   | 0.432   |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; **generalised ordinal regression; a offences measured by self-report questionnaire at age 17 years; b trouble with the police measured by self-report questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use variables
Supplementary Table 23 Associations between traumatic brain injury from birth to age 11 years, with no additional orthopaedic injury, and criminal behaviour at age 17 years compared to orthopaedic injury on complete case sample

| Criminal Behaviour | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|--------------------|------------------------|---------------------|---------------------|---------------------|
| **Offences**  
TBI only vs OI  
* | n = 1792  
0.95 (0.49 - 1.84)  
0.001 | n = 1792  
0.83 (0.42 - 1.62)  
0.002 | n = 1792  
0.80 (0.40 - 1.57)  
0.002 | n = 1792  
0.65 (0.31 - 1.34)  
<0.001 |
| **Omnibus p** | 0.001 | 0.002 | 0.002 | <0.001 |
| **Trouble with the Police**  
TBI only vs OI  
** | n = 1764  
1.48 (0.74 - 2.99)  
0.431 | n = 1764  
1.25 (0.61 - 2.58)  
0.650 | n = 1764  
1.16 (0.56 - 2.42)  
0.634 | n = 1764  
1.04 (0.47 - 2.29)  
0.434 |
| **Omnibus p** | 0.431 | 0.650 | 0.634 | 0.434 |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; **generalised ordinal regression; a** Offences measured by self-report questionnaire at age 17 years; **b** Trouble with the police measured by self-report questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use variables
Supplementary Table 24 Associations between traumatic brain injury and orthopaedic injuries from birth to age 11 years and psychiatric symptoms based on the Strengths and Difficulties Questionnaire at age 17 years on complete case sample

| SDQ                  | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|----------------------|------------------------|---------------------|---------------------|
| Conduct problems a  |                        |                     |                     |
| n                    | n = 3937               | n = 3937            | n = 3937            |
| TBI vs no Injury     | 2.14 (1.26 – 3.63)     | 2.17 (1.28 - 3.70)  | 1.90 (1.11 - 3.26)  |
| OI vs no Injury      | 0.98 (0.68 – 1.41)     | 0.99 (0.68 – 1.43)  | 0.96 (0.66 - 1.39)  |
| TBI vs OI            | 2.19 (1.20 - 3.98)     | 2.20 (1.21 - 4.01)  | 1.98 (1.08 - 3.65)  |
| Omnibus p            | 0.752                  | 0.708               | 0.884               |
| Peer Problems b      |                        |                     |                     |
| n                    | n = 3924               | n = 3924            | n = 3924            |
| TBI vs no Injury     | 1.17 (0.68 - 2.02)     | 1.10 (0.63 - 1.90)  | 0.99 (0.57 - 1.21)  |
| OI vs no Injury      | 0.92 (0.68 - 1.25)     | 0.91 (0.67 - 1.24)  | 0.89 (0.65 - 1.21)  |
| TBI vs OI            | 1.26 (0.70 - 2.29)     | 1.20 (0.66 - 2.19)  | 1.12 (0.61 - 2.05)  |
| Omnibus p            | 0.684                  | 0.605               | 0.456               |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; a logistic regression; a conduct problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years; b peer problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Supplementary Table 25 Associations between traumatic brain injury from birth to age 11 years, with no additional orthopaedic injury, and psychiatric symptoms at age 17 years compared to orthopaedic injury on complete case sample

| SDQ | Unadjusted | Model 1 | Model 2 |
|-----|------------|---------|---------|
|     | OR (95% CI) | OR (95% CI) | OR (95% CI) |
| Conduct problems | | | |
| n | n = 3880 | n = 3880 | n = 3880 |
| TBI only vs OI | 3.02 (1.60 - 5.69) | 3.05 (1.61 - 5.76) | 2.77 (1.45 - 5.31) |
| Omnibus p | 0.716 | 0.667 | 0.826 |
| Peer Problems | | | |
| n | n = 3866 | n = 3866 | n = 3866 |
| TBI only vs OI | 1.42 (0.72 - 2.80) | 1.36 (0.69 - 2.69) | 1.28 (0.64 - 2.54) |
| Omnibus p | 0.695 | 0.623 | 0.481 |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; a conduct problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years; b peer problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Supplementary Table 26 Associations between traumatic brain injury and orthopaedic injuries from birth to age 11 years and psychiatric symptoms based on the Development and Well-Being Assessment (DAWBA) at age 15 years on complete case sample

| DAWBA | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|-------|------------------------|---------------------|---------------------|
|       | Externalising Behaviour |                     |                     |
|       | n = 3112               | n = 3112            | n = 3112            |
| TBI vs no Injury | 2.19 (1.20 - 4.00) | 2.11 (1.15 - 3.88) | 1.83 (0.98 - 3.41) |
| OI vs no Injury | 0.88 (0.56 - 1.39)  | 0.88 (0.55 - 1.38) | 0.87 (0.55 - 1.38) |
| TBI vs OI | 2.49 (1.24 - 5.01) | 2.41 (1.19 - 4.87) | 2.11 (1.03 - 4.32) |
| Omnibus p | 0.894                 | 0.866               | 0.796               |
|       | ODD                   |                     |                     |
|       | n = 3105               | n = 3105            | n = 3105            |
| TBI vs no Injury | 2.11 (1.07 - 4.17) | 2.04 (1.03 - 4.04) | 1.78 (0.89 - 3.58) |
| OI vs no Injury | 0.98 (0.60 - 1.60)  | 0.98 (0.60 - 1.60) | 0.98 (0.60 - 1.61) |
| TBI vs OI | 2.15 (0.99 - 4.67) | 2.08 (0.96 - 4.54) | 1.82 (0.82 - 4.01) |
| Omnibus p | 0.797                 | 0.820               | 0.851               |
|       | CD                    |                     |                     |
|       | n = 3104               | n = 3104            | n = 3104            |
| TBI vs no Injury | 0.91 (0.22 – 3.82) | 0.90 (0.21 – 3.80) | 0.72 (0.17 - 3.10) |
| OI vs no Injury | 0.83 (0.38 - 1.81)  | 0.83 (0.38 - 1.81) | 0.85 (0.39 - 1.86) |
| TBI vs OI | 1.09 (0.23 - 5.19) | 1.08 (0.23 - 5.17) | 0.94 (0.17 - 4.13) |
| Omnibus p | 0.641                 | 0.636               | 0.636               |
|       | ADHD                  |                     |                     |
|       | n = 3112               | n = 3112            | n = 3112            |
| TBI vs no Injury | 3.69 (1.23 - 11.12) | 3.39 (1.11 - 10.37) | 3.02 (0.97 - 9.36) |
| OI vs no Injury | 0.62 (0.18 - 2.13)  | 0.60 (0.18 - 2.07) | 0.57 (0.16 - 1.98) |
| TBI vs OI | 5.94 (1.31 - 26.81) | 5.62 (1.23 - 25.65) | 5.28 (1.14 - 24.51) |
| Omnibus p | 0.758                 | 0.702               | 0.623               |
Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; * logistic regression; a externalising disorder symptoms based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years; b ODD: oppositional defiant disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years; c CD: conduct disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years; d ADHD: attentional defiant hyperactivity disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Supplementary Table 27 Associations between traumatic brain injury from birth to age 11 years, with no additional orthopaedic injury, and psychiatric symptoms based on the Development and Well-Being Assessment (DAWBA) at age 15 years compared to orthopaedic injury on complete case sample

| DAWBA | Unadjusted | Model 1 | Model 2 |
|-------|------------|---------|---------|
|       | OR (95% CI)| OR (95% CI)| OR (95% CI) |
| n     | n = 3063 | n = 3063 | n = 3063 |
| Externalising Behaviour ** |          |         |         |
| TBI only vs OI | 2.25 (0.98 - 5.17) | 2.31 (1.01 - 5.32) | 1.99 (0.85 - 4.64) |
| Omnibus p | 0.759 | 0.747 | 0.698 |
| ODD ** |          |         |         |
| n     | n = 3056 | n = 3056 | n = 3056 |
| TBI only vs OI | 2.25 (0.93 - 5.44) | 2.28 (0.94 - 5.52) | 1.94 (0.79 - 4.79) |
| Omnibus p | 0.863 | 0.880 | 0.901 |
| CD ** |          |         |         |
| n     | n = 3055 | n = 3055 | n = 3055 |
| TBI only vs OI | 0.81 (0.10 - 6.54) | 0.88 (0.11 - 7.12) | 0.67 (0.08 - 5.60) |
| Omnibus p | 0.617 | 0.624 | 0.652 |
| ADHD |          |         |         |
| n     | n = 3063 | n = 3063 | n = 3063 |
| TBI only vs OI | 4.38 (0.72 - 26.52) | 4.77 (0.78 - 29.23) | 4.03 (0.65 - 25.14) |
| Omnibus p | 0.585 | 0.565 | 0.514 |

Complete cases had no missing data for the exposure, outcome or covariates. * TBI: traumatic brain injury; OI: orthopaedic injury; logistic regression; externalising disorder symptoms based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years; ODD: oppositional defiant disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years; CD: conduct disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years; ADHD: attentional defiant hyperactivity disorder based on the Development and Well-being Assessment (DAWBA) self-reported at age 15 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
### Supplementary Table 28: Associations between traumatic brain injury and orthopaedic injuries from age 12 to age 16 years and substance use at 17 years

| Substance Use | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|---------------|------------------------|---------------------|---------------------|---------------------|
| **Alcohol**   |                        |                     |                     |                     |
| n             | 2926                   | 2580                | 2263                | 1649                |
| TBI vs no Injury | 1.71 (1.28 - 2.27)     | 1.59 (1.17 - 2.15)  | 1.72 (1.25 - 2.37)  | 1.41 (0.93 - 2.15)  |
| OI vs no Injury    | 1.06 (0.83 - 1.35)     | 0.98 (0.75 - 1.27)  | 0.98 (0.74 - 1.31)  | 0.70 (0.47 - 1.04)  |
| TBI vs OI        | 1.61 (1.13 - 2.31)     | 1.62 (1.11 - 2.38)  | 1.76 (1.17 - 2.63)  | 2.03 (1.17 - 3.53)  |
| Omnibus p        | 0.116                  | 0.432               | 0.319               | 0.282               |
| **Tobacco**     |                        |                     |                     |                     |
| n             | 2488                   | 2193                | 1923                | 1649                |
| TBI vs no Injury | 1.56 (1.11 - 2.19)     | 1.67 (1.16 - 2.41)  | 1.71 (1.15 - 2.52)  | 1.15 (0.72 - 1.86)  |
| OI vs no Injury    | 1.50 (1.13 - 2.00)     | 1.61 (1.17 - 2.21)  | 1.76 (1.25 - 2.48)  | 2.00 (1.29 - 3.09)  |
| TBI vs OI        | 1.04 (0.68 - 1.58)     | 1.04 (0.66 - 1.63)  | 0.97 (0.60 - 1.57)  | 0.58 (0.32 - 1.06)  |
| Omnibus p        | 0.001                  | 0.000               | 0.000               | 0.003               |
| **Cannabis**    |                        |                     |                     |                     |
| n             | 3172                   | 2788                | 2439                | 1649                |
| TBI vs no Injury | 1.49 (1.11 - 1.99)     | 1.32 (0.97 - 1.81)  | 1.36 (0.98 - 1.88)  | 1.14 (0.74 - 1.76)  |
| OI vs no Injury    | 1.32 (1.03 - 1.68)     | 1.23 (0.95 - 1.60)  | 1.28 (0.96 - 1.72)  | 1.04 (0.69 - 1.58)  |
| TBI vs OI        | 1.13 (0.79 - 1.62)     | 1.08 (0.73 - 1.58)  | 1.06 (0.70 - 1.60)  | 1.09 (0.62 - 1.92)  |
| Omnibus p        | 0.004                  | 0.051               | 0.034               | 0.702               |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. **TBI**: traumatic brain injury; **OI**: orthopaedic injury; 
*logistic regression; **generalised ordinal regression; ^alcohol measured using the Alcohol Use Disorder Identification Test (AUDIT); b tobacco measured using the Fagerström Test for Nicotine Dependence; c cannabis measured using the Cannabis Abuse Screening Test.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis

Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)

Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)

Model 3: As Model 2 with additional adjustment for substance use and crime variables
Supplementary Table 29: Associations between traumatic brain injury from age 12 to age 16 years, with no additional orthopaedic injury, and substance use at age 17 years compared to orthopaedic injury

| Substance Use | Unadjusted | Model 1 | Model 2 | Model 3 |
|---------------|------------|---------|---------|---------|
|               | OR (95% CI)| OR (95% CI) | OR (95% CI) | OR (95% CI) |
| Alcohol a*    | n = 2890    | n = 2548 | n = 2232 | n = 1625 |
| TBI only vs OI| 1.59 (1.09 - 2.32) | 1.58 (1.06 - 2.37) | 1.76 (1.14 - 2.71) | 2.41 (1.35 - 4.29) |
| Omnibus p     | 0.172       | 0.540    | 0.403    | 0.364    |
| Tobacco b**   | n = 2455    | n = 2164 | n = 1895 | n = 1625 |
| TBI only vs OI| 0.95 (0.60 - 1.49) | 0.89 (0.54 - 1.47) | 0.82 (0.48 - 1.40) | 0.59 (0.31 - 1.13) |
| Omnibus p     | 0.002       | 0.001    | <0.001   | 0.002    |
| Cannabis c**  | n = 3135    | n = 2755 | n = 2407 | n = 1625 |
| TBI only vs OI| 1.06 (0.72 - 1.56) | 0.997 (0.66 - 1.51) | 0.97 (0.62 - 1.51) | 1.12 (0.61 - 2.03) |
| Omnibus p     | 0.008       | 0.070    | 0.051    | 0.714    |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; **generalised ordinal regression; a alcohol measured using the Alcohol Use Disorder Identification Test (AUDIT); b tobacco measured using the Fagerström Test for Nicotine Dependence; c cannabis measured using the Cannabis Abuse Screening Test.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use and crime variables
Supplementary Table 30 Associations between traumatic brain injury and orthopaedic injuries from age 12 to 16 years and criminal behaviour at age 17 years

| Criminal Behaviour | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|--------------------|------------------------|---------------------|---------------------|---------------------|
| Offences a**       |                        |                     |                     |                     |
| n                  | n = 3079               | n = 2718            | n = 2372            | n = 1681            |
| TBI vs no Injury   | 2.05 (1.50 - 2.80)     | 1.88 (1.34 - 2.63)  | 1.99 (1.40 - 2.82)  | 1.52 (0.97 - 2.39)  |
| OI vs no Injury    | 1.89 (1.44 - 2.45)     | 1.47 (1.09 - 1.97)  | 1.53 (1.11 - 2.11)  | 1.49 (0.99 - 2.24)  |
| TBI vs OI          | 1.09 (0.74 - 1.60)     | 1.28 (0.85 - 1.94)  | 1.30 (0.83 - 2.01)  | 1.02 (0.58 - 1.79)  |
| Omnibus p          | <0.001                 | 0.001               | <0.001              | 0.022               |

Trouble with the Police b**

| n                  | n = 3024               | n = 2668            | n = 2339            | n = 1651            |
| TBI vs no Injury   | 1.74 (1.22 - 2.48)     | 1.43 (0.96 - 2.13)  | 1.51 (1.00 - 2.29)  | 1.21 (0.72 - 2.03)  |
| OI vs no Injury    | 1.59 (1.17 - 2.17)     | 1.09 (0.77 - 1.54)  | 1.12 (0.77 - 1.64)  | 0.86 (0.52 - 1.42)  |
| TBI vs OI          | 1.09 (0.70 - 1.70)     | 1.31 (0.80 - 2.15)  | 1.35 (0.80 - 2.27)  | 1.41 (0.72 - 2.77)  |
| Omnibus p          | <0.001                 | 0.360               | 0.252               | 0.756               |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; **generalised ordinal regression; a**offences measured by self-report questionnaire at age 17 years; b**trouble with the police measured by self-report questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use variables
Supplementary Table 31 Associations between traumatic brain injury from age 12 to age 16 years, with no additional orthopaedic injury, and criminal behaviour at age 17 years compared to orthopaedic injury

| Criminal Behaviour | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|-------------------|------------------------|---------------------|---------------------|---------------------|
| Offences a**      |                        |                     |                     |                     |
| \( n \)           | \( n = 3043 \)         | \( n = 2682 \)      | \( n = 2341 \)      | \( n = 1657 \)      |
| TBI only vs OI    | 0.94 (0.62 - 1.42)     | 1.09 (0.70 - 1.71)  | 1.09 (0.67 - 1.75)  | 0.85 (0.46 - 1.58)  |
| Omnibus \( p \)   | <0.001                 | 0.002               | 0.002               | 0.041               |

| Trouble with the Police b** |
|-----------------------------|
| \( n \)                     | \( n = 2988 \)         | \( n = 2636 \)      | \( n = 2308 \)      | \( n = 1627 \)      |
| TBI only vs OI              | 0.80 (0.48 - 1.31)     | 0.90 (0.51 - 1.58)  | 0.90 (0.50 - 1.64)  | 0.92 (0.43 - 1.99)  |
| Omnibus \( p \)             | 0.002                  | 0.662               | 0.538               | 0.435               |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; **generalised ordinal regression; a** offences measured by self-report questionnaire at age 17 years; b trouble with the police measured by self-report questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use variables
Supplementary Table 32: Associations between traumatic brain injury and orthopaedic injuries from age 12 to 16 years and psychiatric symptoms based on the Strengths and Difficulties Questionnaire at age 17 years

| SDQ                        | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|----------------------------|------------------------|---------------------|---------------------|
| Conduct problems a*        |                        |                     |                     |
| **n**                      | **n = 4460**           | **n = 3939**        | **n = 3536**        |
| TBI vs no Injury           | 1.21 (0.74 - 1.96)     | 1.41 (0.84 - 2.38)  | 1.39 (0.81 - 2.39)  |
| OI vs no Injury            | 1.39 (0.92 - 2.12)     | 1.46 (0.92 - 2.31)  | 1.37 (0.84 - 2.24)  |
| TBI vs OI                  | 0.87 (0.47 - 1.59)     | 0.97 (0.50 - 1.85)  | 1.02 (0.51 - 2.02)  |
| Omnibus p                  | 0.095                  | 0.058               | 0.126               |

| Peer Problems b*           |                        |                     |                     |
| **n**                      | **n = 4452**           | **n = 3929**        | **n = 3526**        |
| TBI vs no Injury           | 0.87 (0.55 - 1.38)     | 0.75 (0.45 - 1.25)  | 0.72 (0.42 - 1.24)  |
| OI vs no Injury            | 0.87 (0.57 - 1.32)     | 0.56 (0.34 - 0.93)  | 0.55 (0.32 - 0.95)  |
| TBI vs OI                  | 1.00 (0.55 - 1.81)     | 1.35 (0.67 - 2.69)  | 1.30 (0.62 - 2.74)  |
| Omnibus p                  | 0.421                  | 0.014               | 0.018               |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; a conduct problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years; b peer problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Supplementary Table 33 Associations between traumatic brain injury from age 12 to age 16 years, with no additional orthopaedic injury, and psychiatric symptoms at age 17 years compared to orthopaedic injury

| SDQ                          | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|------------------------------|------------------------|---------------------|---------------------|
| Conduct problems a*          |                        |                     |                     |
| n                            | n = 4404               | n = 3890            | n = 3490            |
| TBI only vs OI               | 1.01 (0.54 - 1.87)     | 1.13 (0.58 - 2.19)  | 1.18 (0.58 - 2.38)  |
| Omnibus p                    | 0.065                  | 0.042               | 0.096               |
| Peer Problems b*             |                        |                     |                     |
| n                            | n = 4396               | n = 3880            | n = 3480            |
| TBI only vs OI               | 1.17 (0.64 - 2.14)     | 1.58 (0.78 - 3.21)  | 1.51 (0.71 - 3.22)  |
| Omnibus p                    | 0.560                  | 0.024               | 0.029               |

Sample size reduces per adjustment as the participants who are missing covariate data get excluded. TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; a conduct problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years; b peer problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Supplementary Table 34 Associations between traumatic brain injury and orthopaedic injuries from age 12 to age 16 years and substance use at 17 years on complete case sample

| Substance Use | Unadjusted | Model 1 | Model 2 | Model 3 |
|---------------|------------|---------|---------|---------|
|               | OR (95% CI)| OR (95% CI)| OR (95% CI)| OR (95% CI)|
| Alcohol[^a^]  |            |         |         |         |
| n             | 1649       | 1649    | 1649    | 1649    |
| TBI vs no Injury | 1.76 (1.22 - 2.54) | 1.72 (1.19 - 2.49) | 1.71 (0.60 - 1.20) | 1.41 (0.93 - 2.15) |
| TBI vs OI      | 2.00 (1.24 - 3.21) | 2.05 (1.27 - 3.31) | 2.02 (1.24 - 3.27) | 2.03 (1.17 - 3.53) |
| Omnibus p      | 0.721      | 0.964   | 0.915   | 0.282   |

| Tobacco [^b^][^***^] |
|----------------------|
| n                    | 1649       | 1649    | 1649    | 1649    |
| TBI vs no Injury      | 1.55 (1.04 - 2.31) | 1.70 (1.13 - 2.55) | 1.69 (1.12 - 2.55) | 1.15 (0.72 - 1.86) |
| TBI vs OI             | 1.00 (0.60 - 1.65) | 1.06 (0.64 - 1.77) | 1.01 (0.60 - 1.69) | 0.58 (0.32 - 1.06) |
| Omnibus p             | 0.004      | 0.002   | 0.001   | 0.003   |

| Cannabis [^c^][^***^] |
|-----------------------|
| n                     | 1649       | 1649    | 1649    | 1649    |
| TBI vs no Injury       | 1.71 (1.17 - 2.48) | 1.64 (1.12 - 2.39) | 1.64 (1.12 - 2.41) | 1.14 (0.74 - 1.76) |
| TBI vs OI              | 1.35 (0.84 - 2.19) | 1.39 (0.85 - 2.26) | 1.39 (0.85 - 2.27) | 1.09 (0.62 - 1.92) |
| Omnibus p              | 0.035      | 0.094   | 0.092   | 0.702   |

Complete cases had no missing data for the exposure, outcome or covariates. **TBI**: traumatic brain injury; **OI**: orthopaedic injury; **[^a^]** logistic regression; **[^b^]** generalised ordinal regression; **[^c^]** alcohol measured using the Alcohol Use Disorder Identification Test (AUDIT); **[^***^]** tobacco measured using the Fagerström Test for Nicotine Dependence; **[^***^]** cannabis measured using the Cannabis Abuse Screening Test.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis

Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)

Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)

Model 3: As Model 2 with additional adjustment for substance use and crime variables
Supplementary Table 35 Associations between traumatic brain injury from age 12 to age 16 years, with no additional orthopaedic injury, and substance use at age 17 years compared to orthopaedic injury on complete case sample

| Substance Use | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|---------------|------------------------|---------------------|---------------------|---------------------|
| Alcohol a*    | n = 1625               | n = 1625            | n = 1625            | n = 1625            |
| TBI only vs OI| 2.07 (1.25 - 3.43)     | 2.13 (1.28 - 3.55)  | 2.09 (1.25 - 3.49)  | 2.41 (1.35 - 4.29)  |
| Omnibus p     | 0.823                  | 0.952               | 0.997               | 0.364               |
| Tobacco b**   | n = 1625               | n = 1625            | n = 1625            | n = 1625            |
| TBI only vs OI| 0.83 (0.47 - 1.44)     | 0.89 (0.51 - 1.56)  | 0.84 (0.48 - 1.49)  | 0.59 (0.31 - 1.13)  |
| Omnibus p     | 0.011                  | 0.006               | 0.003               | 0.002               |
| Cannabis c**  | n = 1625               | n = 1625            | n = 1625            | n = 1625            |
| TBI only vs OI| 1.16 (0.69 - 1.95)     | 1.21 (0.72 - 2.05)  | 1.21 (0.71 - 2.06)  | 1.12 (0.61 - 2.03)  |
| Omnibus p     | 0.081                  | 0.164               | 0.163               | 0.714               |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; a logistic regression; b generalised ordinal regression; c alcohol measured using the Alcohol Use Disorder Identification Test (AUDIT); smoking; Fagerström Test for Nicotine Dependence; cannabis measured using the Cannabis Abuse Screening Test.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use and crime variables
Supplementary Table 36: Associations between traumatic brain injury and orthopaedic injuries from age 12 to 16 years and criminal behaviour at age 17 years on complete case sample

| Criminal Behaviour | Unadjusted | Model 1 | Model 2 | Model 3 |
|--------------------|------------|---------|---------|---------|
|                    | OR (95% CI)| OR (95% CI)| OR (95% CI)| OR (95% CI)|
| **Offences**<sup>a</sup> | n = 1681 | n = 1681 | n = 1681 | n = 1681 |
| TBI vs no Injury   | 2.22 (1.49 - 3.30) | 2.02 (1.35 - 3.02) | 2.01 (1.34 - 3.01) | 1.52 (0.97 - 2.39) |
| OI vs no Injury    | 2.01 (1.40 - 2.88) | 1.59 (1.10 - 2.30) | 1.59 (1.10 - 2.30) | 1.49 (0.99 - 2.24) |
| TBI vs OI          | 1.10 (0.67 - 1.81) | 1.27 (0.76 - 2.10) | 1.27 (0.76 - 2.11) | 1.02 (0.58 - 1.79) |
| Omnibus p          | <0.001     | 0.001    | 0.001    | 0.022    |

| **Trouble with the Police**<sup>b</sup> | n = 1651 | n = 1651 | n = 1651 | n = 1651 |
|----------------------------------------|---------|---------|---------|---------|
| TBI vs no Injury                       | 1.89 (1.22 - 2.94) | 1.75 (1.11 - 2.76) | 1.74 (1.10 - 2.76) | 1.21 (0.72 - 2.03) |
| OI vs no Injury                        | 1.26 (0.81 - 1.95) | 0.90 (0.57 - 1.42) | 0.91 (0.57 - 1.43) | 0.86 (0.52 - 1.42) |
| TBI vs OI                              | 1.51 (0.84 - 2.70) | 1.94 (1.06 - 3.55) | 1.92 (1.05 - 3.53) | 1.41 (0.72 - 2.77) |
| Omnibus p                              | 0.063   | 0.751  | 0.728  | 0.756 |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; **generalised ordinal regression; <sup>a</sup>offences measured by self-report questionnaire at age 17 years; <sup>b</sup>trouble with the police measured by self-report questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use variables
Supplementary Table 37 Associations between traumatic brain injury from age 12 to age 16 years, with no additional orthopaedic injury, and criminal behaviour at age 17 years compared to orthopaedic injury on complete case sample

| Criminal Behaviour | Unadjusted | Model 1 | Model 2 | Model 3 |
|--------------------|------------|---------|---------|---------|
|                    | OR (95% CI)| OR (95% CI)| OR (95% CI)| OR (95% CI)|
| **Offences a**     |            |         |         |         |
| n                  | n = 1657   | n = 1657 | n = 1657 | n = 1657 |
| TBI only vs OI     | 0.87 (0.50 - 1.50) | 1.03 (0.59 - 1.79) | 1.03 (0.59 - 1.80) | 0.85 (0.46 - 1.58) |
| Omnibus p          | <0.001     | 0.004   | 0.004   | 0.041   |
| **Trouble with the Police b** |            |         |         |         |
| n                  | n = 1627   | n = 1627 | n = 1627 | n = 1627 |
| TBI only vs OI     | 0.91 (0.47 - 1.79) | 1.20 (0.60 - 2.41) | 1.19 (0.59 - 2.38) | 0.92 (0.43 - 1.99) |
| Omnibus p          | 0.277      | 0.744   | 0.767   | 0.435   |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; *generalised ordinal regression; a offences measured by self-report questionnaire at age 17 years; b trouble with the police measured by self-report questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Model 3: As Model 2 with additional adjustment for substance use variables
Supplementary Table 38 Associations between traumatic brain injury and orthopaedic injuries from age 12 to 16 years and psychiatric symptoms based on the Strengths and Difficulties Questionnaire at age 17 years on complete case sample

| SDQ                        | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|----------------------------|------------------------|---------------------|---------------------|
| **Conduct problems a**     |                        |                     |                     |
| n                          | n = 3536               | n = 3536            | n = 3536            |
| TBI vs no Injury           | 1.31 (0.77 – 2.24)     | 1.41 (0.83 – 2.41)  | 1.39 (0.81 - 2.39)  |
| OI vs no Injury            | 1.35 (0.83 - 2.19)     | 1.37 (0.84 – 2.24)  | 1.37 (0.84 - 2.24)  |
| TBI vs OI                  | 0.97 (0.49 - 1.91)     | 1.03 (0.52 - 2.03)  | 1.02 (0.51 - 2.02)  |
| Omnibus p                  | 0.147                  | 0.116               | 0.126               |

| **Peer Problems b**        |                        |                     |                     |
| n                          | n = 3526               | n = 3526            | n = 3526            |
| TBI vs no Injury           | 0.76 (0.44 – 1.30)     | 0.71 (0.41 – 1.22)  | 0.72 (0.42 - 1.24)  |
| OI vs no Injury            | 0.62 (0.36 - 1.06)     | 0.55 (0.32 - 0.94)  | 0.55 (0.32 - 0.95)  |
| TBI vs OI                  | 1.22 (0.59 - 2.55)     | 1.29 (0.62 - 2.70)  | 1.30 (0.62 - 2.74)  |
| Omnibus p                  | 0.053                  | 0.015               | 0.018               |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; a logistic regression; a conduct problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years; b peer problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)
Supplementary Table 39 Associations between traumatic brain injury from age 12 to age 16 years, with no additional orthopaedic injury, and psychiatric symptoms at age 17 years compared to orthopaedic injury on complete case sample

| SDQ                  | Unadjusted OR (95% CI) | Model 1 OR (95% CI) | Model 2 OR (95% CI) |
|----------------------|------------------------|---------------------|---------------------|
| **Conduct problems a** |                        |                     |                     |
| n                    | n = 3490               | n = 3490            | n = 3490            |
| TBI only vs OI       | 1.13 (0.56 - 2.25)     | 1.2 (0.60 - 2.42)   | 1.18 (0.58 - 2.38)  |
| Omnibus p            | 0.111                  | 0.088               | 0.096               |
| **Peer Problems b**  |                        |                     |                     |
| n                    | n = 3480               | n = 3480            | n = 3480            |
| TBI only vs OI       | 1.41 (0.66 - 2.98)     | 1.51 (0.71 - 3.21)  | 1.51 (0.71 - 3.22)  |
| Omnibus p            | 0.079                  | 0.025               | 0.029               |

Complete cases had no missing data for the exposure, outcome or covariates. TBI: traumatic brain injury; OI: orthopaedic injury; *logistic regression; a conduct problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years; b peer problems based on parent-completed Strengths and Difficulties Questionnaire at age 17 years.

Unadjusted: Injuries from birth to age 16 years with main substance use variable in each analysis
Model 1: As unadjusted with additional adjustment for pre-birth confounders (mother’s age at birth, mother’s education at birth, social class and gender)
Model 2: As Model 1 with additional adjustment for childhood confounders (early life events, parental bonding, positive and negative parenting experiences, maternal alcohol use and maternal tobacco smoking)