Family adversity and health characteristics associated with intimate partner violence in children and parents presenting to health care: a population-based birth cohort study in England

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Summary

Background Little is known about the clinical characteristics of children and parents affected by intimate partner violence (IPV) presenting in health-care settings. We examined the associations between family adversities, health characteristics, and IPV in children and parents using linked electronic health records (EHRs) from primary and secondary care between 1 year before and 2 years after birth (the first 1000 days). We compared parental health problems in in children and parents with and without recorded IPV.

Methods We developed a population-based birth cohort of children and parents (aged 14–60 years) in England, comprising linked EHRs from mother–child pairs (with no identified father) and mother–father–child triads. We followed the cohort across general practices (Clinical Practice Research Datalink GOLD), emergency departments, outpatient visits, hospital admissions, and mortality records. Family adversities included 33 clinical indicators of parental mental health problems, parental substance misuse, adverse family environments, and high-risk child maltreatment-related presentations. Parental health problems included 12 common comorbidities, ranging from diabetes and cardiovascular diseases to chronic pain or digestive diseases. We used adjusted and weighted logistic-regression models to estimate the probability of IPV (per 100 children and parents) associated with each adversity, and period prevalences of parental health problems associated with IPV.

Findings We included 129 948 children and parents, comprising 95 290 (73·3%) mother–father–child triads and 34 658 (26·7%) mother–child pairs only between April 1, 2007, and Jan 29, 2020. An estimated 2689 (2·1%) of 129 948 children and parents (95% CI 2·0–2·3) had recorded IPV and 54 758 (41·2%; 41·5–42·2) had any family adversity between 1 year before and 2 years after birth. All family adversities were significantly associated with IPV. Most parents and children with IPV had recorded adversities (1612 [60·0%] of 2689) before their first IPV recording. The probability of IPV was 0·6 per 100 children and parents (95% CI 0·5–0·6) with no adversity, increasing to 4·4 per 100 children per parents (4·2–4·7) with one adversity, and up to 15·1 per 100 parents and children (13·6–16·5) with three of more adversities. Mothers with IPV had a significantly higher prevalence of both physical (73·4% *vs* 63·1%, odds ratio [OR] 1·6, 95% CI 1·4–1·8) and mental health problems (58·4% *vs* 22·2%, OR 4·9, 4·4–5·5) than mothers without IPV. Fathers with IPV had a higher prevalence of mental health problems (17·8% *vs* 7·1%, OR 2·8, 2·4–3·2) and similar prevalences of physical health problems than those without IPV (29·6% *vs* 32·4%, OR 0·9, 0·8–1·0).

Interpretation Two in five of the children and parents presenting to health care had recorded parental mental health problems, parental substance misuse, adverse family environments, or high-risk presentations of maltreatment in the first 1000 days. One in 22 children and parents with family adversity also had recorded IPV before age 2 years. Primary and secondary care staff should safely ask about IPV when parents or children present with family adversity or health problems associated with IPV, and respond appropriately.

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Introduction

Intimate partner violence (IPV) is a violation of human rights, affecting nearly one in five children in England,[1] and between 23% and 31% of women aged 15–49 years globally.[2] The WHO define IPV as any behaviour causing physical, psychological, or sexual harm within intimate relationships, including parents and their children.[3] IPV often co-occurs with other family adversities and is linked to several mental and physical health problems, increased health and social care needs, and risk of premature death.[2,4–16] Despite the increased health-care needs of families affected by IPV, most clinicians do not identify IPV in general practice,[17] missing the opportunity to support vulnerable families affected by IPV.[16]

The WHO and national guidelines in the UK and USA recommend targeted support to parents and children

Research in context

Evidence before this study

Intimate partner violence (IPV) affects an estimated one in five children and parents in England. Clinical guidelines and policies focus on identifying and responding to families with additional adversity early in life. However, there is scarce evidence on the prevalence and risk indicators of children and parents with IPV presenting to health care. We searched MEDLINE, Embase, and PsycINFO on March 18, 2023, for articles published in English between Jan 1, 2000 and March 18, 2023, with the search terms ("intimate" OR "domestic") AND (violence OR abuse OR maltreatment*) AND (parent* OR mother* OR maternal OR father* OR paternal OR family OR families OR child*) AND (health OR primary OR secondary OR medical OR emergency*) AND (care* OR department*). Of the 322 identified non-duplicated articles, we found no study on indicators of vulnerable families using linked child and parent data in generalist health-care settings. Evidence to inform primary and secondary care responses to indicators of IPV among children and parents was scarce.

Added value of this study

To our knowledge, this is the first comprehensive study to examine several adversity and health-related indicators of IPV using electronic health records of families presenting to primary and secondary care. We used a large English birth cohort of 129 948 children (born 2008–19) with linked mothers and fathers followed across general practices, emergency departments, outpatients, and hospital admissions from 1 year before birth to 2 years after birth. Family adversities were highly prevalent in the health-care records of children and parents and were associated with an increased probability of IPV before the child turned 2 years of age. The highest probability of IPV was among families with three or more adversities, families in which both parents and the child had at least one adversity, or among parents with self-harm, suicide attempts, severe drug misuse, or personality disorders. Half of all adversities were only recorded in maternal and primary care records.

Implications of all the available evidence

There is a high likelihood of IPV when children or parents present to health care with different indicators of family adversity, ranging from parental mental health and substance misuse problems to repeatedly missed child appointments. Health professionals in primary and secondary care should safely ask about IPV when parents or children present with family adversity or health problems associated with IPV, and respond appropriately. Most family adversities were identified via parents only, reinforcing the importance of a think-family approach to identify and respond to IPV, including reviewing both parents and children's records.

presenting to health care with indicators of IPV during the early life course.[18–25] However, evidence to inform guidelines on the clinical indicators of children and parents that could prompt asking about IPV during routine health-care visits is scarce.[19,25] Most studies have examined family characteristics of IPV using population-based surveys involving mothers or children only,[10,26–28] rather than longitudinal health-care data of both children and parents in the early years.[29] Compared with other adversities and settings, identifying families with IPV in health care is particularly challenging because of parents' fears of consequences, such as children being removed from the home or retaliation from the perpetrator.[30] Other barriers to reporting IPV include limited professional training in effectively recognising IPV indicators, and ethical concerns about the legal implications of reporting (eg, children being taken away).[22,31] Studies on clinically relevant indicators of families with IPV in health care rely on data from individual family members (eg, parents or children) or data sources in isolation (eg, hospital admissions),[32] which underestimate the needs of children and parents presenting to primary care.

In the UK, parents and children routinely attend health care for antenatal, maternity, and childhood vaccination appointments before and after birth.[33,34] The ability to link parents and children's electronic health records (EHRs) provides an opportunity to apply a so-called think-family approach[35] to examine child and parent characteristics associated with IPV before and after birth.[7,36] In this population-based birth cohort study, we used linked EHRs of children, mothers, and potential fathers to evaluate adversity and health-related indicators of IPV in the first 1000 days, which could inform early identification and support via prioritised family–child interventions.[21,37–40] First, we described the prevalence and distribution of IPV and family adversities in EHRs of parents and children. Then, we determined the association between different adversities and IPV, from the records of the child or parents. Finally, we described the prevalence of parental physical and mental health problems among families with and without IPV.

Methods

Study design and participants

We derived a population-based birth cohort of mothers and children from the mother baby link (MBL) linkage key provided by the Clinical Practice Research Datalink GOLD (CPRD-GOLD) accessed via CALIBER (appendix pp 2–4),[41] linked to the Hospital Episodes Statistics Admitted Patient Care (HES-APC), HES Accident and Emergency (HES-A&E), HES Outpatient (HES-OP), the Index of Multiple Deprivation 2019 (IMD-2019), and the mortality register from the Office for National Statistics (ONS; figure 1). CPRD-GOLD is a primary care database holding patient data from approximately 6·9% of UK general practices (2014 estimate) and is broadly

See Online for appendix

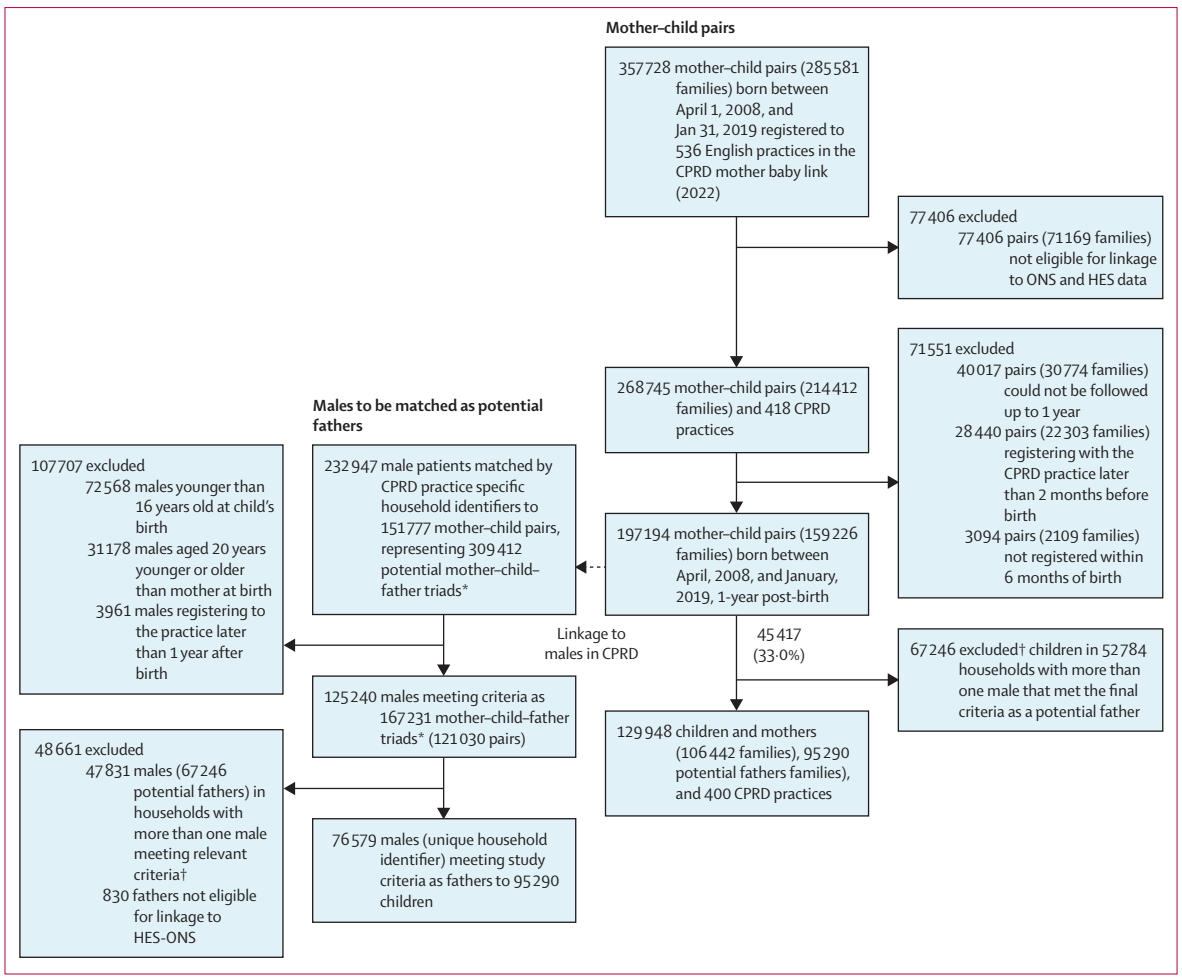

Figure 1: **Mother–child birth cohort selection and linkage of fathers**

CRPD=Clinical Practice Research Datalink. HES-ONS=Hospital Episodes Statistics-Office for National Statistics. *n greater than the number of children when several male individuals in the same household were matched as a potential father to the same child. †Exclusions of 48 661 male individuals and 67 246 children in households with more than one eligible male who met all other criteria as a potential father (appendix pp 8–9, 21–22 shows the results from sensitivity analyses when keeping mother–child pairs matched to several eligible males by selecting one random male).

representative of the general population.[42] The data is recorded during routine visits or opportunistically during patient care. The CPRD-MBL contains mother–child pairs linked with high validity using CPRD practice-specific household identifiers (eg, home addresses) and maternity records.[43] In 2007, the CPRD-MBL contained 423 English practices consenting for linkage to other data sources. Most practices (313 [74·0%] of 423) contributed data until 2014 (midpoint of our study period). The HES-APC, HES-A&E, and HES-OP are secondary care databases containing individual-level data of all hospital admissions, accident and emergency attendances, and outpatient appointments funded by the English National Health Service (NHS).[44] The IMD-2019 is the official English metric for relative deprivation on the basis of seven domains (eg, income and employment status), linked to the postcodes of patients.[45] The IMD can be classified into five quantiles, from the least to the most deprived.

The birth cohort comprised parents and children defined as mother–child pairs (ie, no identified father) and mother–father–child triads (figure 1). Of the linked mother–child pairs, we included mothers with births between April 1, 2008, and Jan 30, 2019, if the child was registered with a CPRD practice within 6 months of birth and had a minimum of 1 year follow-up after birth in CPRD. Mothers had to register with the CPRD practice at least 2 months before delivery to ensure adequate data to derive pregnancy and birth covariates.[46] To identify mother–father–child triads, we followed previous English primary care studies[47] and linked mother–child pairs in CPRD-MBL to a sole male with the same unique practice-specific household identifier, aged at least 16 years at the delivery date, with less than 21 years of age difference relative to the mother, and who registered with the practice within 1 year after birth (appendix p 5). For the primary analyses, we excluded mother–child pairs with

several matched men meeting all the aforementioned criteria (67 246 pairs), because we could not distinguish the father from these men.[47]

Data selection

We included data from 1 year before birth (minimum of 2 months before birth) and 2 years after birth (minimum 1 year after birth) between April 1, 2007, and Jan 29, 2020, when all data sources were concurrent and before the first officially recorded COVID-19 case in the UK.[48] We restricted the data to clinical events recorded in any child, mother, or father record up to 1 year before and 2 years after birth. This period includes the first 1000 days of the life of a child from conception to age 2 years, consistent with prioritised family–child care interventions.[21,37–39] The study was approved by the MHRA (UK) Independent Scientific Advisory Committee (protocol 21_000587), under section 251 (NHS Social Care Act 2006).[49] CPRD hold the ethics approval from the Health Research Authority for using anonymised patient data, which does not require informed consent.

For more on the **code lists and algorithms** see www.ACEsinEHRs.com

IPV

The primary outcome was the first record of IPV in the EHR of the child, mother, or father between 1 year before and 2 years after birth using a validated algorithm.[7] The validated IPV indicators included assaults (predominately in the mother), child protection, safeguarding or police incidents, and IPV-related deaths from the ONS.[7] The algorithm combined several IPV indicators from the records of children (eg, 13HP600, violence between parents) and parents (eg, 14X8.00, victim of domestic violence) across any of the linked data sources. In sensitivity analyses, we expanded the outcome into a composite variable of IPV or child maltreatment (appendix p 6). Child maltreatment and IPV are highly correlated and consistently co-occur in records of families across data sources.[7,22,29]

For **complete code list from the ONS** see www.ACEsinEHRs.com

Family adversity

We included 33 clinical indicators of family adversity organised into four clinically meaningful and validated adversity domains for identifying vulnerable families in EHRs consistent with national guidelines (appendix p 6).[7,22,29,50] The four family adversity domains included parental substance misuse (three indicators), parental mental health problems (14 indicators), adverse family environment (12 indicators), and high-risk presentations of child maltreatment (four indicators in children).[7] Consistent with previous studies,[7,9] we derived variables for the total number of different family adversities recorded in each pair or triad (none, one, two, or three or more adversities) and different combinations of adversities to examine co-occurrences. We have described the development, validation, and clinical relevance of the selected adversity indicators elsewhere.[7,29] In brief, we defined indicators by combining information from mother, father, or child EHRs from all sources (eg, read codes, International Classification of Diseases 9th or 10th edition, prescriptions, and self-reported measures). We used several rule-based algorithms to classify specific indicators (eg, fractures, head injuries, and psychotropic medications) to prevent misclassification (eg, accidents and medications used for non-mental health purposes). We treated children, mothers, or fathers with no adversity indicator during the study period as unexposed. All code lists and algorithms are freely available online.

Parental physical and mental health problems

We compared the prevalence of parental health problems among children and parents with and without IPV. We included 12 domains of parental health problems, including two family adversity domains (parental mental health problems and substance misuses) on the basis of the top ten most common conditions among female and male individuals aged 15–49 years in England in the Global Burden of Disease study 2019 (appendix pp 19–20).[51] We included musculoskeletal disorders, chronic pain, chronic respiratory diseases, neoplasms, neurological disorders, digestive diseases, diabetes and kidney diseases, cardiovascular diseases, nutritional deficiencies, and other non-communicable diseases. We added a chronic pain indicator to separate chronic pain diagnoses or pain symptoms lasting longer than 90 days using algorithms from previous primary care studies (appendix p 21).[52]

Birth cohort characteristics

To describe baseline cohort characteristics and variables to calculate inverse probability weights,[46] we derived IMD, parent age at birth, parity at the birth of the child, birthweight, gestational age, congenital anomalies (EUROCAT guidelines),[53] and the total number of maternal comorbidities. We selected maternal over paternal shared characteristics such as IMD to maximise data completeness, because some families did not have an eligible father (26·7% were mother–child pairs only).

Statistical analysis

We presented baseline characteristics as frequencies (percentages) for categorical data and median (IQR) for continuous variables. We examined the distribution of the first recorded IPV and family adversities using time since birth as the underlying timescale. For each pair or triad, follow-up started at the earliest practice registration between 1 year and 2 months before birth. Follow-up ended at earliest practice deregistration, the last data collection date from the practice, death, the study end date, or the second birthday of the child, or whichever came first in the pair or the triad.

Because the outcome of IPV was rare and recording may be delayed, we could not meaningfully separate time

periods for exposures and outcomes to use the underlying time-to-event data for modelling. Therefore, we used logistic regression models to examine the association between each adversity and IPV to estimate odds ratios and marginal predictions for probabilities.[54] We re-expressed probabilities to 100s to aid interpretation (ie, one in 100). We adjusted the models for the birth year of the children to account for potential changes in coding practices over time.[55] We included the family identifier as a cluster variable to calculate robust standard errors to account for several siblings per mother.

We used logistic regression models with inverse probability weights (IPWs; adjusted for calendar birth years) to compute period prevalences of physical and mental health problems among families with and without IPV. All models used IPWs (appendix p 7),[56,57] to account for potential attrition bias of mothers who registered with a general practitioner later than 2 months before birth and children who could not be followed beyond their first birthday. We calculated the IPWs using a logit regression model with predictor variables of attrition described previously by Abel and colleagues[58] and Syed and colleagues (appendix p 7).

We did six sensitivity analyses to test the robustness of our estimates. First, we expanded the primary outcome to include any child maltreatment or IPV, increasing statistical power. Second, we increased the follow-up to 5 years after birth. Third, we restricted the cohort to births between 2012 and 2019 to assess the influence of increased data collection rates in HES-A&E in 2012 onwards. Fourth, we examined whether estimates based on EHRs available from two parents differed relative to estimates using EHRs involving the mother only. Fifth, we repeated the analyses, including households with more than one adult male individual, by selecting a random male individual. Finally, we examined the influence of using separate data sources by limiting exposures of adversities to HES and ONS data only and IPV outcomes to CPRD only.

Data were missing for baseline characteristics used to calculate IPWs, including parity, gestational age, birth weight, and social deprivation (table 1). We imputed missing values under the missing at-random assumption using multiple imputations by chained equations (MICE) to create 25 imputed datasets (25 iterations for each imputation).[59] Predictors in the imputation models included all analysis variables (appendix p 7). We pooled the estimates across imputed datasets using Rubin's rule.[60] We did all analyses on the secure analytic server of University College London (London, UK; Data Safe Haven; certified to ISO27001 information security standards) using Stata 17 and R version 4.2.1 (a complete list of R packages are available online).

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results

The characteristics of the birth cohort for children and parents with and without IPV recorded between 1 year before and 2 years after birth are presented in table 1. We included 129 948 children and parents (106 442 families), comprising 95 290 (73·3%) mother–father–child triads (76 579 families) and 34 658 (26·7%) mother–child pairs only between April 1, 2007, and Jan 29, 2020 followed

For **R packages** see www.ACEsinEHRs.com

	Overall cohort (n=129 948)	No IPV (n=127 259)	IPV (n=2689)
Parental characteristics			
Children with mothers only (no father)	34 658 (26·7%)	33 806 (26·6%)	852 (31·7%)
Available follow-up time after birth (parent or child), years	2·0 (1·0, 2·0)	2·0 (1·0, 2·0)	2·00 (1·0, 2·0)
Maternal age at birth, years*			
≤19	2712 (2·1%)	2445 (1·9%)	267 (9·9%)
20–39	119 257 (91·8%)	116 933 (91·9%)	2324 (86·4%)
≥40	7979 (6·1%)	7881 (6·2%)	98 (3·6%)
Paternal age at birth, years			
≤19	2581 (2·0%)	2396 (1·9%)	185 (6·9%)
20–39	74 390 (57·2%)	72 986 (57·4%)	1404 (52·2%)
≥40	18 319 (14·1%)	18 071 (14·2%)	248 (9·2%)
Maternal parity*			
0	43 830 (33·7%)	43 034 (33·8%)	796 (29·6%)
1–3	53 443 (41·1%)	52 280 (41·1%)	1163 (43·3%)
≥4	5285 (4·1%)	5055 (4·0%)	230 (8·6%)
Missing data	27 390 (21·1%)	26 890 (21·1%)	500 (18·6%)
Number of siblings per mother–child pair at birth			
1	52 789 (41·5%)	53 931 (41·5%)	1142 (42·5%)
2	55 180 (43·4%)	56 173 (43·2%)	993 (36·9%)
≥3	19 290 (14·8%)	19 844 (15·6%)	544 (20·6%)
Index of multiple deprivation quintile*			
1 (least deprived)	30 997 (23·9%)	30 727 (24·1%)	270 (10·0%)
2	26 498 (20·4%)	26 146 (20·5%)	352 (13·1%)
3	25 438 (19·6%)	24 980 (19·6%)	458 (17·0%)
4	23 435 (18·0%)	22 770 (17·9%)	665 (24·7%)
5 (most deprived)	21 850 (16·8%)	20 968 (16·5%)	882 (32·8%)
Missing data	1730 (1·3%)	1668 (1·3%)	62 (2·3%)
Maternal ethnicity			
White	108 975 (83·9%)	106 730 (83·9%)	2245 (83·5%)
Asian	11 197 (8·6%)	10 999 (8·6%)	198 (7·4%)
Black	5105 (3·9%)	4960 (3·9%)	145 (5·4%)
Other	1451 (1·1%)	1423 (1·1%)	28 (1·0%)
Mixed	1828 (1·4%)	1764 (1·4%)	64 (2·4%)
Missing data	1392 (1·1%)	1383 (1·1%)	9 (0·3%)
Location of general practice (region of England, UK)*			
London	15 306 (11·8%)	14 925 (11·7%)	381 (14·2%)
Northeast England, northwest England, and Yorkshire	21 830 (16·8%)	21 297 (16·7%)	533 (19·8%)
East and west midlands	15 380 (11·8%)	15 068 (11·8%)	312 (11·6%)
East	13 841 (10·7%)	13 610 (10·7%)	231 (8·6%)
Southeast, southwest, and south-central England	63 591 (48·9%)	62 359 (49·0%)	1232 (45·8%)

(Table 1 continues on next page)

	Overall cohort (n=129 948)	No IPV (n=127 259)	IPV (n=2689)
(Continued from previous page)			
Child and delivery characteristics			
Sex of child*			
Female	63 359 (48·8%)	62 076 (48·8%)	1283 (47·7%)
Male	66 589 (51·2%)	65 183 (51·2%)	1406 (52·3%)
Multiple pregnancy*			
Single child	121 867 (93·8%)	119 169 (93·8%)	2698 (94·5%)
Multiple (eg, twins)	3640 (2·8%)	3561 (2·8%)	79 (2·8%)
Missing data	4441 (3·4%)	4364 (3·4%)	77 (2·7%)
Gestational age at birth, weeks*			
≥37	110 380 (84·9%)	108 124 (85·0%)	2256 (83·9%)
<37	9406 (7·2%)	9141 (7·2%)	265 (9·9%)
Missing data	10 162 (7·8%)	9994 (7·9%)	168 (6·2%)
Birthweight, grams*			
≥3500	49 050 (37·7%)	48 233 (37·9%)	817 (30·4%)
2500–3499	55 770 (42·9%)	54 472 (42·8%)	1298 (48·3%)
<2500	6243 (4·8%)	6021 (4·7%)	222 (8·3%)
Missing data	18 885 (14·5%)	18 533 (14·6%)	352 (13·1%)
Congenital anomaly*	4475 (3·4%)	4371 (3·4%)	104 (3·9%)
Birth year*			
2007–12	100 295 (77·2%)	98 221 (77·2%)	2074 (77·1%)
2013–19	29 653 (22·8%)	29 038 (22·8%)	615 (22·9%)

Data are median (IQR) or n (%). IPV=intimate partner violence. *Variable used for calculating inverse probability weights.

Table 1: **Cohort characteristics by presence or absence of IPV between 1 year before and 2 years after birth**

between 1 year before and 2 years after birth. We included 400 practices (median 260 children per practice, IQR 102–449, or 216 families, IQR 87–364). Median parental age at birth was 31 years for mothers (IQR 27–35, range 13–50) and 34 years for fathers (IQR 30–38, range 16–60; table 1). The cohort characteristics of children and parents in the main analysis were similar to cohorts used in the sensitivity analyses (appendix pp 8–11).

Overall, an estimated 2689 (2·1%) of 129 948 children and parents (95% CI 2·0–2·3) had recorded IPV (figure 2A), and 54 758 (41·2%; 41·5–42·2) had any family adversity between 1 year before and 2 years after birth (figure 2B). Most IPV (1814 [67·5%] of 2689) and family adversities (31 318 [57·2%] of 54 758) were recorded in the maternal record only (figure 2A). 2139 (79·5%) of 2689 recorded IPV and 27 132 (49·5%) of 54 758 recorded adversities were only captured in primary care (appendix p 13). Median age at the first IPV recording was 0·5 years (IQR 0·3 years before birth to 1·3 years after birth; figure 2C) for children, and 29 years (IQR 24·0–34·0, range 16·0–51·0) for mothers. The distribution of first IPV recordings remained relatively stable before and after birth, whereas the first recorded adversity peaked around the birth of the child (figure 2C). Most parents and children with IPV had adversities (1612 [60·0%] of 2689) recorded before their first IPV recording between 1 year and 2 years after birth (figure 2C). Parents and children with IPV were more likely to include teenage parents (<20 years old at the child's birth), be more deprived, registered to a general practitioner in the north of England, include mothers with higher number of previous births (four or more), and have children with lower gestational age than families without IPV (table 1; appendix p 14).

All family adversities were significantly associated with IPV (table 2). The adjusted and weighted probability of IPV was 4·4 per 100 children and parents with any adversity, relative to 0·6 per 100 children and parents with no adversity. Across all four family adversity domains, the probability of IPV ranged from 5·2 per 100 children and parents with parental mental health problems, to 8·1 per 100 children and parents with indicators of adverse family environments. Stratifying adversities by the records of individual family members showed that adversities in the record of the child were associated with a slightly higher probability of IPV than for adversities only in the mother or father records. child maltreatment was excluded from the analyses, but as expected, was associated with a higher overall probability of IPV (table 2; codes most frequently associated with IPV shown in the appendix pp 15–16).

The probability of IPV increased for each increase in the number of different family adversities, from 2·2 per 100 children and parents (95% CI 2·0–2·3) with one adversity up to 15·1 with IPV per 100 children and parents (13·6–16·5) with three or more adversities (table 2). Similarly, compared with families with no adversity, the probability of IPV increased with each additional family member with at least one adversity, ranging from 1·7 per 100 children and parents (1·2–2·2) for adversities recorded in children only to 15·5 per 100 children and parents (12·5–18·5) for adversities recorded in the child, mother, and father (table 2). We provide estimates for specific combinations of adversities in the appendix (p 17).

We calculated probabilities for the specific indicators that made up each family adversity domain (figure 3). Of the 33 domain-specific indicators, personality disorders and self-harm or suicide attempts showed the strongest association with IPV relative to parents without these indicators. The next strongest indicator was severe drug misuse, followed by parental learning or intellectual disabilities and family disruptions and parental conflicts. Of the child-specific indicators, children harmed by undetermined intent, followed by children with three or more missed health-care appointments within 3 years, showed the strongest association with IPV relative to children without these indicators.

Most of the parental physical and mental health problems were more common among parents with IPV than those without IPV (figure 4; numerators and relative risk estimates are shown in appendix pp 19–20).

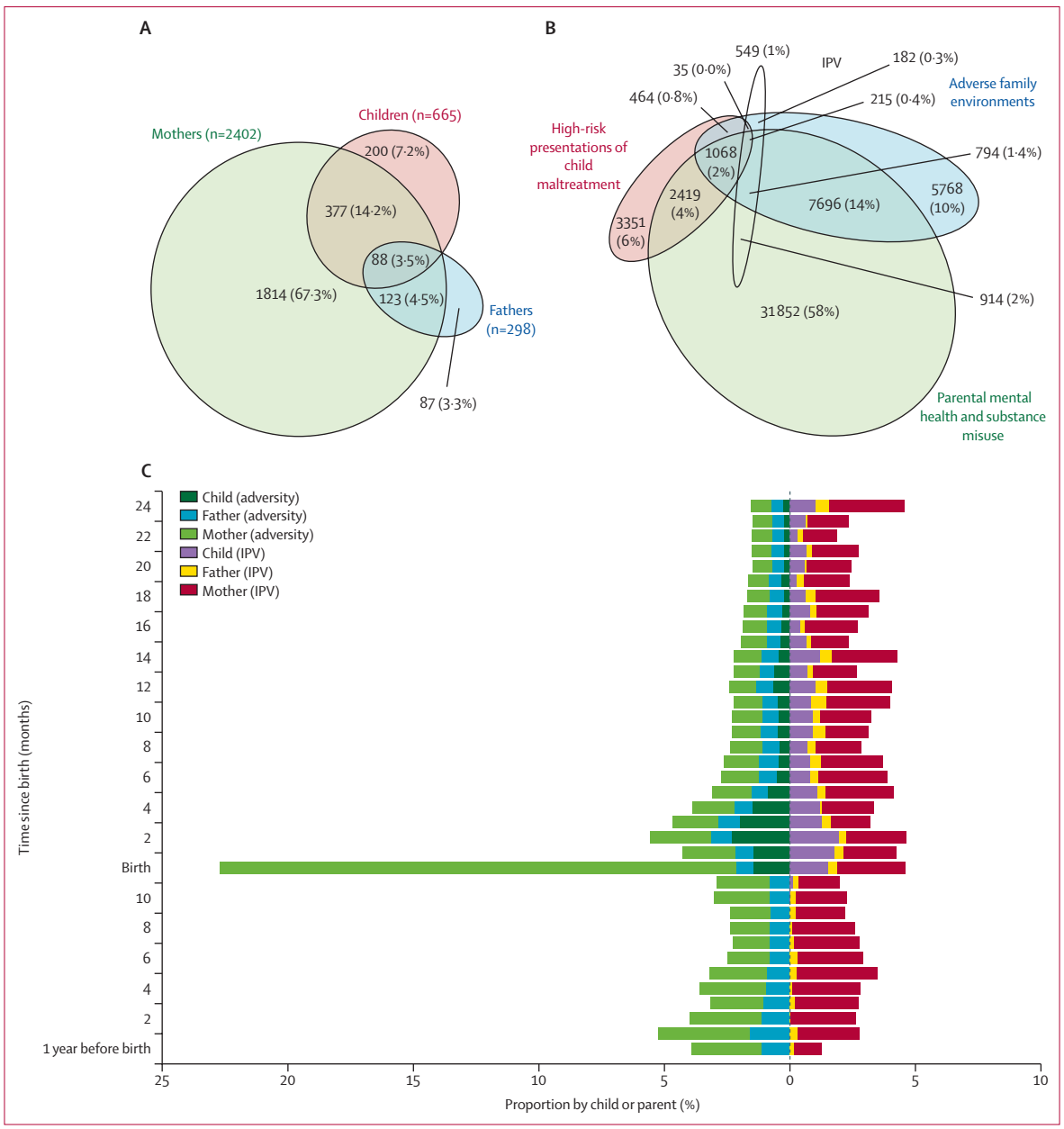

Figure 2: **Overlap and distribution of recorded IPV and family adversities by family members' records (mother, father, or child) and time since birth (months)**
The overlap in (A) and (B) are shown using area-proportional Euler diagrams. (A) Overlap of recorded IPV by different family members' records (ie, mother, father, or child). Data in brackets outside the diagram refer to the total number of mothers, fathers, or children with a record of IPV (keeping only one record per family member). IPV recorded in both parents and children may not correspond to the same event. (B) Overlap of IPV with other family adversities. Proportions are calculated based on the combined total of any adversity and IPV (n=55 307). Parental mental health and substance misuse problems were collapsed into one to aid visual interpretation. (C) Distribution of the first recordings of any family adversity (left; n=54 758) and IPV (right; n=2689) by family members' records (keeping only one record per family member). All estimates were based on recordings between 1 year before and 2 years after birth.

The most noticeable difference was for mental health problems. Mothers with IPV had on average a 36·3% (95% CI 33·5–39·0) higher prevalence of mental health problems than mothers without IPV (58·4% *vs* 22·2%, adjusted and weighted OR 4·9, 95% CI 4·4–5·5). Fathers with IPV had on average a 10·6% (8·6–12·6) higher prevalence of mental health problems than fathers without IPV (17·8% *vs* 7·1%, OR 2·8, 2·4–3·2). Depression was the most common parental mental health problem (18·7%, 18·4–19·0). Parents (mother or father) with IPV had on average 31·8% higher prevalence of depression than parents without IPV (49·9% *vs* 18·0%, OR 4·5, 4·0–5·1). For any parental physical health problem, mothers with IPV had on average a

10·3% (7·6–12·9) higher prevalence than mothers without IPV (73·4% *vs* 63·1%, OR 1·6, 1·4–1·8). Fathers with IPV had similar prevalence estimates of physical health problems relative to those without IPV (29·6% *vs* 32·4%, OR 0·9, 0·8–1·0). The most noticeable difference of parental health problems was for chronic pain. Mothers with IPV had on average a 14·9% (12·3–17·4) higher prevalence of chronic pain than mothers without IPV (39·4% *vs* 24·2%, OR 2·0, 1·8–2·2). Differences in chronic pain estimates were less noticeable in fathers with IPV than fathers without IPV (14·3% *vs* 12·3, OR 1·2, 1·0–1·4; appendix p 20).

The probabilities of IPV remained robust in six of five sensitivity analyses (appendix p 22–27). The exception was when expanding the IPV definition to include any IPV or child maltreatment, resulting in a two times higher probability associated with different adversities relative to primary analysis with the IPV outcome. Restricting adversities to births between 2012 and 2019 generally provided higher adjusted and weighted ORs for all adversities associated with IPV (eg, any adversity OR 9·7) than in the primary analysis (any adversity OR 7·7), although the probabilities remained similar to the primary analysis.

	Overall cohort (n=129 948)	No IPV (n=127 259)	IPV (n=2689)	Probability of IPV per 100 children/parents (95% CI)	Adjusted and weighted OR (95%CI)
Family adversities					
None*	75 190 (57·9%)	74 762 (58·8%)	428 (15·9%)	0·6 (0·5–0·6)	Ref
Any adversity	54 758 (42·1%)	52 497 (41·3%)	2261 (84·1%)	4·4 (4·2–4·7)	7·7 (6·8–8·8)
Adverse family environments	16 222 (12·5%)	14 996 (11·8%)	1226 (45·6%)	8·1 (7·4–8·7)	6·3 (5·6–7·1)
Parental mental health problems	35 669 (27·4%)	33 950 (26·7%)	1719 (63·9%)	5·2 (4·9–5·5)	5·0 (4·4–5·6)
Parental substance misuse	18 639 (14·3%)	17 549 (13·8%)	1090 (40·5%)	6·4 (5·9–6·9)	4·3 (3·9–4·9)
High-risk presentation of child maltreatment	7552 (5·8%)	7119 (5·6%)	433 (16·1%)	6·5 (5·5–7·6)	3·4 (2·8–4·1)
Total number of adversities*					
None	75 190 (57·9%)	74 762 (58·8%)	428 (15·9%)	0·6 (0·5–0·6)	Ref
1	36 310 (27·9%)	35 509 (27·9%)	801 (29·8%)	2·2 (2·0–2·3)	3·7 (3·2–4·2)
2	14 061 (10·8%)	13 243 (10·4%)	818 (30·4%)	6·5 (5·8–7·2)	11·6 (9·9–13·6)
≥3	4387 (3·4%)	3745 (2·9%)	642 (23·9%)	15·1 (13·6–16·5)	29·6 (25·3–34·8)
Any adversity recorded in the mother, father, or child*					
Mother or father only	38 516 (29·6%)	37 230 (29·3%)	1286 (47·8%)	3·5 (3·2–3·7)	6·0 (5·3–6·9)
Child only	4247 (3·3%)	4173 (3·3%)	74 (2·8%)	1·7 (1·2–2·2)	2·9 (2·1–3·9)
Mother and father only	6784 (5·2%)	6385 (5·0%)	399 (14·8%)	6·1 (5·4–6·8)	10·9 (9·2–12·9)
Mother or father and child	4048 (3·1%)	3724 (2·9%)	324 (12·0%)	9·2 (7·4–11)	16·9 (13·3–21·5)
Mother, father, and child	1158 (0·9%)	980 (0·8%)	178 (6·6%)	15·5 (12·5–18·5)	30·6 (23·7–39·5)
Mothers†					
Any adversity	42 845 (33·0%)	40 795 (32·1%)	2050 (76·2%)	5·2 (4·8–5·5)	7·1 (6·4–8·0)
Adverse family environments	11 133 (8·6%)	10 140 (8·0%)	993 (36·9%)	9·7 (8·8–10·5)	7·0 (6·2–7·9)
Parental mental health problems	30 181 (23·2%)	28 609 (22·5%)	1572 (58·5%)	5·6 (5·2–5·9)	4·8 (4·3–5·4)
Parental substance misuse	14 579 (11·2%)	13 661 (10·7%)	918 (34·1%)	7·1 (6·4–7·7)	4·6 (4·0–5·1)
Total number of adversities					
None	87 103 (67·0%)	86 464 (67·9%)	639 (23·8%)	0·8 (0·7–0·8)	Ref
1	31 427 (24·2%)	30 487 (24·0%)	940 (35·0%)	3·1 (2·8–3·4)	4·1 (3·6–4·8)
2	9788 (7·5%)	9001 (7·1%)	787 (29·3%)	8·9 (8·1–9·8)	12·9 (11·2–14·8)
≥3	1630 (1·3%)	1307 (1·0%)	323 (12·0%)	19·7 (17·2–22·2)	32·2 (26·8–38·7)
Any adversity recorded in the mother or child					
Neither mother nor child	82 338 (63·4%)	81 788 (64·3%)	550 (20·5%)	0·7 (0·6–0·8)	Ref
Mother only	4765 (3·7%)	4676 (3·7%)	89 (3·3%)	4·3 (4–4·6)	6·5 (5·8–7·4)
Child only	38 157 (29·4%)	36 594 (28·8%)	1563 (58·1%)	1·9 (1·4–2·4)	2·9 (2·2–3·8)
Mother and child	4688 (3·6%)	4201 (3·3%)	487 (18·1%)	11·4 (9·8–13·1)	18·7 (15·5–22·6)
Fathers‡					
Any adversity	15 603 (12·0%)	14 889 (11·7%)	714 (26·6%)	4·8 (4·4–5·3)	2·6 (2·3–2·9)
Adverse family environments	4589 (3·5%)	4267 (3·4%)	322 (12·0%)	7·3 (6·4–8·3)	3·7 (3·2–4·3)
Parental mental health problems	9888 (7·6%)	9407 (7·4%)	481 (17·9%)	5·1 (4·6–5·7)	2·6 (2·3–3·0)
Parental substance misuse	5327 (4·1%)	5040 (4·0%)	287 (10·7%)	5·4 (4·7–6·2)	2·6 (2·3–3·1)

(Table 2 continues on next page)

	Overall cohort (n=129 948)	No IPV (n=127 259)	IPV (n=2689)	Probability of IPV per 100 children/ parents (95% CI)	Adjusted and weighted OR (95%CI)
(Continued from previous page)					
Total number of adversities					
None	114 345 (88·0%)	112 370 (88·3%)	1975 (73·4%)	1·8 (1·7–1·9)	Ref
1	11 975 (9·2%)	11 564 (9·1%)	411 (15·3%)	3·8 (3·3–4·2)	2·0 (1·7–2·3)
2	3055 (2·4%)	2825 (2·2%)	230 (8·6%)	7·3 (6·3–8·4)	4·1 (3·4–4·8)
≥3	573 (0·4%)	500 (0·4%)	73 (2·7%)	13·9 (9·9–18·0)	7·9 (5·7–11·0)
Any adversity recorded in the father or child					
Neither father nor child	106 568 (82·0%)	104 976 (82·5%)	1592 (59·2%)	1·6 (1·5–1·7)	Ref
Father only	7777 (6·0%)	7394 (5·8%)	383 (14·2%)	3·9 (3·5–4·3)	2·4 (2·2–2·8)
Child only	13 927 (10·7%)	13 406 (10·5%)	521 (19·4%)	5·7 (4·6–6·7)	3·6 (3–4·5·0)
Father and child	1676 (1·3%)	1483 (1·2%)	193 (7·2%)	12·1 (9·8–14·4)	8·4 (6·7–10·5)
Children					
Any adversity	9535 (7·3%)	8943 (7·0%)	592 (22·0%)	7·0 (6·1–7·9)	3·9 (3·4–4·6)
Adverse family environments	2237 (1·7%)	2026 (1·6%)	211 (7·8%)	9·8 (8·0–11·5)	4·9 (4·0–6·1)
High-risk presentation of child maltreatment	7552 (5·8%)	7119 (5·6%)	433 (16·1%)	6·5 (5·5–7·6)	3·4 (2·8–4·1)
Total number of adversities					
None	120 495 (92·7%)	118 382 (93·0%)	2113 (78·6%)	1·9 (1·8–2·0)	Ref
1	9117 (7·0%)	8609 (6·8%)	508 (18·9%)	6·5 (5·6–7·5)	3·6 (3·1–4·3)
≥2	336 (0·3%)	268 (0·2%)	68 (2·5%)	17·3 (13·0–21·6)	10·8 (8·0–14·7)
Child maltreatment‡	4868 (3·7%)	3490 (2·7%)	1378 (51·2%)	29·3 (27·6–31·0)	38·1 (33·9–43·0)

*The reference category for each adversity domain was children or parents without the examined adversity domain or any adversity. The probability of IPV for the reference category ranged from 0.59 per 100 children and parents with no family adversity to 1·6 per 100 children and parents with no parental substance misuse. †Stratification by mothers includes only adversities in the mother or the child, and stratification by fathers includes only adversities in the father or the child. ‡Child maltreatment was not included in any of the examined family adversities.

Table 2: **Adjusted and weighted probabilities and odds ratios for IPV by family adversity type and family member between 1 year before and 2 years after birth**

Discussion

We examined associations between 33 validated family-adversity indicators, parental health problems, and IPV using a large English birth cohort of 129 948 children and parents followed across primary and secondary care in the NHS. We found that two in five (54 758 [41·2%] of 129 948 children and parents) had recorded family adversities 1 year before birth to age 2 years. Indicators of family adversity increased the probability of IPV to one in 22 children and parents. The highest probability of IPV was among families with three or more adversities, or in which both parents and the child had at least one adversity, or among parents with self-harm, suicide attempts, or personality disorders (one in eight parents and children). Families with IPV had increased risks of all parental physical and mental health problems compared with those without IPV.

Our findings align with the extensive literature on the co-occurrence of IPV and other adverse childhood experiences, including results from meta-analyses,[7,26,61,62] global cross-sectional surveys,[63,64] and cohort studies on parental mental health problems and IPV.[65–67] Few studies, however, have used EHRs of parents and children to examine risk factors for IPV.[29,32] We, therefore, extend previous studies by combining prospectively collected data from EHRs of children and parents to examine risk indicators of IPV relevant to primary and secondary care. Except for one US study (2422 children with EHRs from four community health centres),[66] we know of only one previous study that has evaluated the association between family adversities and IPV using EHRs from children and parents in primary care.[7]

The low prevalence of IPV in the current study is consistent with previous estimates of IPV in health-care settings, reflecting the hidden nature of IPV and the importance of using linked family-member records to identify affected children and parents. For instance, the prevalence of IPV (2·1%) in our study was twice that of our previous EHR study (1·0%), probably explained by the additional linkage of fathers, outpatient, and accident and emergency data. Our prevalence of IPV was also double that of a UK cluster randomised controlled trial, in which general practices received training in identifying and responding to IPV among women (641 IPV records [0·9%] in 70 521 eligible women among 24 practices receiving training).[16]

Consistent with the cumulative stress model,[7,68] we found that the probability of IPV increased for each additional adversity or each additional family member with recorded adversity. Families with IPV were also

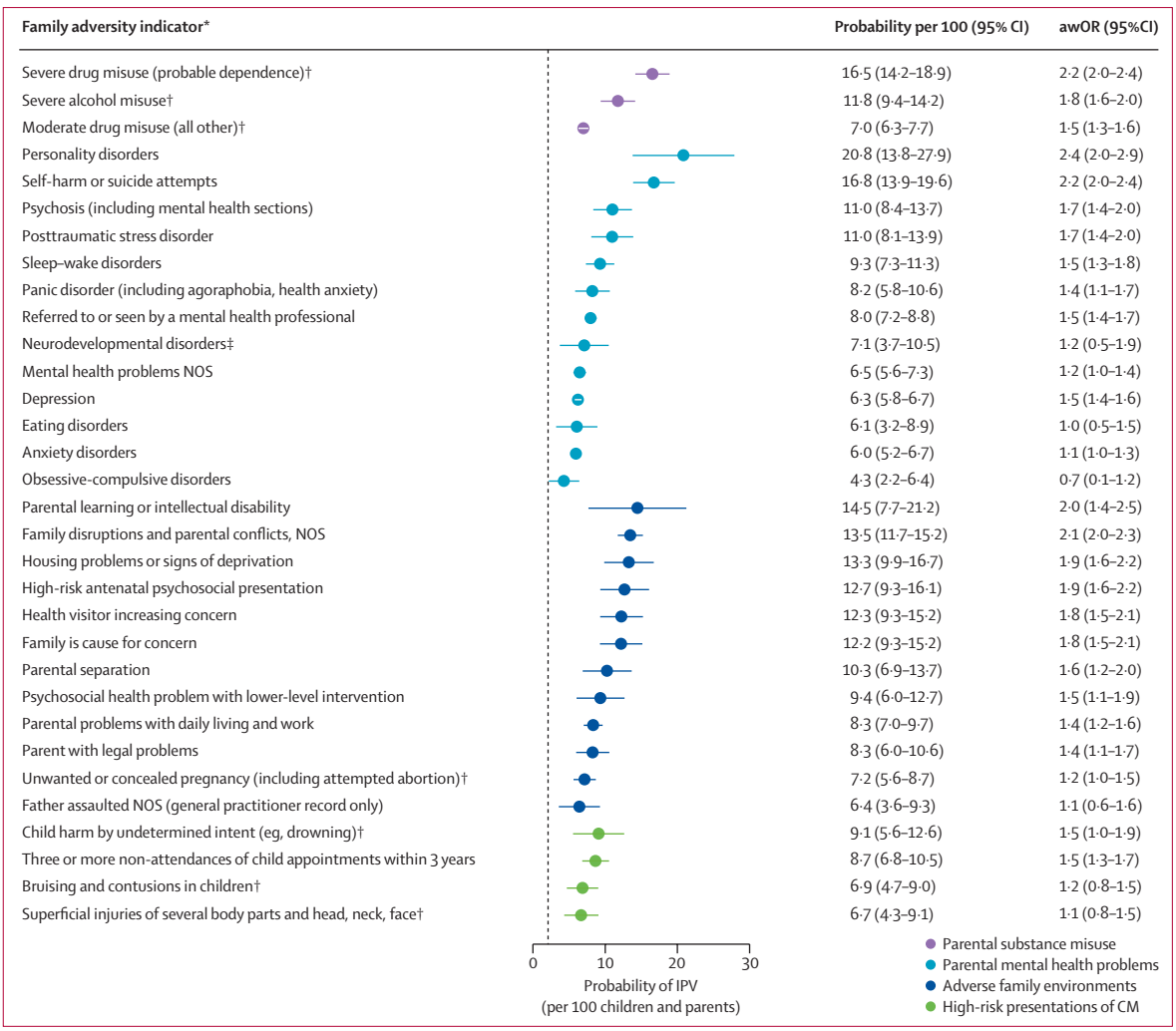

Figure 3: **Adjusted and weighted probabilities of IPV for domain-specific indicators of adversity in children and parents between 1 year before and 2 years after birth**

Estimates are adjusted and weighted probabilities per 100 children and parents. The vertical dashed line indicates the baseline probability of parental IPV, which is 2·1 per 100 children and parents (95% CI 2·0–2·3). awOR=adjusted and weighted odds ratio. IPV=intimate partner violence. NOS=not otherwise specified. *We restricted disaggregation of domain-specific indicators to those present in 250 or more unique children, ordered by ascending prevalence, high to low. †Indicators are defined by several rule-based algorithms, including age restrictions in years (upper age cut-off denoted in parentheses), exclusions of accidental injuries, genetic predispositions (eg, bone diseases), traumatic birth injuries, transmissions of diseases from mother to child during birth, or need to meet higher cut-off scores on a validated self-report instrument. All code lists and algorithms are freely available online. ‡Neurodevelopmental disorders include attention deficit hyperactivity disorder, autism spectrum disorders, and conduct disorders.

For more on the **code lists and algorithms** see www.ACEsinEHRs.com

more socially and economically deprived and had higher estimates of all examined parental health problems than families without IPV. The prevalence of chronic pain among mothers was the most noticeable difference. This finding mirrors a UK primary care study using EHRs, which found a two-fold increased risk of fibromyalgia and chronic fatigue in women with recorded IPV compared with women without IPV.[69] However, we could not ascertain the temporal sequence between IPV and health problems, because we allowed IPV and indicators to co-occur. Instead, these findings underscore the complex nature of IPV, with a substantial proportion of families affected by IPV exposed to several adversities, pre-existing systemic vulnerabilities (eg, deprivation), and long-term health conditions.

Our study is unique in using a large English birth cohort of 129 948 children and parents followed across the NHS, including general practices, emergency departments, outpatient visits, hospital admissions, and death records. We examined a comprehensive range of indicators of IPV relevant to primary and secondary care that map onto clinically recognisable presentations of vulnerable families who present to health care.[7,29] Our study period is consistent with national policy priorities for family-centred interventions during the first 1000 days

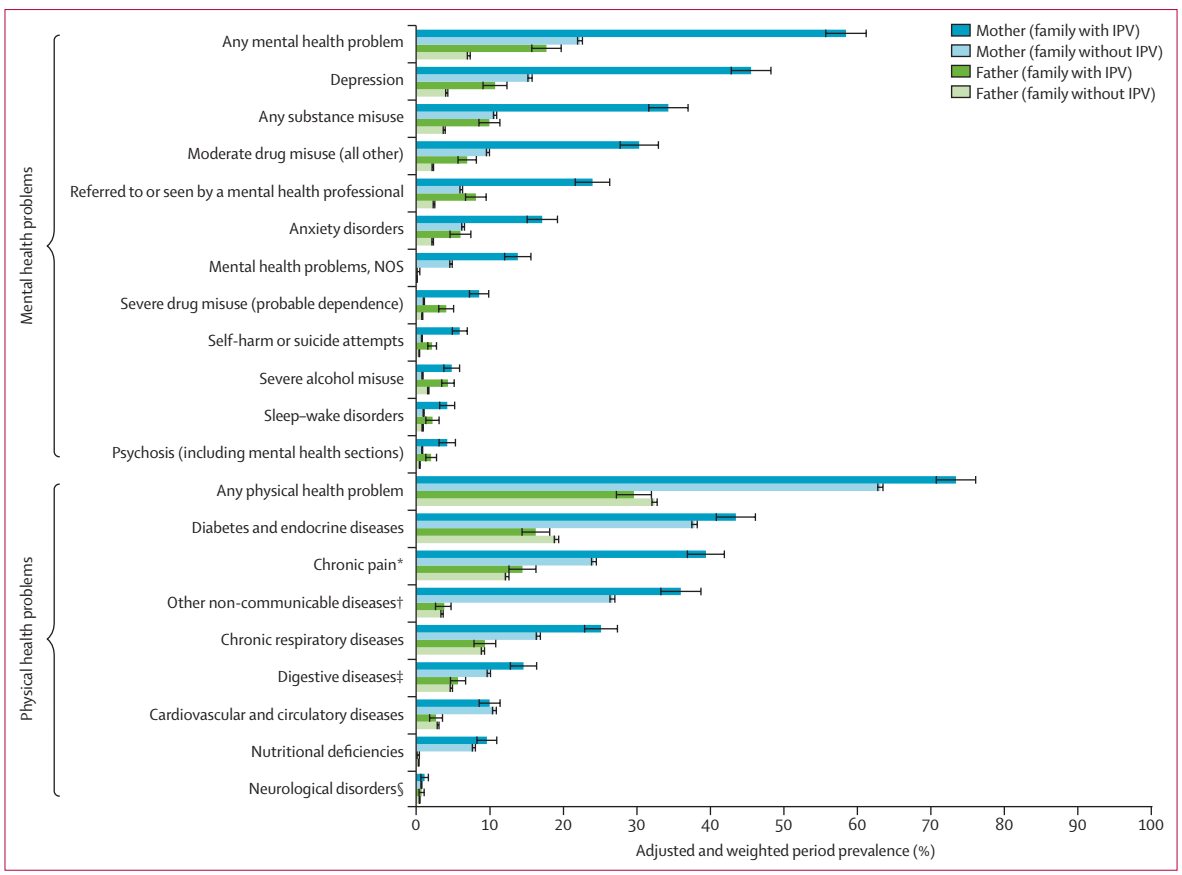

Figure 4: **Prevalence of parental mental and physical health problems among children and families with and without recorded IPV between 1 year before and 2 years after birth stratified by parent (mother or father)**

Adjusted and inverse-probability-weighted period prevalence estimates between 1 year before and 2 years after birth on the basis of marginal predictions from a logistic regression model, adjusted for birth year. Horizontal lines represent 95% CIs. NOS=not otherwise specified. IPV=intimate partner violence. *Chronic pain included any specific diagnosis of chronic pain, specialist pain clinic referrals, prescriptions for higher potency pain analgesics, or continuous pain episodes lasting longer than 3 months. †Other non-communicable diseases included gynaecological diseases, oral disorders, and endocrine, metabolic, blood, and immune disorders. ‡Digestive diseases included cirrhosis, gallbladder and biliary diseases, upper-digestive-tract diseases, and inflammatory bowel syndrome. §Neurological disorders included epilepsy, multiple sclerosis, and motor neuron disease (appendix pp 19–20).

of a child's life,[21] including using opportunities to ask about IPV during clinical care, such as antenatal visits and child health and development reviews for children aged 2 years. We show that more than 57% of family adversities were only captured in maternal records, and 50% were only captured in primary care by general practioners within the first 1000 days of a child's life.

This study has several limitations. First, family adversities are complex and heterogeneous and not all families with adversities will require or be eligible for increased support.[70] Many children and parents with adversities do not develop poorer health outcomes and show resilience, and findings should be considered with caution to prevent stigma and barriers to help seeking.[70]

Second, many parents might not have disclosed IPV or had IPV recorded with coded data used in our analysis. Clinicians might also delay or avoid recordings because of concerns about potential harm from information sharing, particularly if the perpetrator is accessing the record of a child.[71] Recorded IPV might therefore reflect only a small proportion of families affected by IPV.[29,72] Further research should focus on how IPV recording in EHRs can be improved.

Third, associations between adversity, health problems, and IPV might reflect surveillance bias and correlated assessments (eg, the more you look, the more IPV you find),[73] rather than differences in the underlying risk of IPV. For instance, families with adversity and health problems might have more opportunities for IPV to be recognised and recorded. However, we used a large representative cohort with EHRs from several sources before, during, and after pregnancy, with most adversities captured during routine encounters, minimising surveillance bias. The associations remained robust in sensitivity analyses when using separate data sources for adversities (EHRs from hospitals) and IPV (primary care). Additionally, we found a high prevalence of other adversities (41·2% excluding IPV) in the cohort, indicating that these adversities were consistently recorded in EHRs.

Fourth, CPRD GOLD contains EHRs from one of the three main primary care data systems in the UK but with decreasing data coverage,[74] limiting the generalisability of estimates to general practices with other EHR systems. Additionally, ever-changing policies and coding practices will affect the recording rates over time. Further research is needed using nationwide linkage of patients across all general practice systems (eg, EMIS, SystmOne),[74,75] not just selected EHR systems.

Finally, there is no validated method of linking fathers in the UK. We could not verify whether the linked male individuals were biological fathers, partners, or other family members. The linkage criteria also meant that we excluded male same-sex couple parents and could not identify female same-sex couples, limiting the generalisability of the findings to a small but substantial proportion of families (eg, roughly 0·5% of UK families were same-sex couples in 2015).[76]

We showed that there is a high likelihood of IPV when children or parents present to health care with different indicators of family adversity, ranging from parental mental health and substance misuse problems to repeatedly missed child appointments. Therefore, health professionals in primary and secondary care should safely ask about IPV when parents or children present with family adversity or associated health problems of IPV, and respond appropriately.[17,77] Our findings should inform the UK National Institute for Health and Care Excellence and the WHO IPV guidelines to broaden the indicators of children and parents that should prompt enquiry about IPV in families presenting to health-care settings, particularly during health-care visits in general practice and emergency departments.[25]

We showed that more than half of family adversities were identified via the maternal records, reinforcing the importance of a think-family approach, including reviewing both parents and children's records to inform clinical responses to IPV. General practioners, health visitors, and practice nurses can access a shared EHR to prompt enquiry about IPV during frequent contact with families, ranging from the 8-week baby check to infant immunisations. However, identifying family adversities requires clinicians to search across the linked records, raising important obstacles to the capacity of clinicians with competing demands.[78] Providers of EHR systems in primary care need to develop integrated think-family functions that allow clinicians to search for adversity across household records,[79] with strong safeguards to prevent sharing of information beyond the primary care team.[76,80]

Identification of IPV without appropriate response is unlikely to be beneficial.[81] On a national level, our findings support UK policy (eg, the best start for life: a vision for the 1001 critical days) to prioritise family-centred interventions (eg, UK supporting families programme).[21,40] Families presenting to primary or secondary care with adversity represent an important target for improving the health and development[82] of parents and children via timely and accessible joined-up services (eg, Early Help System),[40] and longitudinal monitoring in primary care and connected services (eg, hubs). Although there is scarce evidence of effective interventions for reducing IPV specifically,[83] women disclosing IPV to professionals consistently report that they want caring responses including emotional support,[84] education about IPV,[30] risk assessment, and planning for the safety of adults and children safety,[85] and opportunity to be referred to a specialist and long-term support where needed (WHO LIVES principle).[86] To provide safe and effective support, sufficient trained health and social care professionals are needed to respond to family adversities and to ask about and respond to IPV.[84,85]

For the **CALIBER resource** see https://www.caliberresearch.org/

For the **UCL Institute of Health Informatics** see https://www.ucl.ac.uk/health-informatics/caliber

Contributors

SS, RG, GF, JD, EH, LDH, and REL conceived the study. SS and REL designed the study. SS completed the statistical analyses. REL, RG, and GF provided study supervision. SS and REL had full access to the extracted CPRD data. SS, RG, and REL accessed and verified all the data in the study. All authors contributed to interpreting the data and drafting the manuscript revisions. All authors had full access to all the data in the study and accepted the responsibility to submit it for publication. SS affirms that the manuscript is an honest, accurate, and transparent account of the study being reported, and that no important aspects of the study have been omitted.

Declaration of interests

We declare no competing interests.

Data sharing

This study uses data from the CPRD, a research service that provides primary care and linked data for public health research. CPRD data governance does not allow the distribution or access of data to other parties outside of the approved study protocol. Researchers can apply for data access with a study protocol at https://www.cprd.com/ and need approval from the Research Data Governance Secretariat. We provide all relevant code lists and coding scripts via https://ACEsinEHRs.com. All code is shared without investigator support.

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