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Original Article

Antecedents and outcomes of a later attention–deficit hyperactivity disorder (ADHD) diagnosis in females

Joanna Martin, Olivier Y. Rouquette, Kate Langley, Miriam Cooper, Kapil Sayal, Tamsin J. Ford, Ann John and Anita Thapar

Background

Females are less likely than males to be diagnosed with attention–deficit hyperactivity disorder (ADHD). When diagnosed, females are older than males.

Aims

In this study, we examined the childhood antecedents of later ADHD diagnosis and its impact on adolescent/emerging adult outcomes, with a focus on females.

Method

In this cohort study, we used data from a Welsh nation-wide electronic cohort of 13 593 individuals ($n = 2680$ (19.7%) females) diagnosed with ADHD and 578 793 individuals ($n = 286\,734$ (49.5%) females) without ADHD. We compared females with later diagnoses (ages 12–25) to those with earlier, timely diagnoses (ages 5–11) and no diagnosis, in terms of childhood (ages 5–11) antecedents and adolescent/adult (ages 12–25) outcomes. We also tested for sex differences.

Results

Although females with earlier ADHD diagnosis showed more health and educational difficulties in childhood than those with later diagnosed ADHD (odds ratios ranged from 0.18 to 0.92), there was clear evidence of these difficulties in females with later diagnosed ADHD, compared with females without ADHD (odds ratios: 1.07–9.02). In adolescence/early adulthood, females with later diagnosed ADHD used more healthcare services and had worse mental health, educational and socioeconomic outcomes than females diagnosed earlier (odds ratios: 1.39–4.96) and those without ADHD (odds ratios: 1.54–23.98). Many of these outcomes were exacerbated in females compared with males.

Conclusions

The results demonstrate that later ADHD diagnosis is associated with significant negative outcomes by adolescence and disproportionately disadvantages females. Despite later diagnosis, there was clear evidence of childhood mental health and educational difficulties when compared with females without ADHD. Therefore, timely childhood ADHD diagnosis may help to mitigate later risks, especially for females.

Keywords

Attention–deficit hyperactivity disorder; neurodevelopmental disorders; mental health services; electronic health records; child and adolescent psychiatry.

Attention–deficit hyperactivity disorder (ADHD) is a common neurodevelopmental condition less likely to be diagnosed in females than males,[1] partly due to under-recognition.[2] In individuals with ADHD, females are diagnosed later than males,[3,4] and are at higher risk for various neurodevelopmental and psychiatric conditions, prescribed more psychotropic medications and show higher healthcare use.[3,5–8] Barriers to ADHD diagnosis and treatment include being female, low socioeconomic status, ethnic minority status and the intersection of these identities.[9–11] Diagnosed ADHD is associated with substantial individual impact and increased economic costs related to psychiatric and somatic disorders, drug abuse, injuries, criminality and educational and occupational impacts.[12] Timely recognition and treatment improve long-term social, educational and occupational outcomes, and reduce risks of depression, suicide, substance abuse, accidents and criminality.[13–15] On the other hand, undiagnosed and, therefore, untreated ADHD exacerbates adverse outcomes,[16] also increasing associated economic costs.[17] However, few studies of undiagnosed ADHD have included young people or females and none have investigated sex differences.[16] A better understanding is needed of the childhood antecedents of later ADHD diagnosis, the potential health, social and educational outcomes of later diagnosis and whether any antecedents and outcomes are exacerbated in females compared with males. These are essential steps to identify early signs which may warrant referral and to improve timely recognition and subsequent clinical care for females with ADHD, who are a historically underserved population.

Aims

The objective of this study is to address these knowledge gaps, using a whole-nation electronic register-based cohort of young people in Wales. The specific aims are to examine the association between ADHD diagnosis timing and: (a) healthcare, educational and demographic childhood antecedents, and (b) healthcare, educational and socioeconomic outcomes in adolescence/emerging adulthood. We hypothesised that predictors of later diagnosed ADHD in females would include greater healthcare access and educational difficulties in childhood, compared with females without ADHD, but not necessarily to the same extent as females diagnosed earlier. We also hypothesised that females with later diagnosed ADHD would exhibit worse healthcare, educational and socioeconomic outcomes in adolescence/adulthood compared with both females with earlier diagnosis and no ADHD. Sex comparisons were largely exploratory, with the expectation that some outcomes would be exacerbated in females.

Method

Cohort

We used nationwide register data from the Secure Anonymised Information Linkage (SAIL) Databank (http://www.saildatabank.com),[18–20] a person-level linkable data repository that covers routinely collected primary and secondary healthcare, education and social care data for Wales. Full details are described in the Supplementary Text available at https://doi.org/10.1192/bjp.2026.10556.

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national/institutional committees on human experimentation and with the Helsinki Declaration of 1975, revised in 2013. All procedures involving humans were approved by the Information Governance Review Panel (IGRP #1335), an independent body consisting of government, regulatory and professional agencies.[21] Individual consent is not available in the SAIL databank.

The study follow-up period used data from 1 January 2000 to 31 December 2019. Individuals born between 1 January 1989 and 31 December 2006 were included. They were followed up from their 5th birthday, study start, start of registration with a GP surgery providing data to SAIL or a Welsh address (whichever came last). The end of each individual's follow-up period was defined as their 25th birthday, study end, end of registration with a GP/Welsh address or date of death (whichever came first). Individuals with <365 (non-continuous) days of data between the ages of 5 and 18 were excluded. We restricted the sample to individuals followed up for a minimum of 365 days between ages 5–11 (analyses of antecedents) and ages 12–18 (analyses of outcomes).

Healthcare, educational, demographic and other data-sets (see Supplementary Text) were linked at an individual level. Healthcare data from primary, in-patient and out-patient (including child/adolescent and adult mental health services) and emergency care services included dates of diagnoses, appointments and prescriptions.

The ADHD sample included those meeting the above inclusion criteria, who received an ADHD diagnosis or a prescription for ADHD medication (see below) during each individual's follow up period (see Supplementary Text). The comparison (non-ADHD) sample included all individuals born in the same time period, with sufficient follow up data, who never had a recorded ADHD diagnosis or prescription.

Variables

See the Supplementary Text for detailed definitions, with a brief overview below.

We examined biological sex, ethnic status (majority or any minority), socioeconomic deprivation (using the Welsh Index of Multiple Deprivation, WIMD) at study start and end and experience of social services involvement.[22]

ADHD was defined using a validated list of ICD-10 codes relevant to ADHD, used in secondary care, as well as Read Code lists and algorithms (version 2), which are a coded thesaurus of clinical terms (including diagnoses, medications and administrative codes) used in primary care in the UK National Health Service (NHS).[3,23]

Binary variables for age at first recorded ADHD were defined using the first date of ADHD diagnosis/prescription in primary or secondary care records. Earlier ADHD diagnoses were those first recorded before age 12 (i.e. prior to or around the time of the key life transition from primary to secondary school in Wales and in line with the ADHD symptom onset definition used by the DSM-5). Later diagnoses were defined as those first recorded on or after an individual's 12th birthday (i.e. during secondary school or emerging/young adulthood). This binary threshold was used to reflect DSM-5 and also the key life transition from primary to secondary school in Wales.

Lists of previously published and validated Read Codes were used to define the following conditions and prescriptions: autism, specific learning difficulties and conduct disorder,[23–25] anxiety and depression,[26] self-harm (including non-fatal intentional self-harm, self-injury, self-poisoning and suicide attempts),[27,28] alcohol and psychoactive (excluding tobacco) substance use (including harmful use, dependence or use resulting in hospital admission),[27] eating disorders (including anorexia nervosa, bulimia nervosa and 'eating disorders, not otherwise specified'),[29] bipolar disorder and schizophrenia/other psychotic disorder,[30] as well as prescriptions for anti-anxiety (including anxiolytics, sedatives and hypnotics, which included melatonin and was independent of anxiety diagnosis),[26] antidepressant[26] and antipsychotic[31] medications. Separate binary variables were defined for whether a specific condition/prescription was first recorded prior to age 12 or first recorded at age 12+.

Variables were defined for the numbers of recorded primary care, out-patient, in-patient and emergency department visits per year that each individual was included in the study (i.e. mean visits per year), split by age (5–11 or 12–18).

For females, we defined a binary variable for teenage (i.e. age 12–18) pregnancy.[32]

Binary variables were derived for whether each individual who undertook the exams at key stages (KS) 1–4 passed (coded 0) or failed (coded 1). KS4 passes were dichotomised into low/high attainment. Persistent absences were defined as a binary variable, aggregated by age (5–11 or 12–18), if >10% of possible sessions were missed (coded 1) or not (coded 0) in any school year.[25]

Binary variables were defined for birth mother's ADHD (any time point) and depression (when child was aged 5–11), using the above definitions.

Analyses

Age at first recorded ADHD diagnosis was used to dichotomise the sample into those diagnosed earlier (i.e. childhood, ages 5–11) and later (i.e. adolescence/early adulthood, ages 12–25).

We examined factors during childhood (prior to age 12) that may precede or coincide with the ADHD diagnostic process, including neurodevelopmental and mental health conditions and prescriptions common in childhood, healthcare service use, primary school assessments (KS1 and KS2), school absences and maternal ADHD or depression. We also examined demographic factors, including ethnicity, social services involvement and socioeconomic deprivation.

To determine the impact of the timing of ADHD diagnosis, we focused on outcomes during adolescence and emerging adulthood (ages 12–25). We examined mental health conditions and prescriptions first recorded at age 12+, healthcare service use, teenage pregnancy (12–18, females only), secondary school assessments (KS3 and KS4), school absences and socioeconomic deprivation at study end (in those 18+).

For both aims, we compared females with a later ADHD diagnosis to females: (a) with an earlier diagnosis and (b) without ADHD. To determine whether any associations were stronger in females, we analysed males separately and also analysed females and males together, to test for moderation by sex using an interaction test.

All analyses were performed in R-4.4.1 on macOS (R Foundation for Statistical Computing, Vienna, Austria; https://www.R-project.org/), using logistic or linear regression, co-varying for birth year and study follow-up time, to account for variation in dates of birth and length of individual time in the study.

Cluster robust standard errors were estimated to account for known siblings, using maternal ID for clustering. All analyses were corrected for multiple testing using a false discovery rate (FDR).

To consider the influence of data coverage, we repeated main analyses in restricted subsets, including only individuals with relatively complete data coverage (≥95%) during childhood (ages 5–12) and adolescence (ages 12–18).

Results

The cohort included 13 593 individuals ($n = 2680$ (19.7%) females) with ADHD and 578 793 individuals ($n = 286\,734$ (49.5%) females) without ADHD. A small proportion (211 (7.9%) females and 1061 (9.7%) males) of those with ADHD met the study criteria based on only having a record of an ADHD medication prescription. Of those, 89.9% met inclusion criteria for analyses of childhood (ages 5–11) antecedents, including 12 425 individuals ($n = 2448$ (19.7%) females) with ADHD and 520 097 (257 612 (49.5%) females) without ADHD, while 94.9% met the criteria for analyses of adolescent/adult (ages 12–25) outcomes. This included 13 248 individuals (2618 (19.8%) females) with ADHD and 548 922 (272 093 (49.6%) females) without ADHD. Table S1 presents descriptive statistics for antecedents and outcomes, split by ADHD diagnosis and sex.

Childhood (ages 5–11) antecedents

Earlier versus later diagnosis

After accounting for multiple testing, the following childhood antecedents were more common in earlier ($n = 1366$) compared with later ($n = 1082$) diagnosed females: autism, learning difficulties, conduct disorder, anti-anxiety medication prescriptions, maternal depression, KS1 and KS2 failure, contacts with healthcare services (general practitioner (GP), out-patients, and in-patients) and socioeconomic deprivation (see Figs. 1(a) and 2; Tables 1(a) and S2). The following childhood antecedents showed no evidence of strong association with age at ADHD diagnosis: anxiety, maternal ADHD, school absences, ethnicity, being care-experienced and emergency care visits.

There was a largely similar pattern of results in males (Table 1(a)). The exceptions were that the association for conduct disorder was stronger in females, whereas for GP contacts this was stronger in males. There was also a sex difference for maternal ADHD; while males with earlier diagnosis were more likely than those with a later diagnosis to have a mother with ADHD, the pattern was reversed for females, albeit this was not significant. Additionally, later ADHD was associated with school absences and emergency care contacts in males, whereas socioeconomic deprivation was not associated, though the strengths of these associations did not differ by sex.

Later versus no diagnosis

When females with later diagnosed ADHD, were compared with females without ADHD ($n = 257\,612$) in childhood, they had higher rates of: autism, learning difficulties, conduct disorder, anxiety, anti-anxiety medication prescriptions, maternal depression, maternal ADHD, KS1 and KS2 failure, school absences, being care-experienced, more contacts with all healthcare services and greater socioeconomic deprivation (see Figs. 1(a) and 2; Tables 1(b) and S3). There was no difference for ethnicity.

The associations were stronger in females for: autism, KS1 and KS2 failure and GP and out-patient contacts, but with converse findings for socioeconomic deprivation. Males with later diagnoses were less likely to be from an ethnic minority compared with males without ADHD, though this did not differ by sex. The results were similar in females and males for all other variables (Table 1(b)).

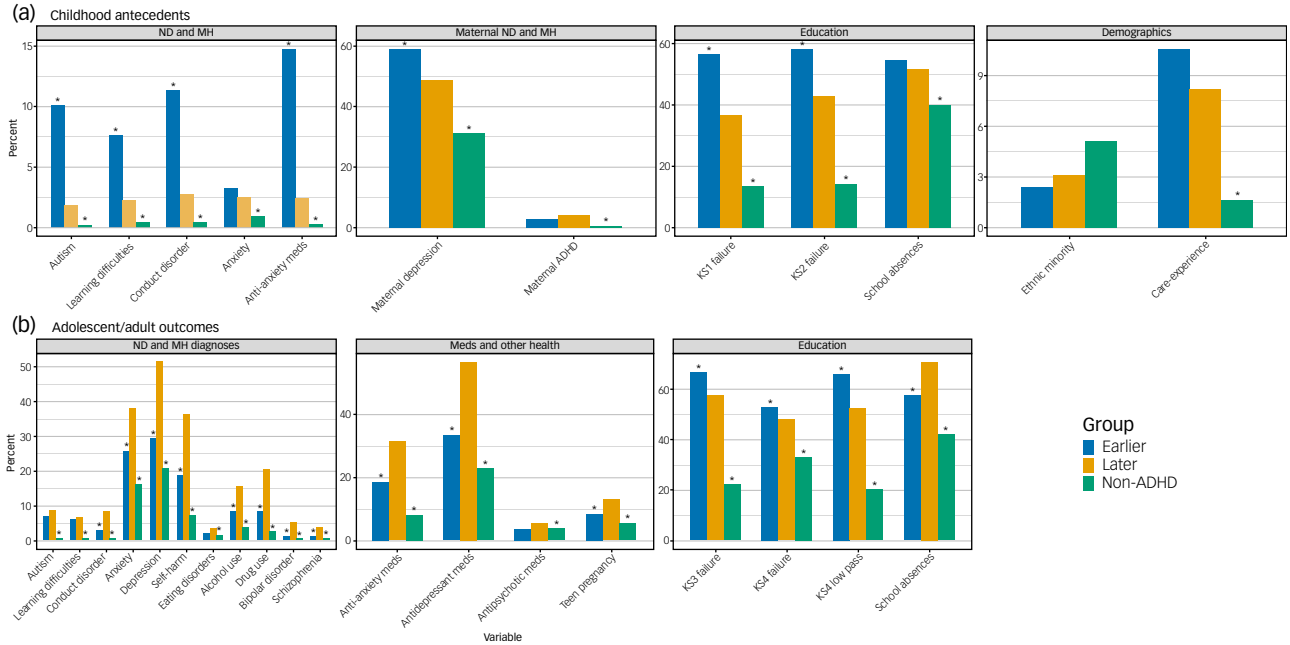

Fig. 1 (a) Binary childhood antecedents (ages 5–11) and (b) adolescent/adult outcomes (ages 12–25) in females with earlier versus later versus no attention–deficit hyperactivity disorder (ADHD) diagnosis. *$p_{\text{false discovery rate}} < 0.05$. Asterisks above the earlier ADHD group indicate that those results differ from the later ADHD group. Asterisks above the non-ADHD group indicate that those results differ from the later ADHD group. ND, neurodevelopmental; MH, mental health; KS, key stage. Anti-anxiety medications included anxiolytics, sedatives and hypnotics, which included melatonin.

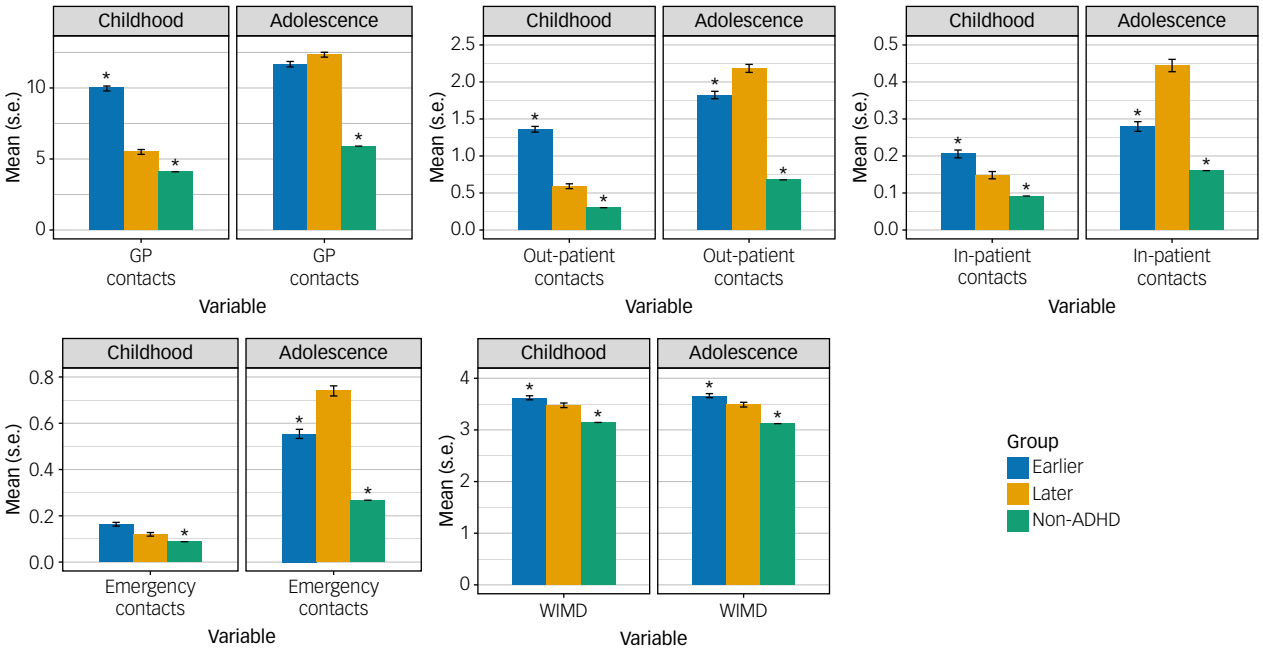

Fig. 2 Continuous childhood antecedents and adolescent/adult outcomes in females with earlier versus later versus no attention–deficit hyperactivity disorder (ADHD) diagnosis. *$p_{\text{false discovery rate}} < 0.05$. Asterisks above the earlier ADHD group indicate that those results differ from the later ADHD group. Asterisks above the non-ADHD group indicate that those results differ from the later ADHD group. GP, general practitioner (primary care); WIMD, Welsh Index of Multiple Deprivation (higher is greater deprivation).

Table 1 Sex-stratified and interaction analyses of childhood antecedents (ages 5–11) with (a) attention–deficit hyperactivity disorder (ADHD) diagnosis timing (earlier versus later) and (b) no ADHD compared with later ADHD diagnosis

	(a) ADHD diagnosis timing (0 = earlier versus 1 = later)			(b) No ADHD (= 0) compared with later ADHD diagnosis (= 1)		
Variable	Females Odds ratio (95% CIs)	Males Odds ratio (95% CIs)	Sex-by-predictor interaction analysis Odds ratio (95% CIs)	Females Odds ratio (95% CIs)	Males Odds ratio (95% CIs)	Sex-by-predictor interaction analysis Odds ratio (95% CIs)
Autism	**0.20 (0.12–0.32)**	**0.33 (0.27–0.40)**	0.62 (0.37–1.05)	**7.72 (4.91–12.12)**	**3.41 (2.82–4.12)**	**2.41 (1.48–3.93)**
Learning difficulties	**0.29 (0.18–0.46)**	**0.47 (0.37-0.59)**	0.63 (0.38–1.05)	**5.19 (3.47–7.76)**	**3.20 (2.57–3.99)**	1.69 (1.07–2.67)
Conduct disorder	**0.21 (0.14–0.32)**	**0.44 (0.37-0.52)**	**0.49 (0.31–0.76)**	**6.75 (4.67–9.76)**	**7.12 (6.08–8.35)**	0.99 (0.66–1.47)
Anxiety	0.86 (0.52–1.43)	0.75 (0.55–1.02)	1.18 (0.65–2.13)	**2.75 (1.87–4.05)**	**2.27 (1.75–2.96)**	1.27 (0.80–2.03)
Anti-anxiety medication	**0.18 (0.12–0.27)**	**0.18 (0.14–0.23)**	1.00 (0.61–1.62)	**8.42 (5.65–12.55)**	**5.92 (4.64–7.54)**	1.48 (0.93–2.37)
Maternal ADHD*	1.71 (1.03–2.84)	**0.70 (0.51–0.96)**	**2.39 (1.34–4.24)**	**9.02 (6.14–13.23)**	**5.74 (4.35–7.57)**	1.61 (1.03–2.53)
Maternal depression	**0.79 (0.65–0.95)**	**0.79 (0.72–0.87)**	1.01 (0.82–1.25)	**2.13 (1.85–2.44)**	**2.01 (1.85–2.18)**	1.11 (0.95–1.30)
Ethnic minority*	1.45 (0.83–2.56)	1.24 (0.91–1.68)	1.18 (0.62–2.24)	0.67 (0.44–1.02)	**0.60 (0.47–0.76)**	1.11 (0.69–1.81)
Care-experience*	0.95 (0.72–1.27)	0.96 (0.81–1.13)	1.03 (0.74–1.42)	**5.75 (4.59–7.19)**	**5.46 (4.69–6.35)**	1.12 (0.86–1.46)
Key stage 1 failure	**0.47 (0.37–0.59)**	**0.47 (0.41–0.53)**	0.99 (0.76–1.31)	**3.75 (3.11–4.52)**	**2.73 (2.44–3.06)**	**1.37 (1.10–1.70)**
Key stage 2 failure	**0.49 (0.40–0.60)**	**0.58 (0.52–0.65)**	0.87 (0.70–1.10)	**4.36 (3.73–5.10)**	**3.50 (3.19–3.84)**	**1.25 (1.05–1.49)**
School absences	0.96 (0.78–1.19)	**0.88 (0.78–0.99)**	1.08 (0.85–1.36)	**1.74 (1.49–2.04)**	**1.84 (1.67–2.03)**	0.94 (0.78–1.12)
General practitioner contacts	**0.86 (0.84–0.88)**	**0.83 (0.82–0.85)**	**1.04 (1.01–1.07)**	**1.07 (1.06–1.08)**	**1.05 (1.05–1.06)**	**1.02 (1.01–1.03)**
Out-patient contacts	**0.62 (0.56–0.68)**	**0.58 (0.54–0.61)**	1.08 (0.97–1.20)	**1.52 (1.45–1.60)**	**1.44 (1.40–1.49)**	**1.09 (1.03–1.15)**
In-patient contacts	**0.66 (0.50–0.87)**	**0.81 (0.70–0.94)**	0.83 (0.61–1.14)	**1.85 (1.62–2.11)**	**1.61 (1.48–1.75)**	1.16 (1.00–1.36)
Emergency contacts	1.36 (0.94–1.98)	**1.64 (1.33–2.01)**	0.91 (0.64–1.30)	**3.67 (2.71–4.96)**	**3.48 (2.93–4.15)**	1.22 (0.93–1.60)
WIMD**	**0.92 (0.87–0.98)**	0.99 (0.96–1.02)	0.94 (0.88–1.00)	**1.16 (1.11–1.21)**	**1.24 (1.21–1.27)**	**0.94 (0.89–0.99)**

WIMD: Welsh Index of Multiple Deprivation (higher is greater deprivation).
*Lifetime (not restricted to ages 5–11); **At entry into study.
Bold font indicates $p < 0.05$ after false discovery rate correction. Anti-anxiety medications included anxiolytics, sedatives and hypnotics, which included melatonin.

Adolescent/adult (ages 12–25) outcomes

Earlier versus later diagnosis

Compared with earlier ADHD diagnosis ($n = 1326$), later diagnosis ($n = 1292$) in females was associated with the following outcomes during adolescence/adulthood: conduct disorder, anxiety, depression, self-harm, alcohol use, drug use, bipolar disorder, schizophrenia, anti-anxiety and antidepressant prescriptions, teenage pregnancy, school absences and more out-patient, in-patient and emergency contacts. In contrast, the following outcomes were associated with an earlier diagnosis in females: KS3 and KS4 failure, low pass at KS4 and socioeconomic deprivation (see Figs. 1(b) and 2; Tables 2(a) and S4). There was no evidence of association with the following outcomes: autism, learning difficulties, eating disorders, antipsychotic medication prescriptions or GP contacts.

Table 2 Sex-stratified and interaction analyses of (a) attention–deficit hyperactivity disorder (ADHD) diagnosis timing (earlier versus later) and (b) no ADHD versus later ADHD diagnosis with adolescent/adult outcomes (ages 12–25)

	(a) ADHD diagnosis timing (0 = earlier versus 1 = later)			(b) No ADHD (= 0) compared with later ADHD diagnosis (= 1)		
Variable	Females Odds ratio (95% CIs)	Males Odds ratio (95% CIs)	Sex-by-predictor interaction analysis Odds ratio (95% CIs)	Females Odds ratio (95% CIs)	Males Odds ratio (95% CIs)	Sex-by-predictor interaction analysis Odds ratio (95% CIs)
Autism*	1.35 (0.99–1.84)	**1.33 (1.13–1.55)**	0.95 (0.68–1.31)	**23.77 (19.37–29.17)**	**11.20 (9.94–12.63)**	**2.08 (1.65–2.64)**
Learning difficulties*	0.97 (0.69–1.36)	1.22 (1.00–1.50)	0.78 (0.54–1.13)	**15.17 (12.02–19.14)**	**8.74 (7.50–10.19)**	**1.74 (1.31–2.29)**
Conduct disorder*	**3.19 (2.13–4.76)**	**2.19 (1.81–2.64)**	1.42 (0.93–2.16)	**21.71 (17.65–26.70)**	**18.17 (15.98–20.66)**	1.19 (0.94–1.52)
Anxiety*	**1.70 (1.43–2.03)**	**1.46 (1.31–1.63)**	1.14 (0.93–1.39)	**3.35 (2.98–3.77)**	**2.85 (2.63–3.10)**	**1.17 (1.02–1.35)**
Depression*	**2.34 (1.96–2.79)**	**1.69 (1.53–1.88)**	**1.42 (1.16–1.73)**	**4.53 (4.03–5.08)**	**3.20 (2.97–3.45)**	**1.42 (1.24–1.63)**
Self-harm*	**2.33 (1.94–2.81)**	**1.58 (1.41–1.78)**	**1.41 (1.13–1.75)**	**7.69 (6.84–8.64)**	**6.54 (6.01–7.12)**	**1.21 (1.04–1.39)**
Eating disorders*	1.69 (0.99–2.88)	1.32 (0.62–2.83)	1.26 (0.50–3.15)	**2.62 (1.92–3.57)**	**2.12 (1.19–3.76)**	1.24 (0.64–2.38)
Alcohol use*	**1.71 (1.33–2.21)**	**1.71 (1.49–1.98)**	0.97 (0.73–1.30)	**5.28 (4.52–6.17)**	**4.35 (3.94–4.80)**	**1.25 (1.04–1.50)**
Drug use*	**2.57 (2.01–3.28)**	**1.83 (1.62–2.07)**	**1.38 (1.05–1.82)**	**11.47 (9.96–13.21)**	**7.71 (7.08–8.40)**	**1.54 (1.30–1.81)**
Bipolar disorder*	**4.96 (2.65–9.29)**	**1.72 (1.03–2.88)**	**2.88 (1.29–6.45)**	**23.98 (18.39–31.26)**	**11.76 (8.25–16.77)**	**2.04 (1.32–3.17)**
Schizophrenia*	**3.44 (1.85–6.40)**	**2.37 (1.83–3.08)**	1.34 (0.68–2.62)	**11.24 (8.32–15.17)**	**8.89 (7.51–10.53)**	1.28 (0.91–1.80)
Anti-anxiety medication*	**1.69 (1.40–2.04)**	**1.58 (1.43–1.76)**	1.14 (0.93–1.40)	**6.15 (5.39–7.02)**	**6.53 (6.00–7.09)**	0.92 (0.79–1.08)
Antidepressant medication*	**2.43 (2.04–2.91)**	**1.81 (1.64–1.99)**	**1.37 (1.12–1.67)**	**5.73 (5.06–6.49)**	**4.24 (3.94–4.57)**	**1.34 (1.16–1.55)**
Antipsychotic medication*	1.31 (0.89–1.92)	**1.85 (1.33–2.58)**	0.70 (0.42–1.16)	**1.54 (1.20–1.97)**	**1.70 (1.37–2.12)**	0.90 (0.65–1.25)
Teenage pregnancy	**1.39 (1.07–1.82)**	NA	NA	**2.71 (2.29–3.22)**	NA	NA
Key stage 3 failure	**0.55 (0.45–0.68)**	**0.73 (0.65–0.81)**	**0.76 (0.61–0.95)**	**5.47 (4.77–6.28)**	**5.12 (4.70–5.58)**	1.04 (0.88–1.22)
Key stage 4 failure	**0.77 (0.60–0.98)**	1.01 (0.88–1.15)	0.78 (0.59–1.02)	**1.88 (1.58–2.23)**	**2.59 (2.33–2.89)**	**0.73 (0.60–0.90)**
Key stage 4 low pass	**0.61 (0.43–0.88)**	0.96 (0.77–1.19)	0.63 (0.42–0.95)	**4.66 (3.66–5.93)**	**4.43 (3.74–5.25)**	1.04 (0.78–1.40)
School absences	**1.76 (1.44–2.14)**	**1.42 (1.28–1.57)**	1.22 (0.98–1.51)	**3.41 (2.95–3.95)**	**2.70 (2.49–2.94)**	**1.26 (1.06–1.49)**
Variable	β (s.e.)	β (s.e)	β (s.e.)	β (s.e.)	β (s.e.)	β (s.e.)
General practitioner contacts	0.39 (0.27)	**−0.96 (0.12)**	**1.66 (0.29)**	**6.36 (0.18)**	**4.61 (0.09)**	**1.79 (0.21)**
Out-patient contacts	**0.51 (0.07)**	**0.13 (0.03)**	**0.42 (0.08)**	**1.50 (0.06)**	**0.86 (0.02)**	**0.64 (0.06)**
In-patient contacts	**0.14 (0.02)**	**0.04 (0.01)**	**0.12 (0.02)**	**0.28 (0.02)**	**0.08 (0.00)**	**0.20 (0.02)**
Emergency contacts	**0.22 (0.03)**	**0.16 (0.01)**	**0.08 (0.03)**	**0.47 (0.02)**	**0.27 (0.01)**	**0.20 (0.02)**
WIMD**	**−0.18 (0.07)**	−0.02 (0.03)	−0.12 (0.07)	**0.37 (0.04)**	**0.44 (0.03)**	−0.06 (0.05)

NA, not available; WIMD, Welsh Index of Multiple Deprivation (higher is greater deprivation).
*First recorded at age 12+. **At end of study in those aged 18+.
Bold font indicates $p < 0.05$ after false discovery rate correction. Anti-anxiety medications included anxiolytics, sedatives and hypnotics, which included melatonin.

The associations were stronger in females (with the same direction of effects in males) for depression, self-harm, drug use, bipolar disorder, antidepressant prescriptions, KS3 failure and out-patient, in-patient and emergency contacts. The association for GP contacts was stronger in males (earlier diagnosed males had more GP contacts), with no evidence of association in females. Some variables showed no association in males (KS4 failure and low pass) or were associated only in males (autism and antipsychotic medication prescriptions), though interaction analyses showed no differences by sex. All other variables showed similar results by sex (Table 2(a)).

Later versus no diagnosis

Females with later diagnosed ADHD were more likely than females without ADHD ($n = 272\,093$) to experience the following in adolescence/adulthood: all examined conditions and prescriptions, teenage pregnancy, KS3 and KS4 failure, low pass at KS4, school absences, more contacts with all healthcare services and higher socioeconomic deprivation (see Figs. 1(b) and 2; Tables 2(b) and S5).

The associations between later diagnoses compared with no diagnosis were stronger in females than males for eight conditions (autism, learning difficulties, anxiety, depression, self-harm, alcohol use, drug use and bipolar disorder), antidepressant prescriptions, school absences and all healthcare contacts. In contrast, the association was stronger in males for KS4 failure. The results were similar by sex for all other variables (Table 2(b)).

Sensitivity tests

We repeated analyses in subsets of individuals with relatively complete (≥95%) data coverage (50.9% of individuals at ages 5–12 and 63.3% of individuals at ages 12–18). The results were broadly similar to the primary analyses, aside from the following differences (Tables S6–9). Several associations in childhood no longer differed by sex (GP contacts in the earlier versus later analysis; KS2 failure and out-patient contacts in the later versus no ADHD analysis), whereas the association was now stronger in females for autism in the earlier versus later analysis. In adolescence/adulthood, several associations were no longer significant (teenage pregnancy and KS4 failure with later versus earlier ADHD in females; autism with later versus earlier ADHD in males). Also, several associations no longer differed in strength by sex (antidepressant prescriptions, KS3 failure and emergency contacts in the earlier versus later analysis; anxiety and KS4 failure in the later versus no ADHD analysis), whereas the association was now stronger in females for conduct disorder in the analysis of later versus no ADHD.

Discussion

This study aimed to determine the childhood antecedents and adolescent/adult outcomes of later (ages 12–25) ADHD diagnosis, compared with earlier (<12) and no diagnosis in females. The results indicate that although females with a later ADHD diagnosis generally had fewer childhood difficulties than those with an earlier diagnosis (indicating a less severe phenotype), several antecedents did not differ between these groups. Compared with females without ADHD, those with a later diagnosis already had clear evidence of childhood mental health and educational difficulties, increased healthcare use and socioeconomic deprivation. Several antecedents were more strongly associated in females than males.

Despite childhood differences indicating a less severe phenotype, by adolescence and emerging adulthood, females with a later diagnosis experienced more mental health difficulties, teenage pregnancy and healthcare contacts, compared with those diagnosed earlier. Many of these outcomes were exacerbated in females. All investigated adverse outcomes were more likely in females with a later diagnosis than no diagnosis, with generally stronger associations in females than males. Overall, our results demonstrate that later ADHD diagnosis is associated with significant negative outcomes by adolescence, which disproportionately disadvantages females.

Our results support our first hypothesis that females with a later diagnosis have clear evidence of difficulties in childhood, which precede ADHD diagnosis. They did not differ from females diagnosed earlier regarding anxiety, school absences and emergency contacts. Compared with females without ADHD, they had more recognised neurodevelopmental and mental health conditions (autism, learning difficulties, conduct disorder, anxiety and anti-anxiety medication prescriptions, which included melatonin), maternal ADHD and depression, educational problems (exam failure and school absences) and more healthcare contacts. As such, the presence of these childhood difficulties and healthcare service use, known to be associated with ADHD,[33] can be considered as important early indicators that ADHD assessment may be warranted in primary school-age females. Females with later diagnosed ADHD were also more likely to have experienced the care system and socioeconomic deprivation compared with females without ADHD, consistent with previous research.[34,35] These demographic groups are especially vulnerable to barriers to accessing care and to their health needs being overlooked. Overall, this evidence argues against the explanation of later diagnosis being a late-emerging ADHD phenotype that only has clinically significant impact later in life.[36]

The generally elevated risks of childhood healthcare and educational difficulties in females with an earlier compared with later diagnosis are consistent with previous research[37] and indicate that the most severely impacted females are more likely to reach ADHD services in Wales. However, our study clearly shows that those with fewer but nonetheless substantive difficulties are missing out on timely ADHD recognition and support.

The results generally support our second hypothesis, that females with later diagnosed ADHD exhibit worse healthcare, educational and socioeconomic outcomes compared with both females with an earlier diagnosis and without ADHD, with some exceptions, as discussed below. Despite the fact that the earlier diagnosed group had generally more childhood difficulties, by adolescence, the later diagnosed group had more problems, especially regarding mental health (including conduct disorder, anxiety, depression, self-harm, alcohol use, drug use, bipolar disorder, schizophrenia, anti-anxiety and antidepressant medication prescriptions). They were also at higher risk of teenage pregnancy, school absences and more healthcare contacts. This suggests a protective effect of timely diagnosis and treatment on these later outcomes.

However, the earlier diagnosed group continued to have poorer educational outcomes (exam failure and low attainment) and greater socioeconomic deprivation. These findings may reflect that females diagnosed later could have the impact of their ADHD symptoms somewhat buffered by relative advantages in academic ability and family socioeconomic resources,[36] whereas the earlier diagnosed group have more learning difficulties and pre-existing family adversity. The groups also did not differ for several health outcomes (including adolescent neurodevelopmental conditions, eating disorders, antipsychotic medication prescriptions or GP contacts). This suggests that even an earlier diagnosis cannot fully mitigate against the mental health risks conferred by ADHD, and that these emerging risks are not being sufficiently proactively identified in those diagnosed earlier. Whole-system care (encompassing healthcare, social care and educational services) needs to improve to address ADHD inequalities.

Females with later diagnosed ADHD had poorer outcomes than those without ADHD on every outcome examined, across mental health, education and teenage pregnancy. This is critically important. Educational failure and poor mental health (including substance misuse and severe and enduring mental illness such as schizophrenia and bipolar disorder) come at substantial and wide-ranging costs to individuals, their families and the economy. The exceptionally high prevalence of depression (51.4%), anxiety (38.1%) and self-harm (36.2%) in the later diagnosed group should be noted. It is important to also recognise the impact on future generations as adverse outcomes likely contribute to intergenerational transmission of adversity and inequality.

Although our focus was primarily on females with ADHD due to the historical neglect of this group (clinically and in research), we also examined males. The pattern of results was very similar and therefore, many of these results are also relevant to later diagnosed males. Although females are more likely to be diagnosed later, there are also many males who experience later diagnosis and negative outcomes. We found a number of sex differences. Conduct disorder was a particularly strong indicator of earlier diagnosis in females, as shown before.[38] Maternal ADHD was more likely among earlier than later diagnosed males, with no difference in females. This likely reflects small numbers with limited power to detect sex differences and, also, we cannot differentiate between the timing of maternal and offspring diagnoses. Childhood autism, exam failure and healthcare contacts were more strongly associated with later compared with no diagnosis in females, indicating that these are especially important indicators of likely ADHD in females.

Importantly, several associations in adolescent outcomes were stronger in females. The risk of negative outcomes in later compared with earlier diagnosed females was greater than in males for depression, self-harm, drug use, bipolar disorder, antidepressant prescriptions, exam failure and secondary healthcare contacts. These results build on previous studies that found an overall greater risk of many mental health outcomes in females with ADHD,[3,5–8] finding that the disproportionately later ADHD diagnosis in females may add to this burden of negative outcomes. In the comparison of later diagnosed females against those without ADHD, the associations were stronger than in males for autism, learning difficulties, anxiety, depression, self-harm, alcohol use, drug use, bipolar disorder, antidepressant prescriptions, school absences and all healthcare contacts. This demonstrates that the outcomes of later diagnosis have a larger impact on females, particularly in terms of mental health problems, leading to greater use of healthcare resources.

Our study has several notable strengths; we used a nationwide register of all individuals with ADHD in Wales, with good coverage, including both primary and secondary healthcare records and linked educational and demographic variables.

In terms of limitations, routinely collected administrative data have variable accuracy and are not designed for research purposes, which may lead to biases. Our study only includes individuals with ADHD who reached NHS clinical services and received a diagnosis; as such, many individuals with undiagnosed ADHD (or ADHD diagnosed privately) will be among the non-ADHD group. The recent English national adult survey showed very few (0.5%) people without significant ADHD symptoms reported having been diagnosed with ADHD and almost none were taking ADHD medication.[39] Furthermore, any such misclassification would serve to reduce differences between our cohorts, suggesting that observed group differences are robust. It is also possible that some ADHD

diagnoses could be misdiagnoses. Therefore, our study reflects clinical practice in Wales during the 20-year study period. We were unable to define ADHD based on pubertal timing due to lack of available data and the sample size of the later diagnosed group precluded further stratification in terms of adolescence/adulthood. Healthcare contacts could be influenced by factors aside from severity or multi-morbidity (e.g. attitudes towards help-seeking, access to services), which could not be differentiated. Other limitations are that the population coverage was lower for some of the linked databases (e.g. educational, maternal and ethnicity data only from 2011 via the Office for National Statistics, which could be more likely to be missing for individuals immigrating to Wales), maternal ADHD was considered at any time point due to small numbers, and we lacked linkage to biological fathers. Also, we were only able to look at biological sex and not gender identity, which is important to study in its own right in people with ADHD, as well as the intersection between sex/gender and other factors (e.g. ethnicity, deprivation). As the study period ended prior to 2020, the COVID-19 pandemic did not influence the results, but also our study does not provide data on these most recent years, which have seen shifts in clinical services and waiting lists for ADHD in the UK.

Future studies are needed to further examine differences in ADHD diagnosis timing in adolescence and adulthood, as well as to develop improved gender-inclusive assessment tools to aid ADHD diagnosis, especially in females.

This study has important clinical and wider societal implications, highlighting that a substantial proportion of females with ADHD (and a relatively smaller proportion of males) are not receiving a diagnosis of ADHD by age 12 in childhood, despite prominent co-occurring neurodevelopmental, mental health, educational and general healthcare difficulties early in life. This later diagnosed group experiences a variety of serious mental health problems, educational difficulties and socioeconomic disadvantages by adolescence and early adulthood, many of which are worse than in those who receive an earlier diagnosis and support. ADHD is highly prevalent and adverse outcomes are often severe and lifelong. Therefore, timely diagnosis and intervention are essential to reduce the impact on individuals with ADHD, as well as costs to healthcare services and economic productivity.

Joanna Martin, PhD, Centre for Neuropsychiatric Genetics and Genomics, Cardiff University, UK; and Wolfson Centre for Young People's Mental Health, Cardiff University, UK; **Olivier Y. Rouquette**, PhD, Institute of Suicide Prevention and Mental Health, Swansea University, UK; and GESIS, Leibniz Institutes for the Social Sciences, Cologne, Germany; **Kate Langley**, PhD, School of Psychology, Cardiff University, UK; **Miriam Cooper**, PhD, MRCPsych, Wolfson Centre for Young People's Mental Health, Cardiff University, UK; and Clinical Partners Limited, Semley, UK; **Kapil Sayal**, PhD, MRCPsych, Centre for ADHD and Neurodevelopmental Disorders Across the Lifespan, Institute of Mental Health, Nottingham, UK; and Unit of Mental Health and Clinical Neurosciences, School of Medicine, University of Nottingham, UK; **Tamsin J. Ford**, PhD, MRCPsych, Department of Psychiatry, University of Cambridge, UK; **Ann John**, MPH, MRCGP, Centre for Neuropsychiatric Genetics and Genomics, Cardiff University, UK; Wolfson Centre for Young People's Mental Health, Cardiff University, UK; and Institute of Suicide Prevention and Mental Health, Swansea University, UK; **Anita Thapar**, PhD, MRCPsych, FRCPsych, Centre for Neuropsychiatric Genetics and Genomics, Cardiff University, UK; and Wolfson Centre for Young People's Mental Health, Cardiff University, UK

Correspondence: Joanna Martin. Email: martinjm1@cardiff.ac.uk

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Supplementary material

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Data availability

Data and research materials are available through application to the SAIL databank (https://www.saildatabank.com). Codes and algorithms used in this manuscript are available in collaboration with the Adolescent Mental Health Data Platform.

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Author contributions

J.M.: acquisition of funding, study design, analyses, manuscript writing and editing. O.Y.R.: data curation and manuscript editing. K.L., M.C., K.S., T.J.F., A.J. and A.T.: study design, manuscript editing.

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Transparency declaration

J.M. is the lead author and manuscript guarantor and 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.

References

1 Willcutt EG. The prevalence of DSM-IV attention-deficit/hyperactivity disorder: a meta-analytic review. *Neurotherapeutics* 2012; **9**: 490–9.

2 Martin J. Why are females less likely to be diagnosed with ADHD in childhood than males? *Lancet Psychiatry* 2024; **11**: 303–10.

3 Martin J, Langley K, Cooper M, Rouquette OY, John A, Sayal K, et al. Sex differences in attention-deficit hyperactivity disorder diagnosis and clinical care: a national study of population healthcare records in Wales. *J Child Psychol Psychiatry* 2024; **65**: 1648–58.

4 Dalsgaard S, Thorsteinsson E, Trabjerg BB, Schullehner J, Plana-Ripoll O, Brikell I, et al. Incidence rates and cumulative incidences of the full spectrum of diagnosed mental disorders in childhood and adolescence. *JAMA Psychiatry* 2020; **77**: 155–64.

5 Solberg BS, Halmøy A, Engeland A, Igland J, Haavik J, Klungsøyr K. Gender differences in psychiatric comorbidity: a population-based study of 40 000 adults with attention deficit hyperactivity disorder. *Acta Psychiatr Scand* 2018; **137**: 176–86.

6 Ottosen C, Larsen JT, Faraone SV, Chen Q, Hartman C, Larsson H, et al. Sex differences in comorbidity patterns of attention-deficit/hyperactivity disorder. *J Am Acad Child Adolesc Psychiatry* 2019; **58**: 412–22.e3.

7 Skoglund C, Sundström Poromaa I, Leksell D, Ekholm Selling K, Cars T, Giacobini M, et al. Time after time: failure to identify and support females with ADHD – a Swedish population register study. *J Child Psychol Psychiatry* 2024; **65**: 832–44.

8 Newlove-Delgado T, Hamilton W, Ford TJ, Stein K, Ukoumunne OC. Prescribing for young people with attention deficit hyperactivity disorder in UK primary care: analysis of data from the Clinical Practice Research Datalink. *ADHD Attent Deficit Hyperact Disord* 2019; **11**: 255–62.

9 Madsen KB, Ravn MH, Arnfred J, Olsen J, Rask CU, Obel C. Characteristics of undiagnosed children with parent-reported ADHD behaviour. *Eur Child Adolesc Psychiatry* 2018; **27**: 149–58.

10 Mennies RJ, Birk SL, Norris LA, Olino TM. The main and interactive associations between demographic factors and psychopathology and treatment utilization

in youth: a test of intersectionality in the ABCD study. *Res Child Adolesc Psychopathol* 2021; **49**: 5–17.

11 Wright N, Moldavsky M, Schneider J, Chakrabarti I, Coates J, Daley D, et al. Practitioner review: pathways to care for ADHD - a systematic review of barriers and facilitators. *J Child Psychol Psychiatry* 2015; **56**: 598–617.

12 Du Rietz E, Jangmo A, Kuja-Halkola R, Chang Z, D'Onofrio BM, Ahnemark E, et al. Trajectories of healthcare utilization and costs of psychiatric and somatic multimorbidity in adults with childhood ADHD: a prospective register-based study. *J Child Psychol Psychiatry* 2020; **61**: 959–68.

13 Shaw M, Hodgkins P, Caci H, Young S, Kahle J, Woods AG, et al. A systematic review and analysis of long-term outcomes in attention deficit hyperactivity disorder: effects of treatment and non-treatment. *BMC Med* 2012; **10**: 99.

14 Young S, Asherson P, Lloyd T, Absoud M, Arif M, Colley WA, et al. Failure of healthcare provision for attention-deficit/hyperactivity disorder in the United Kingdom: a consensus statement. *Front Psychiatry* 2021; **12**: 324.

15 Chang Z, D'Onofrio BM, Quinn PD, Lichtenstein P, Larsson H. Medication for attention-deficit/hyperactivity disorder and risk for depression: a nationwide longitudinal cohort study. *Biol Psychiatry* 2016; **80**: 916–22.

16 French B, Daley D, Groom M, Cassidy S. Risks associated with undiagnosed ADHD and/or autism: a mixed-method systematic review. *J Atten Disord* 2023; **27**: 1393–410.

17 Sayal K, Prasad V, Daley D, Ford T, Coghill D. ADHD in children and young people: prevalence, care pathways, and service provision. *Lancet Psychiatry* 2018; **5**: 175–86.

18 Jones KH, Ford DV, Jones C, Dsilva R, Thompson S, Brooks CJ, et al. A case study of the secure anonymous information linkage (SAIL) gateway: a privacy-protecting remote access system for health-related research and evaluation. *J Biomed Inform* 2014; **50**: 196–204.

19 Rodgers SE, Lyons RA, Dsilva R, Jones KH, Brooks CJ, Ford DV, et al. Residential Anonymous Linking Fields (RALFs): a novel information infrastructure to study the interaction between the environment and individuals' health. *J Public Health (Bangkok)* 2009; **31**: 582–8.

20 Rodgers SE, Demmler JC, Dsilva R, Lyons RA. Protecting health data privacy while using residence-based environment and demographic data. *Health Place* 2012; **18**: 209–17.

21 Ford DV, Jones KH, Verplancke JP, Lyons RA, John G, Brown G. The SAIL Databank: building a national architecture for e-health research and evaluation. *BMC Health Serv Res* 2009; **9**: 1–12.

22 Lee A, Elliott M, Scourfield J, Bedston S, Broadhust K, Ford DV, et al. Data resource: children receiving care and support and children in need, administrative records in Wales. *Int J Popul Data Sci* 2022; **7**: 1694.

23 Langley K, Del Pozo-Banos M, Daalsgard S, Paranjothy S, Riglin L, John A, et al. Can a nation-wide e-cohort of ADHD and ASD in childhood be established using Welsh routinely available datasets? *BMJ Open* 2023; **13**: e071851.

24 Kennedy N, Kennedy J, Kerr M, Dredge S, Brophy S. Health checks for adults with intellectual disability and association with survival rates: a linked electronic records matched cohort study in Wales, UK. *BMJ Open* 2022; **12**: e049441.

25 John A, Friedmann Y, DelPozo-Banos M, Frizzati A, Ford T, Thapar A. Association of school absence and exclusion with recorded neurodevelopmental disorders, mental disorders, or self-harm: a nationwide, retrospective, electronic cohort study of children and young people in Wales, UK. *Lancet Psychiatry* 2022; **9**: 23–34.

26 John A, McGregor J, Fone D, Dunstan F, Cornish R, Lyons RA, et al. Case-finding for common mental disorders of anxiety and depression in primary care: an external validation of routinely collected data. *BMC Med Inform Decis Mak* 2016; **16**: 1–10.

27 John A, Delpozo-Banos M, Gunnell D, Dennis M, Scourfield J, Ford DV, et al. Contacts with primary and secondary healthcare prior to suicide: case-control whole-population-based study using person-level linked routine data in Wales, UK, 2000-2017. *Br J Psychiatry* 2020; **217**: 717–24.

28 Marchant A, Turner S, Balbuena L, Peters E, Williams D, Lloyd K, et al. Self-harm presentation across healthcare settings by sex in young people: an e-cohort study using routinely collected linked healthcare data in Wales, UK. *Arch Dis Child* 2020; **105**: 347–54.

29 Micali N, Hagberg KW, Petersen I, Treasure JL. The incidence of eating disorders in the UK in 2000–2009: findings from the General Practice Research Database. *BMJ Open* 2013; **3**: e002646.

30 John A, McGregor J, Jones I, Lee SC, Walters JTR, Owen MJ, et al. Premature mortality among people with severe mental illness — new evidence from linked primary care data. *Schizophr Res* 2018; **199**: 54–162.

31 Gorton HC, Webb RT, Carr MJ, DelPozo-Banos M, John A, Ashcroft DM. Risk of unnatural mortality in people with epilepsy. *JAMA Neurol* 2018; **75**: 929.

32 Mhereeg M, Jones H, Kennedy J, Seaborne M, Parker M, Kennedy N, et al. COVID-19 vaccination in pregnancy: views and vaccination uptake rates in pregnancy, a mixed methods analysis from SAIL and the Born-In-Wales Birth Cohort. *BMC Infect Dis* 2022; **22**: 932.

33 Prasad V, Rezel-Potts E, White P, Downs J, Boddy N, Sayal K, et al. Use of healthcare services before diagnosis of attention-deficit/hyperactivity disorder: a population-based matched case-control study. *Arch Dis Child* 2023; **109**: 46–51.

34 Prasad V, West J, Kendrick D, Sayal K. Attention-deficit/hyperactivity disorder: variation by socioeconomic deprivation. *Arch Dis Child* 2019; **104**: 802–5.

35 Ford T, Vostanis P, Meltzer H, Goodman R. Psychiatric disorder among British children looked after by local authorities: comparison with children living in private households. *Br J Psychiatry* 2007; **190**: 319–25.

36 Riglin L, Wootton RE, Livingston LA, Agnew-Blais J, Arseneault L, Blakey R, et al. 'Late-onset' ADHD symptoms in young adulthood: is this ADHD? *J Atten Disord* 2022; **26**: 1271–82.

37 Barclay I, Sayal K, Ford T, John A, Taylor MJ, Thapar A, et al. Investigating the reasons behind a later or missed diagnosis of attention-deficit/hyperactivity disorder in young people: a population cohort study. *JCPP Adv* 2024; **5**: e12301.

38 Mowlem F, Rosenqvist MA, Martin J, Lichtenstein P, Asherson P, Larsson H. Sex differences in predicting ADHD clinical diagnosis and pharmacological treatment. *Eur Child Adolesc Psychiatry* 2019; **28**: 481–9.

39 Ridout K, O'Shea C, Morris S, Brugha T, Ford T, McManus S, et al. Attention deficit hyperactivity disorder. In *Adult Psychiatric Morbidity Survey: Survey of Mental Health and Wellbeing, England, 2023/4* (eds S Morris, S Hill, T Brugha, S McManus): Ch. 9. NHS England, 2025.