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The intergenerational health, social care, and justice system contacts associated with household substance misuse in Wales

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Abstract

Background

Household substance misuse (SM) is associated with child deprivation and worse physical and mental health. This study utilised linked healthcare, justice, and children's social care data in Wales for the first time, to create a reusable cohort of households that experience substance misuse (SMHH).

Methods

Using the SAIL Databank, a population-scale retrospective electronic cohort (e-cohort) was created to perform a cross-sectional analysis of SM-related health and criminal justice events during 2011–2019 for adults and children in SMHH, which were compared with the rest of the population using period prevalence ratios (PR) and 95% confidence intervals (CI). Other variables included demographics, children's social care, healthcare, and SM-related criminal court cases.

Results

There were 776,366 children and 1,032,088 adults, where 83,558 children (11%) lived in SMHH, and 48,398 (5%) of adults who lived with a child had a SM event. Children in SMHH had a 133% higher prevalence of referral to SM treatment (PR = 2.33, CI: 2.23–2.43), and a SM-related criminal case was 42% more prevalent (PR = 1.42, CI: 1.30–1.55) during the period. Notably, the prevalence of SMHH children receiving care and support was 300% higher (PR = 4.00, CI: 3.92–4.08), and self-harm was 78% more prevalent (PR = 1.78, CI: 1.71–1.86).

Conclusion

SMHH children experience significant disparities, including higher deprivation, adverse birth outcomes, mental health issues, social care involvement, and SM-related criminal justice prosecutions. Evidence-based interventions and policy are needed to support adults and children in SMHH to mitigate the intergenerational impact.

Keywords

substance misuse; substance use harms; harmful substance use; drug; alcohol; intergenerational; data linkage; justice



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Introduction

The global burden of disease (2010) found that the leading cause of years lived with disability worldwide was mental and substance use disorders [1], with a substantial proportion of the disease burden attributed to substance misuse associated with outcomes such as unintentional injuries and suicide [2–4]. In this study, substance misuse is defined as the recurrent use of alcohol or illicit drugs which causes harm to a person, and was the standard terminology used in the datasets. The impact of parental substance misuse on children has also been investigated, and affects children in a variety of health, social, and economic aspects. In particular, children who live in households with parental substance misuse are more likely to experience exposure to poverty, domestic violence, hospitalisation, learning difficulties, and mental health conditions such as depression and anxiety [5]. Substance misuse is associated with multiple overlapping forms of disadvantage, such as homelessness and criminal justice involvement, which are associated with socioeconomic deprivation and stress [6, 7]. Maternal substance misuse during pregnancy is also associated with premature birth, low birth weight and neonatal withdrawal syndrome in the child [5]. Research indicates that children affected by parent/carer substance misuse often have additional well-being and mental health requirements [8].

Perpetuated substance misuse across generations produces a multitude of detrimental factors for children, from sociodemographic and antenatal exposures that predispose infants to developmental challenges, to adverse childhood experiences (ACEs) such as childhood maltreatment associated with living with someone who had an alcohol-related problem or mental health disorder, and experiencing the death of a household member [9].

A significant development in terms of policy was the Well-being of Future Generations (Wales) Act 2015, which was introduced by the Welsh Government to require public bodies in Wales to consider the long-term impact of their decisions, including goals of 'a healthier Wales' and 'a more equal Wales' [10]. It has been shown in Wales that a family with alcohol problems is a significant risk factor for early alcohol use in adolescence [11] and substance misuse is a significant public health issue in Wales.

The Welsh Government Substance Misuse Delivery Plan also highlighted the need for the prevention of harm, and support for individuals and families through partnership working between services [12, 13], with the substance misuse treatment framework for children and young people providing further strategy and the need for interagency collaboration [45]. The Families First guidance also aims to provide targeted support services that mitigate adverse impacts on vulnerable families and enable families to remain together where appropriate [14]. By using linked data to report the wider determinants associated with intergenerational drug and alcohol substance misuse in households, this study aims to describe the complex dynamics of households with experience of substance misuse, which will inform future research and policies to promote the wellbeing of future generations. This research aims to inform evidence-based strategies for prevention, intervention, and additional support,

thereby fostering healthier trajectories for children affected by substance misuse in Wales.

Methodology

Study design

A population-scale retrospective electronic cohort (e-cohort) was created, comprising a linked dataset of households containing children and adults in Wales between 01 January 2011 and 31 December 2019. This cross-sectional study examined the prevalence of various variables associated with substance misuse in adults and children. The study used the SAIL (Secure Anonymised Information Linkage) Databank, a secure repository of anonymised health, justice, and administrative data, with rich linked person-level and address-level data for the Welsh population. Data are linked via a trusted third-party for research purposes and are accessible through a secure trusted research environment [15–19]. The study period was chosen to match the dataset with the least longitudinal data (the Ministry of Justice Data First Magistrates' Courts defendant dataset [20]).

Study population

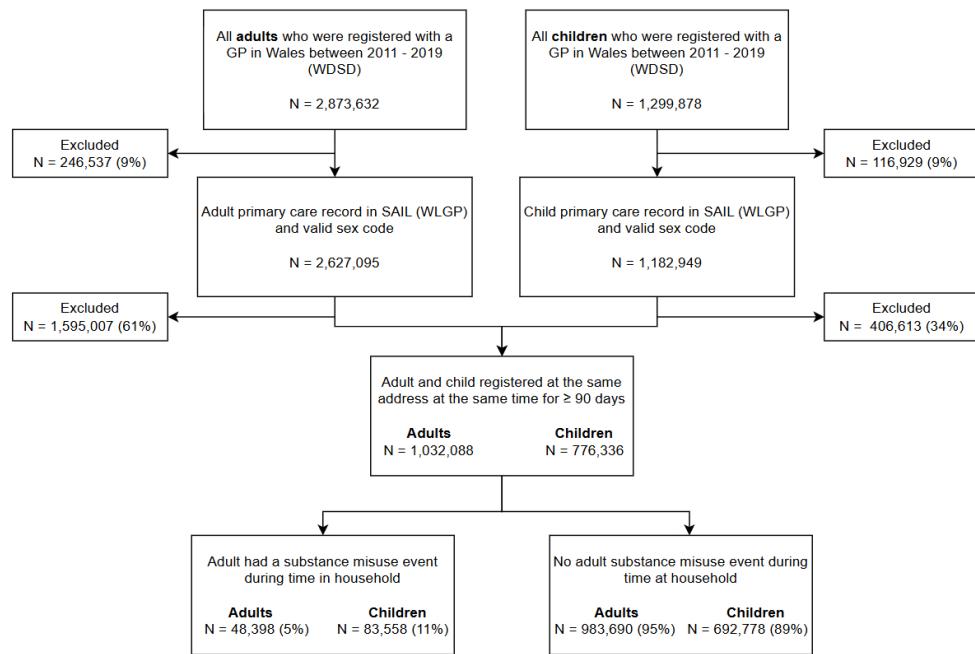
The Welsh Demographic Service Dataset (WDSD) provides demographic information for all people registered with a general practice in Wales, including their Welsh Index of Multiple Deprivation (WIMD) 2019 [21], to establish the population of children (age < 18 years at start of GP registration) and adults (age ≥ 18 years). Linkage was then performed to the Welsh Longitudinal General Practice dataset (WLGP), a dataset containing 86% of primary care GP records for the Welsh population (as of the data extract date, 01 October 2022).

To identify the study population, a set of rules were applied. The individuals had to have an ALF (anonymised linkage field) for linkage, derived using deterministic and probabilistic record linkage, with a matching probability of $\geq 90\%$ [17]. They also had to have a valid week of birth (the Monday preceding the date of birth, to aid in protecting anonymity) and sex. The ALF was used to link between datasets, and the study inclusion and exclusion criteria with the corresponding counts are shown in Figure 1.

Individuals registered at the same address at the same time for a minimum of 90 days were then grouped into a household [22]. These individuals were identified via the Residential Anonymised Linkage Field (RALF) which links individuals to their residential addresses [23]. The granularity of the data meant that we could not ascertain the relationships between individuals; therefore, a household may consist of adults who were, for example, parents, grandparents, carers, or siblings of a child. Changes to family circumstances could result in children having different household compositions over time.

The adults and children were required to have been registered for at least 90 days at the address to allow for: delays in a change of address on the GP system which may otherwise erroneously group previous residents as overlapping members of the same household, and retrospective re-coding

Figure 1: Flowchart showing the study population inclusion criteria for adults and children registered with a General Practice (GP) in Wales (WDSD dataset), at the same residential address at the same time



At the data extract date, 86% of the individuals registered in Wales contributed GP records to the WLGP dataset in the SAIL Databank.

due to a change in primary care registration [24]. The study window for each household therefore began on the latest of: 01 January 2011 or 90 days after the GP registration start date for each adult and child, and ended at the earliest of: end of GP registration, study end date, date of death, or 18th birthday of the child.

Households containing an adult who had a recorded substance misuse event during their time at a household with a child were flagged as substance misuse households (SMHH), and the remaining households were the rest of the population.

Data sources

The association between adult household substance misuse and a range of demographic, clinical, social care, and criminal justice variables were investigated. A flag was created for adults who had a substance misuse event during the time registered at the same address as a child. Substance misuse events were identified from seven sources as shown in Table 1: Welsh Longitudinal General Practice dataset (WLGP); Welsh National Database for Substance Misuse (WNDSM, or Substance Misuse Dataset (SMDS) in SAIL); Patient Episode Dataset for Wales (PEDW); Emergency Department Dataset (EDDS); Outpatient Database for Wales (OPDW); Data First Magistrates' Court defendant case level dataset (MACO) from the UK Ministry of Justice; and the Annual District Deaths Extract (ADDE), which is derived from the Office for National Statistics (ONS) death register. The events were identified as related to substance misuse by using codelists of substance misuse codes which have been made publicly available (Supplementary Appendix A1 and A2) [25, 26].

Variables

The child population was stratified by demographics of: age, sex, WIMD 2019 quintile (which is a geographical area-based measure of deprivation [21]) for the address of the household (all from WDSD), birthweight, and gestational age (from NCCH). In addition, variables were created for:

- Flagging a SMHH; whether at least one adult substance misuse event occurred during their time within the household
- Substance type of the adult SM event(s) (alcohol, drug, unspecified)
- Child in Need or Child Receiving Care and Support [38] at any time prior to study end, with first category of need – the main reason they started receiving care and support (abuse or neglect, child disability or illness, parental disability or illness, family in acute stress, family dysfunction, child socially unacceptable behaviour, low income (not used after April 2016), absent parenting, adoption disruption) [39] and whether a child or adult SM issue was noted
- Child on Child Protection Register [38] prior to study end
- Child in Children Looked After Wales census [40, 41] prior to study end
- SM-related magistrates' court case, where date of offence or court hearing date prior to study end
- Referral to SM treatment services (WNDSM) [42] prior to study end

Table 1: The SAIL Databank individual-level routinely collected administrative datasets used in the study and their purpose

Dataset acronym	Dataset description	Purpose in study
WDSD	Welsh Demographic Service Dataset – a register of all individuals registered with a GP in Wales, includes individuals anonymised address, and practice history [27].	Derived study population, households, time in study, and demographic variables
WLGP	Welsh Longitudinal General Practice Dataset – attendance and clinical information for 86% of general practice interactions in Wales [28].	Source of substance misuse related events, and diagnoses for: anxiety, depression, self-harm, learning difficulties, neurodevelopmental issues
SMDS	Substance Misuse Data Set (also known as the Welsh National Database for Substance Misuse – WNDSM) – captures data relating to all individuals presenting for substance misuse treatment in Wales [29].	Source of substance misuse related events
PEDW	Patient Episode Dataset for Wales – contains all inpatient and day case activity undertaken in NHS Wales, plus data on Welsh residents treated in English Trusts [30].	Source of substance misuse related events
EDDS	Emergency Department Data Set – attendance and clinical information for all NHS Wales accident and emergency attendances [31].	Source of substance misuse related events
OPDW	Outpatient Database for Wales – attendance information for all hospital outpatient appointments [32].	Source of substance misuse related events
ADDE	Annual District Death Extract – a register of all deaths relating to Welsh residents derived from the ONS Deaths register [33].	Source of substance misuse related events and date of death
MACO	Magistrates' Court defendant case level dataset – individuals appearing as defendants in criminal cases dealt with by magistrates' court in England and Wales. All criminal cases start with a first hearing in magistrates' court [20].	Source of substance misuse related events
NCCH	National Community Child Health database – the child health system in Wales [34].	Source of child birth information
CINW	Children In Need census Wales. From April 2016, CINW was discontinued and replaced by CRCS [35].	Source of child care-related information
CRCS	Children Receiving Care and Support census – children with a care and support plan. Captures children with a care and support plan, whilst CINW had a broader coverage [36].	Source of child care-related information
LACW	Children Looked After Wales – an annual census that includes information of care by a local authority that a child has received that year [37].	Source of child care-related information

along with using clinically verified code lists [43, 44] in WLGP for the adult and child, prior to study end:

- Anxiety
- Depression
- Self-harm
- Learning difficulties
- Neurodevelopmental issues – attention deficit hyperactivity disorder and autism spectrum disorder
- and suicide (from the ADDE dataset).

The children who lived with an adult who had a substance misuse event during their time at the household were flagged as children in households with substance misuse (SMHH), whilst the rest of the child population were used as the reference group.

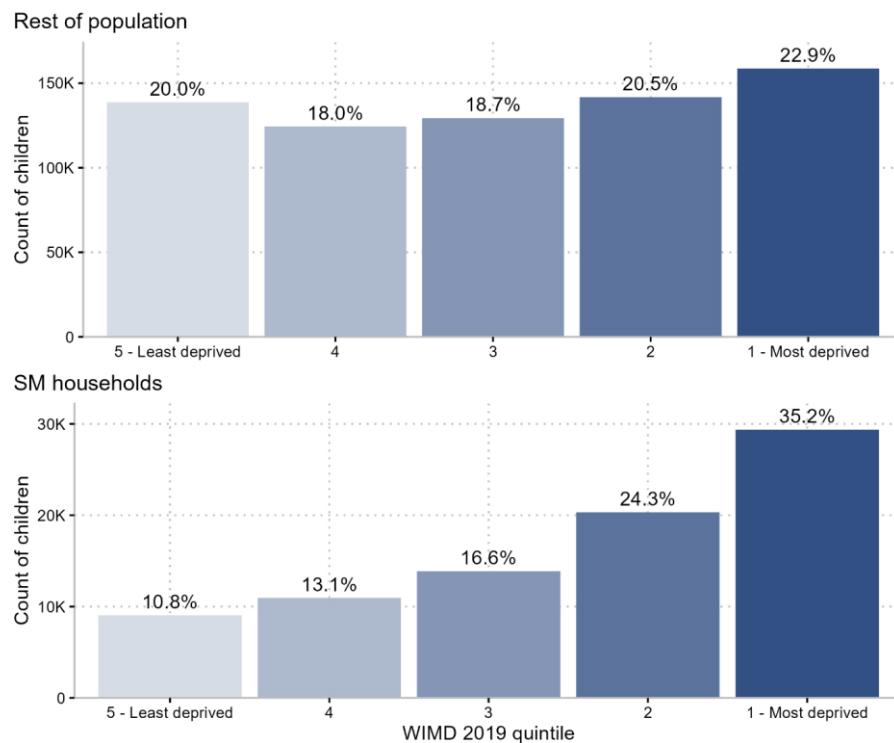
Statistical analysis

Descriptive statistics were used to summarise the number of children who were registered at the same address at the same time as an adult. Median age and inter-quartile range (IQR) was calculated for the children at entry to the study. The period prevalence of each variable was produced separately for the SMHH children and for the rest of population, calculated as

$$\text{Prevalence} = \frac{\text{Number of children with the event during the study}}{\text{Total number of children in the sub-population}}$$

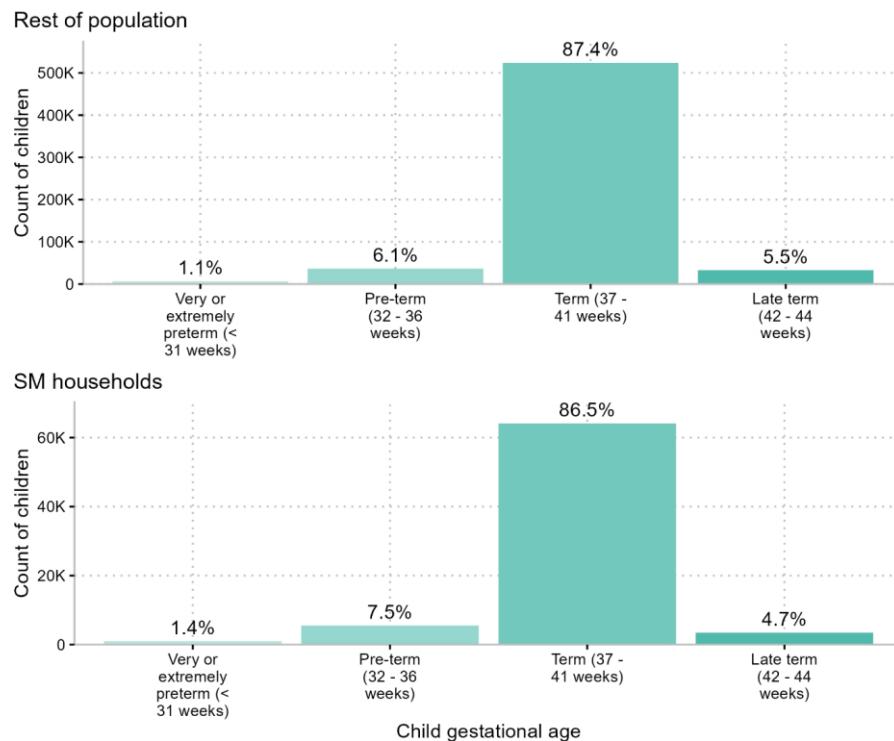
with prevalence ratios (PR) for comparison and Wald 95% confidence intervals (CIs) to assess statistical significance. PRs with CIs enabled a quantitative comparison between children living in a SMHH with children in the rest of the population (the reference group).

Figure 2: Welsh Index of Multiple Deprivation 2019 quintile for the children in (top) the rest of the population, and (bottom) the substance misuse households



Households with substance misuse had a greater percentage of children living in the more deprived areas.

Figure 3: Child gestational age category for the children in (top) the rest of the population, and (bottom) the substance misuse households



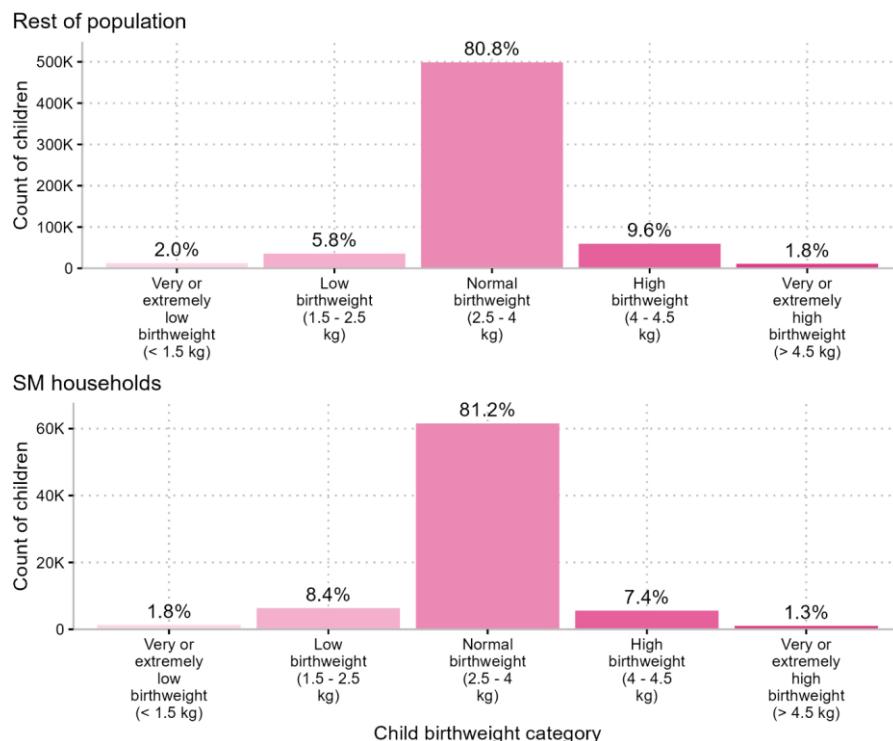
In the substance misuse households, a significantly greater percentage of children were born pre-term.

Results

We quantified the association between adult substance misuse in a household, with health, children's social care, and criminal justice variables. No causal inferences were drawn, due to

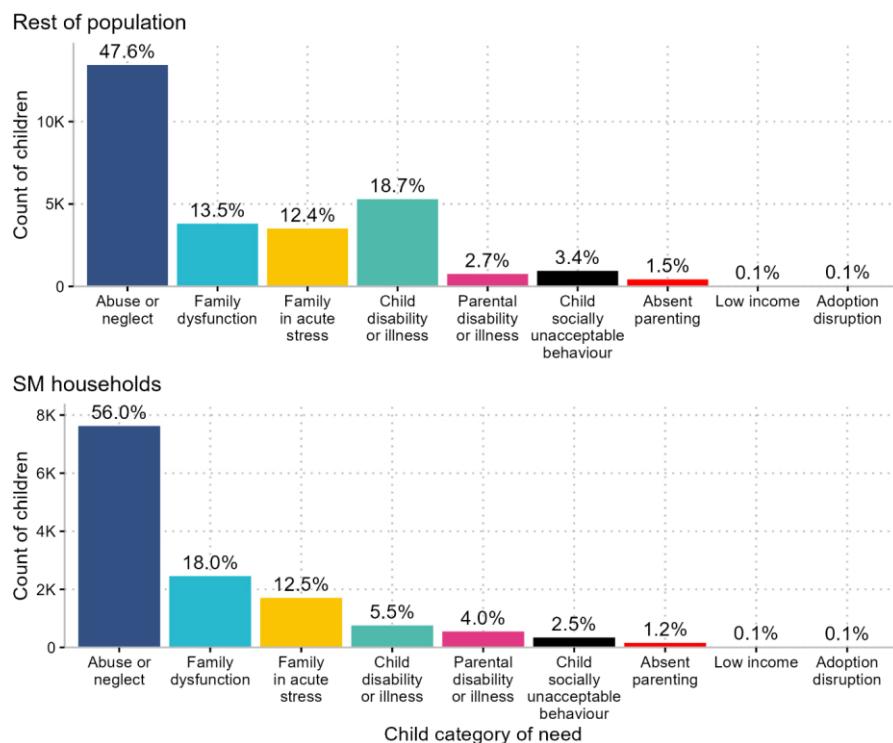
the cross-sectional observational design of the study and other possible factors which were not recorded in the data. Prevalence ratios reflect an association rather than a causal or temporal relationship.

Figure 4: Child birthweight category for the children in (top) the rest of the population, and (bottom) the substance misuse households



In the substance misuse households, a significantly greater percentage of children were born with a low birthweight.

Figure 5: Child category of need for those in the substance misuse households who had a record in the Children in Need Wales (CINW) or Children Receiving of Care and Support (CRCS) datasets, N = 13,623 children



There was a total of 776,366 children and 1,032,088 adults in the e-cohort, where 83,558 (11%) of children lived in household with an adult who had a SM event (SMHH). The corresponding number of adults who had a SM event whilst living with a child was 48,398 (5% of adults who lived with a child). In the rest of the population there were 692,778

children. Table 2 shows descriptive counts for the children in SMHH compared with the rest of the child population. From SM events which could be categorised as specifically either drug or alcohol related, 52.5% of children were in SMHH with an adult who had a drug event and 58.8% were in SMHH with an adult alcohol event.

Demographics

The median age at entry to the study in the SM households was 5 (IQR: 9) years, whilst in the rest of the child population it was 6 (IQR = 12) years. 32% of the children (251,061) were registered with a GP in Wales from before their 1st birthday. No statistically significant differences were seen by sex.

Overall, 24.2% of children were in the most deprived WIMD quintile, while 19.0% of children were in the least deprived quintile. Comparing the deprivation of the SMHH showed significant differences, the counts and percentages are shown in Figure 2. Children in SMHH lived in more deprived areas, with 35.3% of the cohort in the most deprived WIMD quintile, compared to 22.8% for the rest of the population. The prevalence ratios are shown in Table 2 and plotted in Figure 6, where children in SMHH had a 53.5% higher prevalence (PR: 1.535, 95% CI: 1.516–1.555) of being in the most deprived WIMD quintile.

Health

The counts and prevalence ratios to compare each variable for SMHH with the rest of the population are contained in Table 2, and the prevalence ratios are plotted with 95% confidence intervals in Figure 6. Figure 3 shows the gestational age of the children in the rest of the population to compare with the SMHH. Children in SMHH had a 27.1% higher prevalence (PR: 1.271, CI: 1.189–1.358) of being born very or extremely pre-term, and a 22.4% higher prevalence (PR: 1.224, CI: 1.190–1.259) of being pre-term than the rest of the child population. Comparing birthweight (shown in Figure 4) gives a 45.0% higher prevalence of 'low' birthweight in the SMHH children (PR: 1.450, CI: 1.412–1.489), although a 13.6% lower prevalence (PR: 0.864, CI: 0.816–0.914) of 'very or extremely low' birthweight was seen.

In total, 207,596 adults had an SM event during the study window, where 138,532 (66.7%) of those adults were not known to SM treatment services (WNDSM). Of the children in SMHH, 41.5% (34,682) lived with an adult who had a SM event but was not known to WNDSM, and children in SMHH had a 133.3% higher prevalence (PR: 2.333, CI: 2.238–2.432) of being in the WNDSM themselves, as compared with children from the rest of the population.

Living with an adult with diagnosed learning difficulties was 366.8% more prevalent (PR: 4.668, CI: 4.264–5.111) for children in SMHH than in the rest of the population, while the children in SMHH having their own diagnosis was 38.7% more prevalent (PR: 1.387, CI: 1.230–1.564). Adult neurodevelopmental disorders had a 367.2% higher prevalence in SMHH (PR: 4.672, CI: 4.491–4.861) than for households in the rest of the population, and the prevalence of children in SMHH having their own neurodevelopmental disorder was 71.7% higher (PR: 1.717, CI: 1.651–1.785).

Comparing the prevalence of anxiety and depression, children in SMHH had a 57.0% higher prevalence (PR: 1.570, CI: 1.557–1.583) of living with an adult who had a diagnosis of anxiety (than children in the rest of the population), and a 39.4% higher prevalence (PR: 1.394, CI: 1.383–1.405) of living with an adult who had a diagnosis of depression. The SMHH children themselves had a 9.5% higher prevalence of diagnosed anxiety (PR: 1.095, CI: 1.069–1.122) during the study window,

and 5.3% more were diagnosed with depression (PR: 1.053, CI: 1.029–1.076).

When compared with the rest of the population, living with an adult who engaged in clinically recorded self-harm was 522.0% more prevalent for SMHH children (PR: 6.220, CI: 6.117–6.324), with the prevalence of child self-harm 78.1% higher (PR: 1.781, CI: 1.708–1.857).

Residing with an adult who died by suicide was 865.7% more prevalent for children in SMHH than the rest of the population (PR: 9.657, CI: 8.953–10.417), with the relatively small number of child suicides showing no statistically significant difference within the study period.

Criminal justice system

There were 24,136 children in SMHH living with an adult who had a SM-related magistrates' court case, which was 28.9% of children in SMHH, and 3.1% of all children. The prevalence of children having their own SM-related magistrates' court case was 42.0% higher (PR: 1.420, CI: 1.301–1.551), with counts shown in Table 2 and PR plotted in Figure 6. Of children in SMHH, 12.4% (4,222) lived with adults whose first recorded SM event in the household was in the criminal court data.

Children receiving care and support

Receiving care and support (RCS) from local authorities was 299.8% more prevalent for children in SMHH (PR: 3.998, CI: 3.918–4.081). Of children RCS, having a child SM-related issue recorded was 423.6% more prevalent in SMHH than in the rest of the population (PR: 5.236, CI: 4.902–5.593). Parental SM on the child record was 797.7% more prevalent in SMHH children (PR: 8.977, CI: 8.689–9.274) than in the rest of the population RCS. Children in SMHH had a 598.7% higher prevalence of being on the Child Protection Register than the rest of the children RCS (PR: 6.987, CI: 6.744–7.239).

In Figure 5, the category of need for the children in SMHH who were RCS is shown, with the prevalence ratios for all categories in Table 2, which are plotted in Figure 6. Children in SMHH had a 51.1% higher prevalence of 'parental disability or illness' as their category of need (PR: 1.511, CI: 1.353–1.686), and 17.7% higher prevalence of 'abuse or neglect' than the children receiving care and support in the rest of the population (PR: 1.177, CI: 1.144–1.210). However, need due to 'child disability or illness' in the SMHH children was 70.4% less prevalent (PR: 0.296, CI: 0.274–0.319). Focusing on the children looked after, a highly vulnerable subgroup of children receiving care and support who are under the care of the local authority for more than 24 hours, showed that being a child looked after was 351.2% more prevalent for children in SMHH (PR: 4.512, CI: 4.375–4.652).

Discussion

This study offers, for the first time, a comprehensive population-level overview of the wide-ranging disadvantages faced by children living in households where an adult has experienced a substance misuse event. By drawing together diverse indicators—ranging from deprivation and adverse birth outcomes to mental health issues, children's social care

Table 2: Descriptive counts for children in households with an adult, stratified by adult SM event in the household (binary yes/no, corresponding to SMHH/rest of population) for a set of variables.

Variable	Level	No adult SM event (rest of population)		Adult SM event (SMHH cohort)		Prevalence ratio	
		N children	Prevalence (%)	N children	Prevalence (%)	SMHH: no SM	95% CI
Total number (N)		692,778	100.0	83,558	100.0		
Adult alcohol event	Yes	0	0.0	49,142	58.8		
Adult drug event	Yes	0	0.0	43,908	52.5		
Adult unspecified SM event	Yes	0	0.0	15,793	18.9		
Child sex	Male	354,769	51.2	42,874	51.3	1.002	0.992–1.012
	Female	338,009	48.8	40,684	48.7	0.998	0.988–1.008
Welsh IMD quintile	5–Least deprived	138,718	20.0	9,052	10.8	0.541	0.530–0.553***
	4	124,389	18.0	10,946	13.1	0.730	0.715–0.744***
	3	129,314	18.7	13,874	16.6	0.890	0.874–0.905***
	2	141,742	20.5	20,313	24.3	1.188	1.171–1.206***
Child birthweight	1 - Most deprived	158,615	22.9	29,373	35.2	1.535	1.516–1.555***
	Normal birthweight (2.5–4 kg)	498,673	80.8	61,559	81.2	1.005	0.996–1.013
	Very or extremely low birthweight (<1.5 kg)	12,549	2.0	1,332	1.8	0.864	0.816–0.914***
	Low birthweight (1.5–2.5 kg)	35,564	5.8	6,336	8.4	1.450	1.412–1.489***
	High birthweight (4–4.5 kg)	59,378	9.6	5,574	7.4	0.764	0.743–0.785***
	Very or extremely high birthweight (>4.5 kg)	10,840	1.8	1,016	1.3	0.763	0.715–0.813***
Child gestational age	Missing birthweight	75,774	10.9	7,741	9.3	0.847	0.827–0.867***
	Term (37–41 weeks)	523,778	87.4	64,119	86.5	0.990	0.982–0.999*
	Very or extremely preterm (<31 weeks)	6,413	1.1	1,007	1.4	1.271	1.189–1.358***
	Pre-term (32–36 weeks)	36,519	6.1	5,525	7.5	1.224	1.190–1.259***
	Late term (42–44 weeks)	32,850	5.5	3,449	4.7	0.850	0.820–0.880***
	Missing gestational age	93,218	13.5	9,458	11.3	0.841	0.824–0.859***
Adult-specific variables							
Adult in WNDSM	Yes	0	0.0	48,876	58.5		
Adult SM-related criminal court case	Yes	0	0.0	24,136	28.9		
Adult anxiety	Yes	362,064	52.3	68,565	82.1	1.570	1.557–1.583***
Adult depression	Yes	457,258	66.0	76,881	92.0	1.394	1.383–1.405***
Adult self-harm	Yes	32,499	4.7	24,380	29.2	6.220	6.117–6.324***
Adult learning difficulties	Yes	1,300	0.2	732	0.9	4.668	4.264–5.111***
Adult neurodevelopmental	Yes	6,793	1.0	3,828	4.6	4.672	4.491–4.861***
Adult suicide	Yes	1,244	0.2	1,449	1.7	9.657	8.953–10.417**
Child-specific variables							
Child anxiety	Yes	55,054	7.9	7,271	8.7	1.095	1.069–1.122***
Child depression	Yes	67,304	9.7	8,544	10.2	1.053	1.029–1.076***
Child self-harm	Yes	12,323	1.8	2,647	3.2	1.781	1.708–1.857***
Child learning difficulties	Yes	1,853	0.3	310	0.4	1.387	1.230–1.564***
Child neurodevelopmental issues	Yes	14,528	2.1	3,008	3.6	1.717	1.651–1.785***
Child suicide	Yes	170	0.0	20	0.0	0.975	0.614–1.550
Child SM-related criminal court case	Yes	3,398	0.5	582	0.7	1.420	1.301–1.551***
Child in WNDSM	Yes	10,098	1.5	2,841	3.4	2.333	2.238–2.432***
Child Receiving Care and Support	Yes	28,248	4.1	13,623	16.3	3.998	3.918–4.081***
Child CRCS SM-related record	Yes	2,288	0.3	1,445	1.7	5.236	4.902–5.593***
Parent CRCS SM-related record	Yes	6,960	1.0	7,536	9.0	8.977	8.689–9.274***

Continued

Table 2: Continued

Variable	Level	No adult SM event (rest of population)		Adult SM event (SMHH cohort)		Prevalence ratio	
		N children	Prevalence (%)	N children	Prevalence (%)	SMHH: no SM	95% CI
Child CRCS category of need	Abuse or neglect	13,437	47.6	7,625	56.0	1.177	1.144–1.210***
	Child disability or illness	5,293	18.7	755	5.5	0.296	0.274–0.319***
	Parental disability or illness	755	2.7	550	4.0	1.511	1.353–1.686***
	Family in acute stress	3,509	12.4	1,705	12.5	1.008	0.951–1.068
	Family dysfunction	3,810	13.5	2,457	18.0	1.337	1.271–1.407***
	Child socially unacceptable behaviour	947	3.4	343	2.5	0.751	0.664–0.850***
	Low income	31	0.1	20	0.1	1.338	0.763–2.347
	Absent parenting	430	1.5	158	1.2	0.762	0.635–0.914**
	Adoption disruption	36	0.1	10	0.1	0.576	0.286–1.161
Child Protection Register record	Yes	6,708	1.0	5,653	6.8	6.987	6.744–7.239***
Child Looked After Wales	Yes	11,546	1.7	6,283	7.5	4.512	4.375–4.652***

The prevalence for variables with missing data were calculated after removing the missing count. Upper and lower 95% confidence intervals >1 for the prevalence ratio imply the variable is more prevalent in children in SMHH than the rest of the population (with statistical significance), while values <1 imply it is less prevalent.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. SM = substance misuse, IMD = index of multiple deprivation, CRCS = Child in Children Receiving Care and Support or Children in Need Wales (CINW), WNDSM = Welsh National Database for Substance Misuse (SM treatment dataset).

involvement, and substance-related criminal justice cases – this work reveals the depth and interconnectedness of the challenges affecting these children. While each measure tells part of the story, together they paint a picture of systemic and social inequality. This breadth of insight provides a valuable foundation for more targeted future research and policy development.

Demographic characteristics

Our work brings to the fore a striking statistic: that 11% of children (83,558) lived in a household with an adult who had a recorded SM event, and 5% (48,398) of adults who lived with a child had a SM event. These data can now be used to complement previous estimates of the number of children living with substance misusing parents across the UK [45]. A strong association was found between adult substance misuse and deprivation, with 35.3% of children in SM households in the most deprived quintile, compared to 22.8% for the rest of the child population. Children in the most deprived quintile had a 53.5% (CI: 51.6–55.5%) higher prevalence of being in a SM household, showing a significant association between deprivation and SM-related issues. Previous studies have shown that children living in deprivation in Wales are at higher risk of early alcohol use [11], are more likely to experience mental health problems [46] and co-occurring mental disorder and substance misuse [47].

Health

We raise concern that there is likely to be a large population of adults and children with unmet needs, as 34,682 (41.5%) children in SMHH lived with an adult who had a SM event but was not known to SM treatment services (WNDSM).

Children in SMHH were also 133% (CI: 124–143%) more prevalent in WNDSM when compared with other children. Previous research has shown that children of families with known alcohol problems are at higher risk of early drinking behaviour [11], but our study evidences an association between any adult SM in the household and the children requiring SM treatment.

Children in SMHH had a higher prevalence of being preterm (or very or extremely preterm) and having a low birthweight, indicating that household substance misuse is associated with poor early health for children. These adverse birth outcomes align with existing research associating maternal substance misuse with poor maternal and infant health [5, 8], although our study considered all adults in a household. Low birthweight affects cognitive development, and can lead to worse academic outcomes [48, 49]. In addition to differences related to infancy, we also found that learning difficulties and neurodevelopmental issues were more prevalent in children in SMHH.

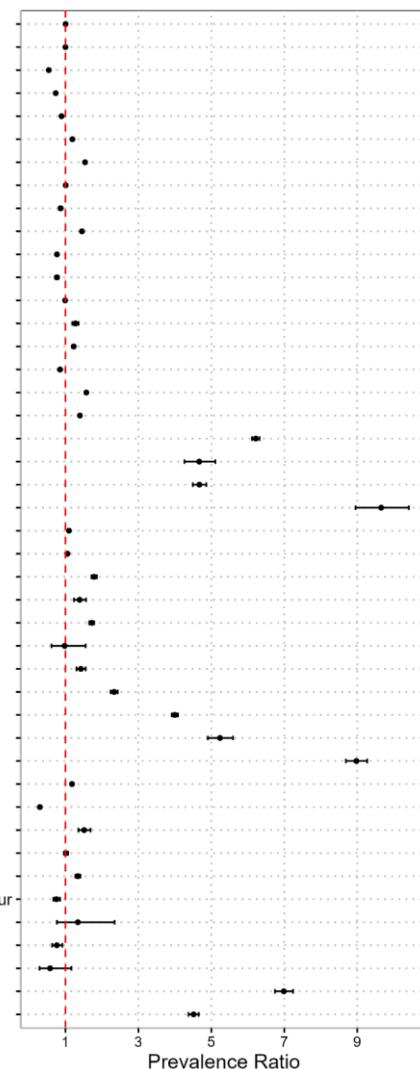
Markedly, children in SMHH had a 5.22 times higher prevalence (CI: 5.12–5.32) of living with an adult who self-harmed and a 78.1% (CI: 70.8–85.7%) higher prevalence of self-harm themselves. In addition, the children had a 8.66 times higher prevalence (CI: 7.95–9.42) of the suicide of an adult in their household, which is associated with negative health and social outcomes [50].

Child care and support services

Children in SMHH had a significantly higher prevalence (3.00 times, CI: 2.92–3.08) of receiving care and support services from local authorities, and a 5.99 times higher prevalence (CI: 5.74–6.24) of being on the Child Protection Register compared to children receiving care and support in the rest

Figure 6: Prevalence ratios for variables related to children in substance misuse households (SMHH), compared with the rest of the population (reference group)

Child sex: Male
 Child sex: Female
 Welsh IMD quintile: 5 - Least deprived
 Welsh IMD quintile: 4
 Welsh IMD quintile: 3
 Welsh IMD quintile: 2
 Welsh IMD quintile: 1 - Most deprived
 Child birthweight: Normal birthweight (2.5 - 4 kg)
 Child birthweight: Very or extremely low birthweight (< 1.5 kg)
 Child birthweight: Low birthweight (1.5 - 2.5 kg)
 Child birthweight: High birthweight (4 - 4.5 kg)
 Child birthweight: Very or extremely high birthweight (> 4.5 kg)
 Child gestational age: Term (37 - 41 weeks)
 Child gestational age: Very or extremely preterm (< 31 weeks)
 Child gestational age: Pre-term (32 - 36 weeks)
 Child gestational age: Late term (42 - 44 weeks)
 Adult anxiety
 Adult depression
 Adult self-harm
 Adult learning difficulties
 Adult neurodevelopmental
 Adult suicide
 Child anxiety
 Child depression
 Child self-harm
 Child learning difficulties
 Child neurodevelopmental issues
 Child suicide
 Child SM-related criminal court case
 Child on SM treatment database
 Child Receiving Care and Support
 Child CRCS SM-related record
 Parent CRCS SM-related record
 Child CRCS category of need: Abuse or neglect
 Child CRCS category of need: Child disability or illness
 Child CRCS category of need: Parental disability or illness
 Child CRCS category of need: Family in acute stress
 Child CRCS category of need: Family dysfunction
 Child CRCS category of need: Child socially unacceptable behaviour
 Child CRCS category of need: Low income
 Child CRCS category of need: Absent parenting
 Child CRCS category of need: Adoption disruption
 Child Protection Register record
 Child Looked After Wales



The red vertical dashed line denotes a prevalence ratio of 1 (no difference between the two groups), and 95% confidence intervals are shown. SM = substance misuse, IMD = index of multiple deprivation, CRCS = Child in either Children Receiving Care and Support or Children in Need Wales (CINW) datasets.

of the population. SMHH children also had a 3.51 times higher prevalence (CI: 3.38–3.65) of being looked after by a local authority, evidencing a strong association between household SM and child welfare issues. Although we were unable to explore household composition, these findings are comparable with studies highlighting increased risk of child maltreatment and receipt of interventions from children's social care (e.g., in receipt of care or support, subject to child protection services, or to become looked after) amongst children who live with parental substance misuse [8]. Likewise, two studies in Wales found that living in a household with adult alcohol and drug misuse, as well as use during pregnancy, were associated with increased risk of care entry [51, 52]. Our findings are perhaps unsurprising given that substance misuse can impact the capacity of the caregiver to provide a safe environment and meet the needs of the child [53, 54]. However, these findings remain extremely concerning because there is a wealth of literature reporting a wide range of disadvantages experienced by children involved with children's

social care services, including poor mental [55] and physical health [56, 57], worse educational [58] and labour market outcomes [59–61] and higher rates of criminal offending [62, 63], which persist into adulthood.

Criminal justice cases

Children in SMHH had a 42.0% (CI: 30.1–55.1%) higher prevalence of SM-related magistrates' court cases when compared to the rest of the population, and all criminal cases start with a first hearing in magistrates' court. Of children living in a SM household, 28.9% lived with an adult who had been in a SM-related magistrates' court case (around 1 in 3 children in SMHH), showing that a significant percentage of SM experienced adults live with children and interact with the criminal justice system. The association between deprivation and any criminal court case has been shown previously [64], however we evidence the association between SM and intergenerational involvement with SM-related criminal justice

cases within households. Previous studies have evidenced the intergenerational transmission of criminal justice contact between parents and children [65–67], but have not considered other adults in the household.

Study strengths

The study created and utilised a large reusable nationwide e-cohort of 1.8 million people (776,366 children and 1,032,088 adults). This large sample size enhances the statistical power and generalisability of the findings, providing robust evidence of the associations between adult substance misuse and child characteristics. By comparing children in substance misuse households (SMHH) to those in the rest of the population, the study offers a picture of the disparities in birth outcomes, socioeconomic, health, and criminal justice cases, elucidating richer information on the unique challenges faced by children in SM households. A novelty of the study is that linkage included all adults in the household, and was not limited to only mothers and their children. The SM-related code lists used in the health and criminal justice system datasets were validated by the Public Health Wales lead on substance misuse, and are publicly available to expedite future research.

Study limitations

This study identifies associations between SMHH and child determinants, it is important to note that these associations do not imply causation. The observational nature of the data limits the ability to infer direct causal relationships, and other unmeasured factors may contribute to the observed results.

Studies using routinely collected administrative data are restricted by coding accuracy, this may introduce bias and inaccuracies, but a large representative population-level sample of the Welsh population was used. SAIL Databank has GP data coverage for around 86% of individuals registered with a GP in Wales, so some primary care SM events could not be captured, and any SM events occurring outside of Wales were not in scope. Some vulnerable groups in society are also underrepresented in electronic health records, in part due to less interaction with formal services and less consistent identifiers for linkage [68, 69]. It is also likely that alcohol use disorders and illegal drug use are under-recorded by GPs, particularly for men and young people [47]. Another known limitation is that most children under three years old in children's social care data do not have an anonymised linkage field, so the youngest children receiving care could not be included [39]. CINW and CRCS also only contain cases open during the entire first three months of a year [23], which therefore also undercounts cases.

The requirement for at least a 90-day period at an address reduced erroneous grouping of new residents with the previous household, but excluded people in temporary accommodation (who updated their address with the GP before and after moves), and people who only updated their address within the last 90 days at an address. It has been shown that household instability is a factor associated with children with the poorest social care outcomes [8], and the patterns of residential mobility among children in Wales have been studied elsewhere [70]. People with lived experience of homelessness have social and health inequities [71] with increased school

absences for children in the family [72], but this was outside the scope of this study.

The Ministry of Justice MACO dataset in SAIL only contained the most serious offence, so information on any multiple less serious offence(s) was not known, and MACO contained only individuals meeting the threshold for criminal prosecution with a SM-related offence.

Implications for policy and research

An e-cohort of households, codelists, and scripts can now be used by researchers to expedite further research. In particular, we evaluated the association between household substance misuse and a number of health, social care, and criminal justice determinants. These findings underscore the need for targeted interventions addressing deprivation, SM, and mental health, and earlier support for children in SMHH from social care. Households known to SM services require early and targeted health and well-being assessments for the children. Rich population-scale linked data can now inform and support the Welsh Government's substance misuse treatment framework for children and young people [73] and future data refreshes can extend the cohort to provide updated estimates. Evidence-based tailored support can be provided for both children and adults in SM households to help break cycles of intergenerational substance misuse and mitigate the associated factors.

Conclusion

The results of this study highlight the complex social dynamics and disadvantage faced by children in households affected by substance misuse in Wales. These children have higher levels of deprivation, adverse birth outcomes, are more likely to be involved with social care, and have additional mental health conditions, particularly anxiety, depression, self-harm and to experience a death by suicide in the household. The findings highlight the urgent need for targeted interventions that address not only the immediate health concerns of affected individuals, but also the systemic factors perpetuating cycles of substance misuse across generations, demonstrating the broader societal impact of substance misuse on intergenerational well-being. When further longitudinal data are collected, future work should explore the longer-term outcomes of these children and could identify and evaluate interventions to mitigate the intergenerational impact of substance misuse. Improving referrals to substance misuse treatment services for adults in SMHH could help address the unmet need and reduce associated intergenerational harm to children. Enhanced support is needed for children in households with substance misuse and the findings have direct policy implications for healthcare and child social care in Wales, and the criminal justice system in England and Wales. Broader implications for public health, policy, and intervention strategies can now be considered.

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Declaration of interests

The authors report no conflicts of interest.

Ethical approval

The SAIL independent Information Governance Review Panel, comprising of information governance experts and members of the public, approved this study as part of SAIL project 1451. As this study design used anonymised, routinely collected data, it did not require ethical approval and written informed consent.

Data availability

The data and code used in this study are available from the Secure Anonymised Information Linkage (SAIL) Databank at Swansea University, Wales, UK. All proposals to use SAIL datasets must comply with information governance policies and are subject to review by the independent Information Governance Review Panel (IGRP). Before data can be accessed, approval must be given by the IGRP. Requests to access these datasets within the SAIL Databank Trusted Research Environment should be directed to www.saildatabank.com.

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