Born into care: Associations between area-level deprivation and the rates of children entering care proceedings in Wales

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A B S T R A C T

There is international concern about rising rates of children entering out-of-home care and what might be done to reduce the need for compulsory intervention in family life. Previous studies have analysed the associations with family-level variables, such as a presence of domestic abuse, parental mental health problems, and substance misuse in the parental household. Other studies have looked at multiple area-deprivation as a predictor of childhood adversity, but there is a dearth of research which disentangle the associations between the rates of children in care and different forms of deprivation. This paper sheds light the statistical associations between different area-deprivation domains and the rates of infants and older children involved in care proceedings in local authorities in Wales, UK, between 2014 and 2019. Data on family court proceedings in Wales from the Children and Family Court Advisory and Support Service (Cafcass Cymru), held within the Secure Anonymised Information Linkage (SAIL) Databank, was linked to information on area-deprivation and incidence rates were computed. Employment deprivation, income, educational and health deprivation are associated with increased incidence rates. Environmental factors such as the physical, housing and access to services domain were not found to be statistically related to the risk of care proceedings. The paper advances knowledge about the wider policy context regarding how to improve the social wellbeing of children in local communities.

1. Introduction

High numbers of children entering out-of-home care are of international concern, both for public services and policymakers (Alrouh et al., 2020; Broadhurst & Mason, 2020; Chill, 2003; Shook, 1999; Slack et al., 2004). Ecological factors such as income and employment deprivation of small areas were found to be associated with an increasing demand for child support interventions. Macro-level analyses that try to understand such ecological factors are therefore important to inform policy and service development. This is especially true in the wake of the covid-19 pandemic, which has already been found to have exacerbated inequalities both at the level of areas and local communities and between households, particularly in the UK, the US, Canada and Australia (Blundell et al., 2020; Johnston et al., 2020).

It is important for those concerned with child welfare interventions to better understand the associations between deprivation and children's risk of being removed to out-of-home care. In the UK, some important work has already been carried out, using local authority (Bilson & Bywaters, 2020; Bywaters et al., 2016), and family court data (Alrouh et al., 2020; Griffiths et al., 2020); this research has largely utilized composite multiple deprivation indices provided by the Office for National Statistics and by the Welsh Statistics Agency (Stats Wales). The use of composite measures is well established, but there is also considerable merit in trying to disentangle domains of deprivation. Composite deprivation indices have enabled important contributions to be made to social policy research, but the fact that they collapse different deprivation domains, such as income, employment, education, health and measures of area remoteness and as access to services, into one measure comes with some limitations. These measures are often based on exploratory factor analyses rather than confirmatory factor analyses techniques, as is the case with the Welsh Index of Multiple Deprivation (WIMD) index (Stats Wales, 2019b, p. 51), which introduces a degree of arbitrariness, and scale dimensionality is often merely assumed but not established. More importantly, such indices hide differential effects of the different deprivation domains which are in themselves interesting and potentially important to policymakers. The question thus arises, how is deprivation associated with the number of children entering care proceedings? Are there any specific deprivation domains that show stronger links than others? Focusing on children appearing in care proceedings in the family court in Wales UK, this study aims to tease out the differential associations of particular domains of deprivation with the numbers of children entering care, to enable policy

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makers to more closely tailor energies and investment. Specifically, we identified which domains of deprivation are associated with high area-level incidence rates of children entering care proceedings.

This is the first ever national study of infants and children in care proceedings in Wales to use full service administrative data from the family courts in Wales to examine the relationships between deprivation domains and crude rates of children entering care proceedings. Novel linkage of de-identified anonymized records of children who were subject to section 31 (s31) care proceedings according to the Children Act 1989 (Gov.UK, 1989) between 2014 and 2019 has been possible through the work of the Nuffield Family Justice Data Partnership (FJDP), supported by the research environment of the Secure Anonymised Information Linkage (SAIL) Databank at Swansea University. By focusing on Wales, we also sought to redress an imbalance in UK literature, as the majority of work thus far has focused on England. In addition, Wales has higher rates of children in care proceedings than England (Alrouh et al., 2020), which makes the need for additional robust evidence that might throw light on the factors associated with this vulnerability all the more pressing.

2. Area deprivation and adverse outcomes for children

The literature on the associations between area deprivation and adverse outcomes for children yields mixed evidence. Several UK-wide and international studies have found positive associations between deprivation, low birth weight in children (Dibben et al., 2006), reduced physical and mental health (Bécares et al., 2012; Haynes & Gale, 2000; Lawlor et al., 2005), increased child neglect (Christoffersen, 2000; Eckenrode et al., 2014; Shook, 1999; Slack et al., 2004; Trickett et al., 1991), increased child mortality (Taylor-Robinson et al., 2019), and reduced social cohesion in families and communities (McCulloch et al., 2012, 2012). Particularly strong associations have been found between parental unemployment (Gillham et al., 1998; Slack et al., 2004) as well as area-level unemployment rates and child neglect: A Danish cohort study of children (Christoffersen, 2000) found positive associations between parental unemployment and increased incidence rates of children that were hospitalised due to neglect or abuse. Similarly Slack et al. (Slack et al., 2004) found strong links between parental unemployment and other parental vulnerability and child neglect in the US. A review of 18 US studies by Freistler et al. (Freistler et al., 2006) found that the majority found positive statistical associations between ecological neighbourhood deprivation and child neglect rates recorded by the authorities. More recently, Eckenrode et al. (2014) confirmed positive links between both area-level poverty and income inequality and child neglect rates. Shuey and Leventhal report similar findings regarding harsh parenting styles (Shuey & Leventhal, 2017), however, their analysis, using propensity score weighting, also found that some of the statistical effect of area-level affluence on parenting style may be affected by selection effects. Wilkinson and Picket presented plausible correlational evidence that area-level deprivation is likely to have damaging effects on the well-being of families, children and communities, and that cumulative disadvantage likely affects the life chances of children growing up in these communities (Wilkinson & Pickett, 2010).

In the UK, some important insights have been offered by Duschinsky, Bywaters et al, and Webb et al (Duschinsky et al., 2020; Webb, Bywaters, Elliott, et al., 2020; Webb, Bywaters, Scourfield, et al., 2020). Past research tried to explain the risk of children needing welfare interventions with a "toxic trio" of parental mental ill health, drug misuse and domestic violence (Brandon, 2009; Middleton & Hardy, 2014), this notion has been picked up widely by practitioners and policymakers. However, the "toxic trio" hypothesis has been criticised (Duschinsky et al., 2020; Skinner et al., 2021) for being too simplistic and for not sufficiently taking inequalities and contextual factors such as area deprivation into account.

Bywaters and colleagues have probed associations between area deprivation (Bywaters, Brady, et al. 2016; Webb et al. 2020; Bywaters,

Bunting, et al. 2016), income inequality (Webb, Bywaters, Elliott, et al., 2020) and the rates of children receiving statutory children's services and rates of children's entry to care. Bywaters et al (2016), Webb et al (2020) and Bywaters et al., 2018 found significant positive relationships between rates of children with a child protection plan, rates of looked after children in England and Wales and area-level income deprivation, however, the authors did not find the relationship with income inequality to be statistically significant for rates of child protection plans. In their study on England Webb et al (Webb, Bywaters, Scourfield, et al., 2020) also found what they called an "inverse intervention law": local authorities in England that have relatively low deprivation levels overall but contain a higher share of more deprived Lower Super Output Areas (LSOA) nationally and with higher levels of income inequality tended to intervene more than the most deprived LA. This finding relates to England only, and was not confirmed for Wales.

Similarly, Broadhurst (2018), Alrouh (2020) and Griffiths et al. (2020), using Cafcass data on s31 court proceedings, found that high deprivation scores of LAs were consistently associated with elevated incidence rates of children appearing in court care proceedings in England and Wales. This was found for children of all ages.

A number of international studies have found ambiguous relationships between neighbourhood deprivation and various adverse outcomes affecting children and adolescents. Coulton et al (2007) state that more work needs to be done to explore the link between neighbourhood conditions and parenting behaviours. Berg and Brännström (2018) and Brännström and Rojas (2012) used large scale registry data on individual children nested in Swedish neighbourhoods and found only modest associations between neighbourhood deprivation and various adverse outcomes affecting adolescents, when controlling for individual and household level deprivation and adjusting for the population exposure to the risk factor. They conclude that a considerable part of the area deprivation effects they found were due to household and individual level poverty. Similarly, Sariaslan et al (2013) found that family level poverty confounded some of the statistical effects of deprivation on violent youth crime.

Molnar et (2016) and Coulton (2007) emphasize the importance of area level social processes in addition to deprivation as important predictors of rates of child maltreatment.

Overall, the majority of the literature finds evidence that area-level deprivation matters for adverse child outcomes, but the statistical effects are often exaggerated, as family level poverty and social processes were found to be important confounders.

This paper adds to the literature by focusing specifically on children who have met the threshold for compulsory state intervention, and care proceedings have been issued in the family courts. Care proceedings are issued under s31 of the Children Act 1989 (Gov.UK, 1989) where the court decides that the child concerned is suffering from or at risk of significant harm. Under s31 of the CA 1989, children can be removed on a temporary or permanent basis from parents' care. In England and Wales, children entering care can do so on a voluntary or compulsory basis. Investigating factors associated with compulsory family court intervention is pressing, given that the numbers of care proceedings have risen sharply in England and Wales during the past decade, resulting in what has been described as a care crisis (FRG, 2018). To, date, there has been insufficient analysis of the wider contextual factors associated with formal court intervention in family life to curtail or severe parental rights; rather research has tended to focus narrowly on parental risk.

Table 1

Summary Statistics:

Variable	Obs.	Mean	Std. Dev.	Min	Max
Incidence rate per Thousand (of Local Authorities in Wales)	440	4.69	5.81	<0.08	39.96
Infant-rate per thousand of the population	110	13.02	6.21	<19	39.95
Age1 to 4, rate per thousand of the population	110	2.225	1.36	<0.08	7.03
Age 5 to 9, rate per thousand of the population	110	1.883	1.07	<0.08	5.25
Age 10 to 15, rate per thousand of the population	110	1.653	1.03	<0.08	5.21
Deprivation					
Income deprivation 2014	440	18.14	9.81	2	35
Employment deprivation 2014	440	19.36	13.96	0	51
Health deprivation 2014	440	18.59	14.06	0	47
Educational deprivation 2014	440	18.59	12.95	0	53
Access to services 2014	440	24.05	19.13	1	62
Community safety deprivation 2014	440	19.73	9.137	7	47
Physical domain deprivation 2014	440	16.81	13.41	2	49
Housing deprivation 2014	440	19.41	13.34	2	48
Net expenditure for family support, own provision, 2018, in £ Thousand	440	1860.81	1539.19	112	7496
Net expenditure for social work child safeguarding, own provision, 2018, in £ Thousand	440	4455.59	2422.26	978	8787
Net expenditure for targeted family support, 2018, in £ Thousand	440	1879.91	1816.39	75	7240
Net expenditure for all children looked after services, 2018, in £ Thousand	440	14117.23	10126.83	3393	50,31
Year	440			2014	2018

3. Data and methods

The study used administrative data from the Welsh Children and - Family Court Advisory and Support Service (Cafcass Cymru) on all children (N = 7,381)[1] who were subject to care proceedings in Wales under s31 of the Children Act 1989, between calendar years 2014 to 2018. This data was linked to area-level deprivation data on the 22 Welsh local authorities (LAs) provided by the Welsh Statistics agency, and to social care data covering the LA's net expenditure for family support services (Stats Wales, 2014, 2019a).The data was accessed via the SAIL Databank, a secure privacy-protecting data sharing platform (Ford et al., 2009; Jones et al., 2014, 2019; Lyons et al., 2009). Cafcass holds data on the local authority of the child at the start of s31 court proceedings, which are shared with the researchers. This is based on address and postcode data held by Cafcass. The data is fully anonymised (Jones et al., 2014). Our use of this data was reviewed and approved by the SAIL Information Governance Review Panel.

We chose the timeframe of 2014 to 2019 to enable us to link to LA data on area-deprivation, as the earliest reliable and comparable deprivation domains data for Welsh LAs are from 2014. Because

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[1] This is the total number of child-case records for children under 16 between 2014 and 2018, 16 records had no LA and were therefore excluded from the analyses (as areas are the unit of analysis).
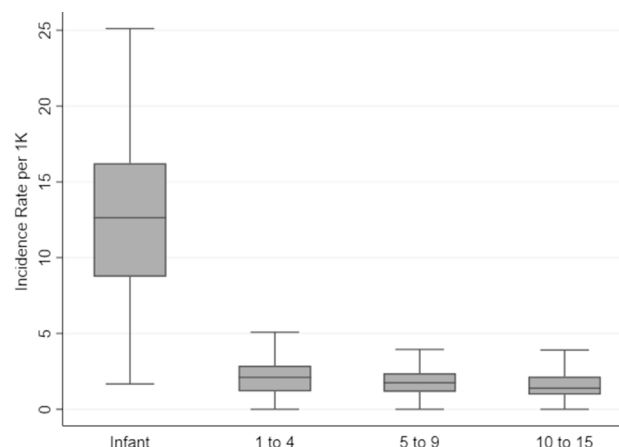

Fig. 1. Boxplot of the Incidence rates of children per 1,000 by age in Welsh local authorities.

deprivation domain data was not published by the Welsh statistics office for the year 2018, we supplemented the latest available deprivation data from the year 2019. Data quality review found only very small numbers of missing values: 14 children were excluded as they had no valid date of birth and for 16 children the LA of residence could not be established. Our study focused on children aged 0 to 15 years.

We chose to perform our analysis on the LA level data, rather than the smaller Geography Lower Layer Super Output Areas (LSOA) for several reasons. Firstly, the numbers of children within LSOA that are referred to family courts for *compulsory* care orders are extremely small in many areas on this level. This small-numbers problem would have created an identity disclosure risk, and therefore an ethical risk. Secondly, the small numbers problem would also severely limit attempts at statistically reliable and robust modelling. Local authorities with their larger entity with more households allow for more robust analyses. Thirdly, local government funds for family support are allocated at the authorities. LA are therefore the most ethical and intuitive choice of analysis level for our data and research question. It is important to note that we do not use area-level deprivation as a proxy for household or family level deprivation. Drawing assumptions about households from higher level area data would come at the risk of committing an ecological fallacy, hence our analysis focuses on areas, not households.

3.1. The dependent variable - incidence rates of children in care proceedings in family courts

Our dependent variable was the incidence rate of children subject to care proceedings per LA. We calculated crude incidence rates of children in care proceedings per 1,000 of the child population in four child age groups for each of the 22 Welsh LAs for the years 2014 to 2019. This was based on the case numbers of children in our Cafcass data and the mid-year child population estimates per LA for each age group: Infants (children aged less than one year old (N = 2,139), children aged one to four years (N = 1,897), children aged five to nine years (N = 1,709) and children aged ten to fifteen years (N = 1,620). The child population estimates per LA were obtained from the Office for National Statistics (ONS) (Office for National Statistics, 2019).

3.2. The independent variables

The main independent variables were the eight area-level deprivation domains (income, employment, health, education, community safety, access to services, housing, physical environment) published by the Welsh Statistics Agency (Stats Wales). Stats Wales publishes data on these area-deprivation domains every five years, which taken together make up the Welsh Index of Multiple Deprivation (WIMD): Income,
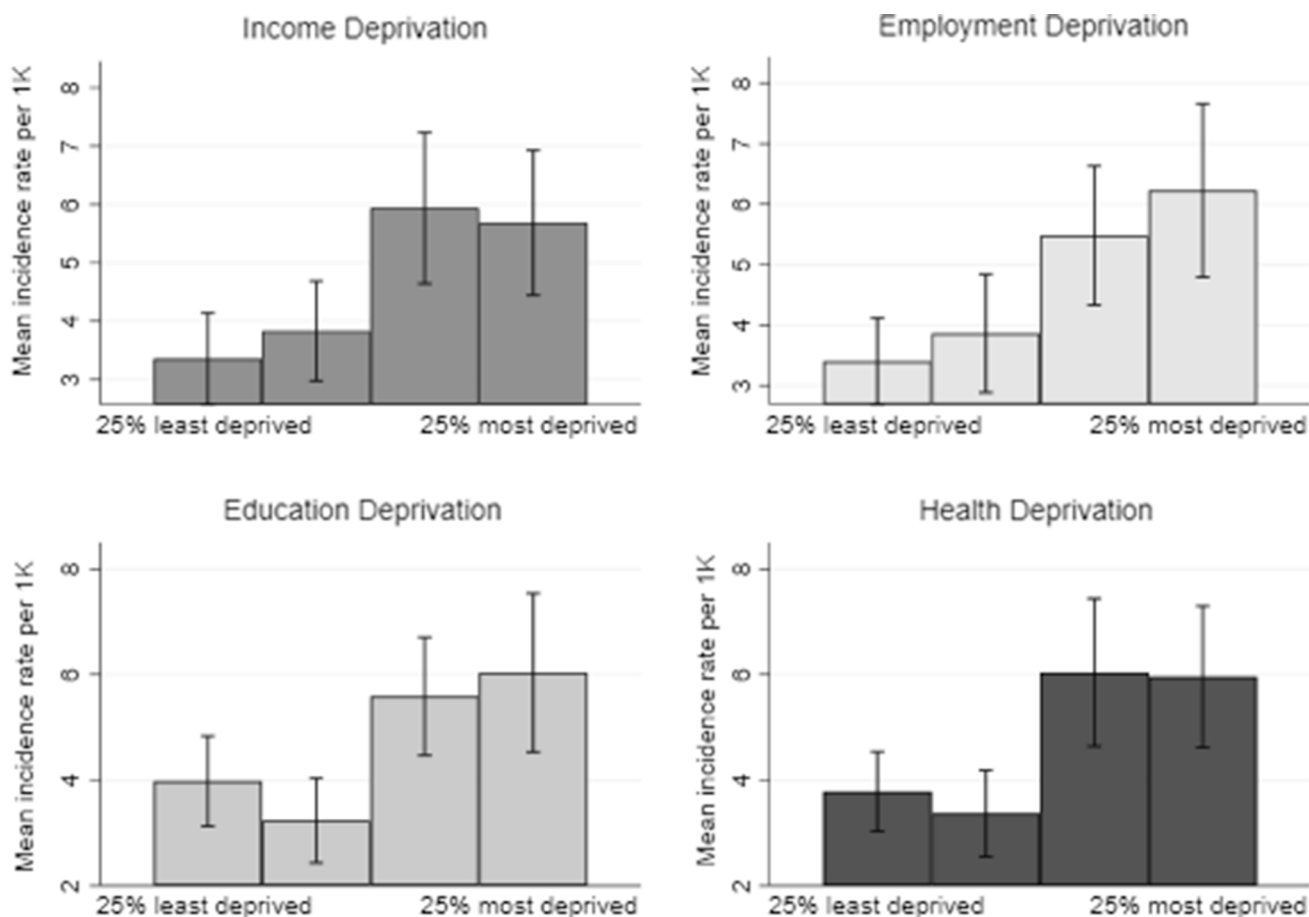
Fig. 2. Mean incidence rates of children in s31 proceedings by deprivation domains.

employment, education, health, community safety, housing, access to services and physical environment deprivation. The domains are sub-indices derived via exploratory factor analyses using several single items that operationalize each domain (Stats Wales 2014, 2019)[2]. The deprivation domain data per LA is for each domain the percentage of Lower Layer Super Output Areas (LSOA) within each LA that are within the 20% most deprived quantile of all LSOAs nationally (in Wales). Our models used the WIMD domain scores for each LA for the calendar year 2014, as this was the first year of our included data, with s31 court cases in our data ranging from 2014 to 2018.

We chose to use the deprivation domain data, rather than the single items the domains consist of, as multi-item domain sub-indices give sufficient information on each domain to answer our research question while maintaining superior statistical power compared to using single domain items. At the same time, using separate deprivation domains, rather than the aggregate IMD, allows for a more nuanced exploration of the distinct patterns of associations with the rates of children entering care, which would otherwise be hidden away. The items making up each domain were sufficiently highly correlated and showed sufficient internal consistency (Cronbach's Alpha > 0.7) to be used as composite measures.

The deprivation and government family support services expenditure data were linked to the LA identifier of each child. Government net family support services expenditure is a measure of social care policy at the local government level and is therefore an important control variable since local policymaking is likely to affect the incidence rates of

children in s31 care proceedings. Furthermore, government spending for family support is correlated with deprivation. The effects of deprivation variables may therefore be masked by the impact of local policymaking. Taylor-Robinson et al. (Taylor-Robinson et al., 2019) found that policies such as New Labour's English health inequalities strategy successfully reduced infant mortality. One might thus expect to see similarly positive statistical associations between government expenditure for child and family support and the rates of s31 care proceedings, where effective policy enables children to remain safely with their families. It is therefore important to control for possible confounding. The net expenditure for family support is operationalised as the net expenditure in government grants per LA in Thousands £[3]. The social care data is publicly available on the Welsh government statistics website (Stats Wales, 2020).

3.3. The datasets

We created two datasets: Firstly, an aggregate dataset of the child incidence rates linked to the eight deprivation domains for the years 2014 to 2018/19 per each Welsh LA, with LA as the unit of analysis. This dataset was used for descriptive statistics of the incidence rates and deprivation domain scores across LAs. Secondly, based on the based on 7,379 child-case records, we derived a longitudinal dataset with time-point observations (2014 to 2018/19) for each of the four age groups by area (LA) as the unit of analysis, which yielded N = 440 time-point-

Table 2
Mixed Effects Poisson Regression of Child Incidence Rates by Area-deprivation Domains.

DV: child count	M1	M2	M3	M4	M5
	IRR	IRR	IRR	IRR	IRR
Year	1.096***	1.096***	1.096***	1.096***	1.096***
Age: Infant	8.045***	8.041***	8.042***	8.042***	8.042***
Age: 1 to 4 years	1.368***	1.367***	1.367***	1.368***	1.368***
Age: 5 to 9 years	1.173***	1.173***	1.173***	1.173***	1.173***
Age: 10 to 15 years (reference category)	1	1	1	1	1
Deprivation: Income Domain 2014		1.026*			
Deprivation: Employment Domain 2014			1.014*		
Deprivation: Health Domain 2014				1.010*	
Deprivation: Education Domain 20,014					1.020*
Deprivation: Community Safety Domain 2014		1.003	1.005	1.01	0.995
Deprivation: Access to Services Domain 2014		0.998	0.996	0.995	0.995
Local Government's Net expenditure for Family Support Services		1	1	1	1
Constant	0.000***	0.000***	0.000***	0.000***	0.000***
Offset (ln population)	1	1	1	1	1
Between-area variance	1.158**	1.069**	1.067**	1.080**	1.073**
N	440	440	440	440	440
LR test (compared with model not including area-level deprivation variables)		16.48	16.97	13.63	15.48
Log-Likelihood	−1503.657	−1495.318	−1495.17	−1496.84	−1495.92
AIC	3019.314	3010.637	3010.347	3013.68	3011.834
BIC	3043.834	3051.505	3051.215	3054.548	3052.702

Note: *** P < 0.01, **P < 0.05, * P < 0.1.

by-age-group-by-area observations.

3.4. The statistical model

We analysed the relationships between deprivation domains and the child incidence rates in court care proceedings by the age of the child, the year of the incidence and by the deprivation domain components scores of the areas by fitting mixed effects Poisson regression models in STATA. The models include the calendar year, a dummy for each age group (the oldest group of 10 to 15 years olds were left out as the reference category), the deprivation domain measures, and the government's net expenditure for family support services (measured in 2018). The models included a random effect, as the years are nested within LA. In a first step, we modelled the statistical associations of the different deprivation domains with the incidence rates of children in s31 care proceedings. We also accounted for the grouped age of the children. In a second step, we modelled interaction effects between the age of the children and the deprivation domain scores.

Because of multi-collinearity between some of the deprivation domain measures (income, employment, education and health), it was not possible to include all domains at the same time. Hence separate models were run, each exploring the statistical association with one deprivation domain while controlling for two other deprivation domains and for the LA net expenditure for family support services. Model fit was assessed using likelihood-ratio tests, AIC and BIC.

All data analysis took place via the SAIL Databank trusted virtual research environment (TRE), who hold the Cafcass data (Johnson et al., 2020). Table 1 shows detailed summary statistics of the variables used.

4. Findings

We begin by looking at the relevant descriptive statistics. Fig. 1 is a boxplot giving an overview of the crude incidence rate for each of the four age groups of children across the 22 LA. The median is shown by the central line, with the boxes indicating the 25th and 75th percentiles of the distribution, and the whiskers indicating the minimum and maximum values.

The median incidence rate of children subject to care proceedings across LA is significantly larger for infants than for older children. The median incidence rate per 1000 children in the population of each age group is 12.6 for infants (aged<1 year), 2.1 for children aged one to four years, 1.7 for children aged five to nine years, and 1.4 for children aged

ten to 15 years. Secondly, the boxplot whiskers indicate a much larger variation across local authorities for infants than for older children. The maximum incidence rate for infants is 25 per 1000, while the maximum values for older children do not exceed five per 1000. Infants are more than eight times more likely to appear in care proceedings, than older children.

Next, we performed a mean comparison of the child incidence rates per LA by four quantiles of each deprivation domain (Fig. 2). Only four of the eight deprivation domains were statistically significantly associated with elevated child incidence rates: Income, employment, education and health deprivation, the 25% most deprived areas consistently having higher incidence rates of children in care proceedings. Access to services (often used a s a measure of area-remoteness), community safety (high crime rates) and the physical environment and housing domains were not statistically significant.

We explored the relationships further using a mixed effects Poisson regression (Table 2). The unit of analysis was time-point observations by the four age groups of children by LA.

We first ran separate models for each deprivation domain. As expected, only income, employment, health and education showed statistically significant incidence rates ratios. They all showed statistically significant positive associations with child outcomes after controlling for other deprivation domains and controlling for the governments' net expenditure for family support services. The latter was not statistically significant in the Poisson model which includes deprivation, despite showing a weak bivariate Pearson's R correlation with child incidence rates[4].

The coefficient sizes are fairly small, which is most likely due to the limited statistical power, given the limited number of LA in Wales.

The models show a strong coefficient of age: The incidence rates of areas are more than eight times higher for infants than for the oldest group of children. The incidence rates are also significantly and consistently higher for children aged 1 to 4, and those aged 5 to 9 than

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[4] We performed a bivariate Pearson's R correlation between expenditure for family support services and the deprivation domains and found a modest correlation with all deprivation domains. This indicates that government expenditure for family and child support services is, as expected, higher in deprived areas, indicating both a greater need for family support in these areas and a greater policy response to those needs. This observation confirms earlier research from Bywaters and others (2016).

Table 3

Poisson Models with Interaction Effects.

DV: Child Incidence Rates	Interaction 1		Interaction 2		Interaction 3		Interaction 4		Interaction 5	
	IRR	S.E.	IRR	S.E.	IRR	S.E.	IRR	S.E.	IRR	S.E.
year	1.096***	0.009	1.096***	0.009	1.096***	0.009	1.096***	0.009	1.141***	0.02
Age: Infant	8.418***	0.721	6.949***	0.472	8.542***	0.622	6.840***	0.453	4.56***	2.16
Age: 1 to 4 years	1.117	0.101	1.066	0.075	1.184*	0.090	1.102	0.075	1.963**	0.08
Age: 5 to 9 years	1.085	0.098	1.085	0.076	1.104	0.085	1.091	0.075	1.131**	0.64
Age: 10 to 15 years (reference category)	1	.	1	.	1	.	1	.	1	.
Income deprivation (20% most deprived LA)	1.024*	0.011								
Interaction: Infant *Income deprivation	0.998	0.004								
Interaction: Age 1 to 4 years * Income deprivation	1.009*	0.004								
Interaction: Age 5 to 9 years * Income deprivation	1.004	0.004								
Employment deprivation (20% most deprived LA)			1.009	0.006						
Interaction: Infant * Employment deprivation			1.007*	0.003						
Interaction: Age 1 to 4 years * Employment deprivation			1.011***	0.003						
Interaction: Age 1 to 4 years * Employment deprivation			1.004	0.003						
Education deprivation (20% most deprived)					1.020*	0.009				
Interaction: Infant * Education deprivation					0.997	0.002				
Interaction: Age 1 to 4 years * Education deprivation					1.006**	0.002				
Interaction: Age 5 to 9 years * Education deprivation					1.003	0.002				
healthdom_20pc_mostdeprt_2014							1.004	0.006		
Interaction: Infant * Heath deprivation							1.007**	0.003		
Interaction: Age 1 to 4 years * Health deprivation							1.010***	0.003		
Interaction: Age 5 to 9 years * Health deprivation							1.003	0.003		
Interaction: Infant * year									0.979	0.023
Interaction: Age 1 to 4 years * year									0.933**	0.022
Interaction: Age 5 to 9 years * year									0.934**	0.023
Community safety deprivation	1.003	0.01	1.005	0.009	0.995	0.012	1.01	0.01		
Access to Services deprivation	0.998	0.005	0.996	0.005	0.995	0.005	0.995	0.005		
Government net expenditure for Family support services, 2018	1	0	1	0	1	0	1	0		
Constant	0.000***	0	0.000***	0	0.000***	0	0.000***	0	0.000***	0
Offset	1		1		1		1		1	
Between-area variance	1.069**	0.023	1.067**	0.023	1.073**	0.025	1.080**	0.027	1.158**	0.054
N	440		440		440		440		440	
Likelihood ratio test	17.46	0	17.64		10.76	0.013	15.56	0		
Log-Likelihood	−1489.918		−1486.35		−1490.54		−1489.06		−1497.325	
AIC	3005.837		2998.706		3007.072		3004.117		3012.65	
BIC	3058.965		3051.834		3060.200		3057.245		3049.431	

Note: *** P < 0.01, **P < 0.05, * P < 0.1.

for children aged 10 to 15, but it is clearly infants who account for the lion's share of care orders in Wales. The calendar year shows a consistently positive relationship with the incidence rates, which indicates an increase over time.

Next, we were interested in whether the associations of child incidence rates with deprivation differ by age. We thus fitted interactions between each age category and the four deprivation domains that showed a statistically significant association with the child incidence rates in the previous main models. Table 3 shows the coefficients of the interaction terms in separate models for each deprivation domain. All four domains showed statistically significant interactions with age, which we visualized in Fig. 3. The plots show the marginal effect of deprivation for each age category. It is clear from the plots that the strongly positive association with deprivation applies mainly to infants. Infants are the group that accounts for most of the s31 care orders and they are affected particularly in areas with high income, employment, educational and health deprivation scores. In fact, deprivation discriminates far less for all the other age groups. It is important to note, however, that the much smaller incidence rates (per 1,000 of the population) for the older children mean a much larger margin of error, hence we need to interpret those marginal statistical effects with some caution.

Lastly, we fitted interaction terms between the age categories and the calendar year (last column of Table 3 and Fig. 4), to check if the known increase in the incidence rates over time varied by the age of children. Fig. 4 shows clearly that this is the case. Again, the increase affects predominantly infants, not older children.

We tested for influential outliers and our findings are subject to some notable outliers: Torfaen and Merthyr Tydfil have unusually high

incidence rates of children in care proceedings, but although they also do show above average deprivation scores, they are not the most deprived areas. Blaenau Gwent and Newport, on the other hand, both have high deprivation scores on all four domains, but much lower incidence rates than Torfaen and Merthyr Tydfil. Of the four statistically significant deprivation domains, employment is the least affected by outliers.

Whilst socio-economic deprivation is clearly relevant for child outcomes, deprivation is only part of the story.

5. Discussion

Our results confirm some previous findings in the published literature, but also add important new insights. Infants have the highest incidence rates, as shown by Broadhurst et al. (Alrouh et al., 2020). We also know that the incidence rates in Wales have increased since 2014 (Alrouh et al., 2020) and that high scores on the Welsh index of multiple deprivation (WIMD) are associated with increased rates of children entering care proceedings (Alrouh et al., 2020; Griffiths et al., 2020) and of children with a support plan (Webb, Bywaters, Scourfield, et al., 2020). However, little was known, thus far, about the differential statistical relationships of the different deprivation domains – i.e. which deprivation domains are most relevant predictors of children's risk of entering care proceedings. Our analyses uncovered that of the eight deprivation domains operationalized in the WIMD, only four were statistically significantly related to an increased risk of children within local authorities of becoming subject to care proceedings. These four domains include employment, income, education and health deprivation. Interestingly, they are the four domains that have the strongest
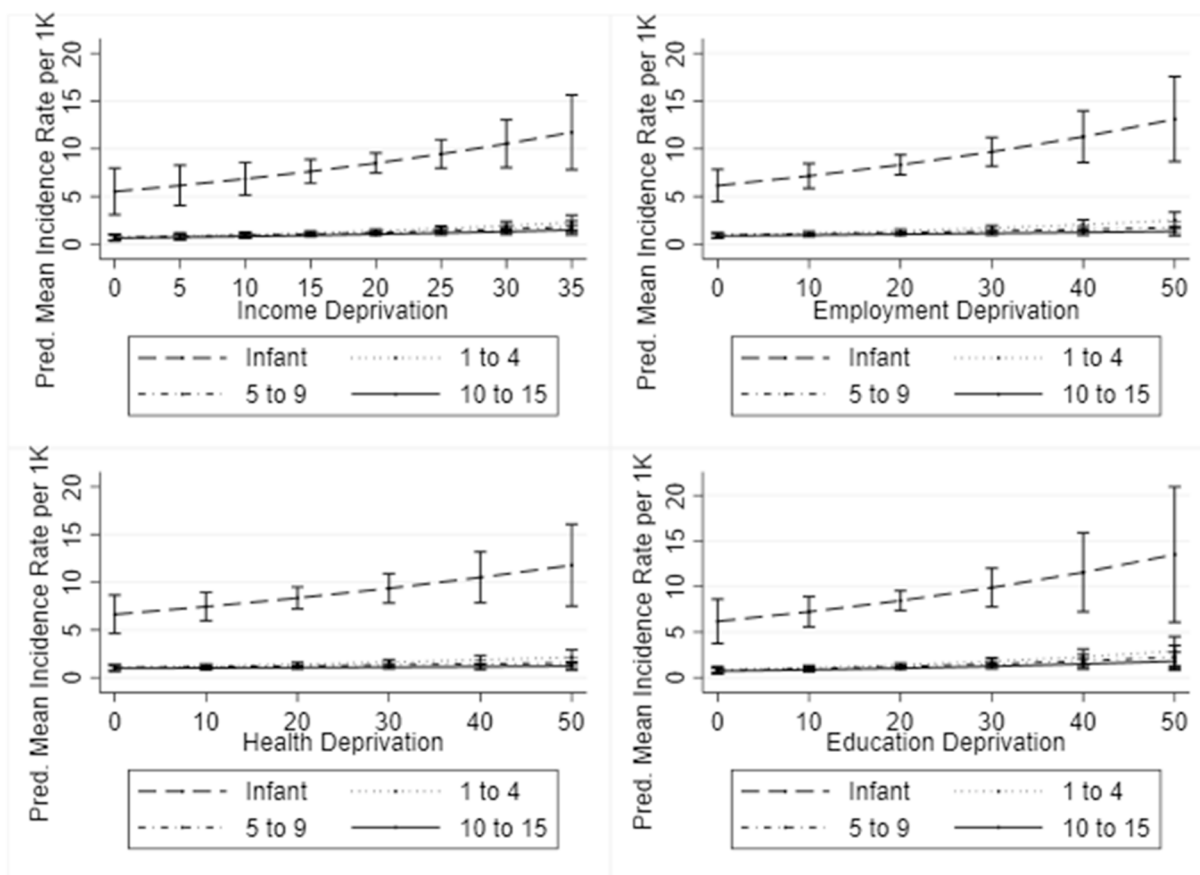
Fig. 3. Interactions between the age of the child and income, employment, health and education deprivation.
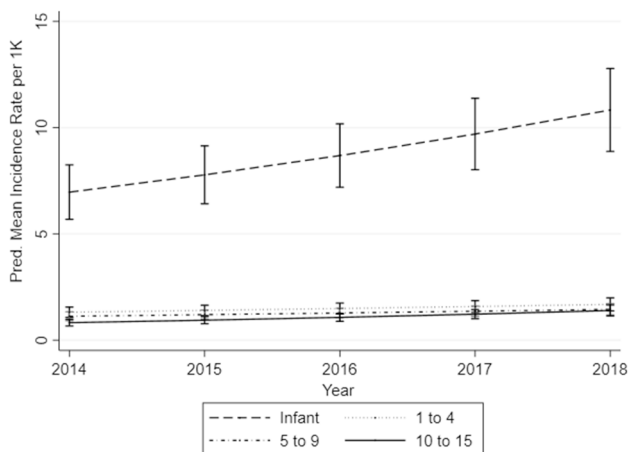

Fig. 4. Interaction between the age of the child and the year of the start of s31 proceedings.

reliance on aggregated individual and household-level measures (household income, numbers of persons on employment benefits, numbers of school dropouts and proportions of people with low qualifications). The physical environmental factors such as access to services (area remoteness in km), housing and physical environment (climate, extent of pollution) were all statistically non-significant.

We found (Table 2) that for a one-unit increase in income-deprivation of an area, the number of children entering care proceedings per local authority increased by 0.024 per thousand, and for a one-unit increase in employment deprivation, the number of children

entering care proceedings increased by 0.014. Considering the effect of outliers, the employment deprivation domain, followed by income deprivation showed the most consistent pattern in our models (scatter-plots showing the distributions and outliers are available in the appendix).

Our models with interaction terms between deprivation and age uncovered that the associations with all four deprivation domains are the strongest for infants. However, the numbers of older children within LAs are so small that their estimates are far less reliable. Our analysis confirmed previous findings of an increase in case numbers over time. Interestingly, our interaction model 5 showed that this increase, again, pertains mainly to infants, rather than older children.

Our models showed that the broader ecology of employment, income, education and health related policies are strongly associated with child welfare inequalities. The government expenditure for family support services, while weakly correlated with the incidence rates of children subject to care proceedings, ceased to be significant when controlling for deprivation. This finding does not detract from the importance of family support programmes and policies. Unsurprisingly the government expenditure for child and family support is correlated with deprivation – policymakers laudably invest more funds in family support in areas with high deprivation levels.

Our findings regarding the statistical significance of employment, income and educational deprivation are relevant especially for the post-industrial communities in Wales in the wake of the covid-19 pandemic. Some of the most deprived areas in our study, i.e. Torfaen and Merthyr Tydfil and Neath Port Talbot have ex-mining communities and towns, where decades of de-industrialisation have resulted in jobs losses, years of persistent employment deprivation and income deprivation. Recent media coverage has highlighted the scarring effect of deindustrialisation, now coupled with the increased risk of covid-19 morbidity and

mortality in these communities (Pasha-Robinson, 2018; Smith & Aguilar Garcia, 2020).

Our findings suggest that beyond targeted family support, policy-makers should consider broader ecological measures that strengthen local labour markets, ameliorate income deprivation and boost educational outcomes for vulnerable children and families. The success of the British governments' recent 'levelling-up' agenda (HM Government, 2022)[5], which is a commitment to reducing area-level inequalities, will be put to the test especially in the deprived Welsh areas with above average rates of children subject to care proceedings.

6. Conclusions

This paper adds to the knowledge base on children in care proceedings by unpacking the associations with the different area deprivation domains in Wales. We uncovered some important patterns. Our findings show that neighbourhood-level employment, income, educational and health deprivation are strongly associated with an increased risk of children of becoming subject to care proceedings, while other more environmental forms of deprivation are less significant. The findings hold particularly for infants.

Our analysis was carried out with data that predates the Covid-19 pandemic. The effects of the pandemic on employment and on vulnerable post-industrial towns and communities are already visible and have been subject to media reporting.

In the wake of Covid-19, it will be important to continue to monitor both children's incidence rates in care proceedings and factors that are likely to impact them. In post-pandemic Britain, policies combating deprivation will be ever more important for the wellbeing of children and families in communities.

CRediT authorship contribution statement

Stefanie Doebler: Conceptualization, Methodology, Writing – original draft, Formal analysis, Investigation, Writing – review & editing. **Karen Broadhurst:** Conceptualization, Writing – original draft, Writing – review & editing. **Bachar Alrouh:** Methodology, Investigation, Formal analysis, Validation. **Linda Cusworth:** Writing – review & editing. **Lucy Griffiths:** Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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data available for research.

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