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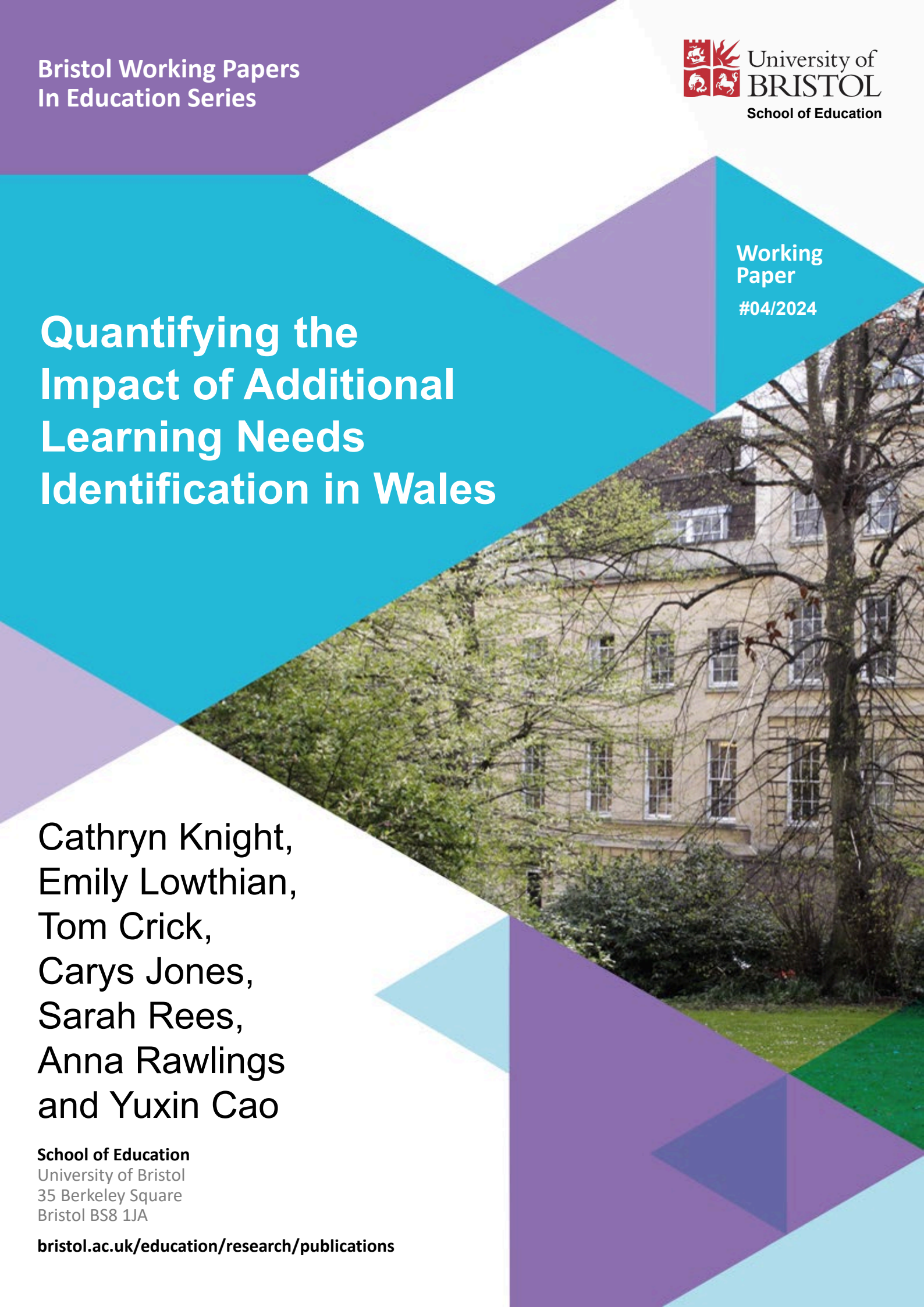
Quantifying the Impact of Additional Learning Needs Identification in Wales



Cathryn Knight,
Emily Lowthian,
Tom Crick,
Carys Jones,
Sarah Rees,
Anna Rawlings
and Yuxin Cao

School of Education
University of Bristol
35 Berkeley Square
Bristol BS8 1JA

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Bristol Working Papers in Education #04/2024

Quantifying the Impact of Additional Learning Needs Identification in Wales

By Dr Cathryn Knight[1], Dr Emily Lowthian[2], Professor Tom Crick[2], Carys Jones[3], Dr Sarah Rees[3], Anna Rawlings[3], Yuxin Cao[1]

[1]School of Education, University of Bristol
[2]Department of Education & Childhood Studies, Swansea University
[3]SAIL Databank, Swansea University

University of Bristol
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Corresponding author
Dr Cathryn Knight
School of Education, University of Bristol
cathryn.knight@bristol.ac.uk

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Nuffield Foundation

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EXECUTIVE SUMMARY

Aims: This project used data from over 200,000 children in Wales, born between 2002/3 and 2007/8 to explore the predictors of being identified with special educational needs (SEN)[1] and the association of this identification on academic attainment. The research aims to provide insight into how the previous SEN system in Wales was identifying and supporting the attainment of children with SEN in mainstream schooling, along with providing a baseline from which to view the effectiveness of the new statutory additional learning needs (ALN) system which was rolled out from 2020.

In particular, the research aimed to answer the following questions:

1. What individual and environmental factors contribute to the identification of SEN/ALN?
2. How does being identified with SEN/ALN influence learners' academic outcomes in mainstream schools?
3. How do learners' educational outcomes differ by the type of need that is identified (i.e. ADHD, dyslexia, autism and BESD)?
4. How does the age of SEN/ALN identification influence educational outcomes?

Methods: Data for this project was accessed from the Secure Anonymised Information Linkage (SAIL) Databank, a trusted research environment based at Swansea University, UK. Data were linked from the Welsh education and health datasets for each learner. Following exploratory analysis of the data such as descriptive statistics, we used multilevel models to understand the significant predictors of SEN identification and its relationship with attainment. Multilevel models offer a powerful analytical framework for investigating aspects which predict attainment over time. These models enabled the investigation of SEN identification (over time and at different key stages) and its relationship with attainment whilst controlling for sociodemographic covariates (e.g. free school meals (FSM), season of birth) and health covariates (e.g. health service utilisation). Simultaneously, multilevel models incorporate the hierarchical structure inherent in the data, acknowledging that students are nested within schools, and schools are, in turn, nested within local authorities.

The longitudinal aspect of multilevel models accommodates the dynamic nature of the educational data, capturing changes and trends in SEN and attainment in each key stage[2]. Through the incorporation of random effects at different levels, the models account for variations between learners and quantify the extent of variability attributable to differences between schools and local authorities. This provides a comprehensive understanding of the complex interplay of factors influencing both the likelihood of being diagnosed with SEN and educational attainment. Furthermore, the models allow for learners who move between

[1] N.B. – when referring to learners within our dataset we use the term special educational needs (SEN) as this is how they were identified at the time of data collection. When talking more generally about policy and practice in light of the new Additional Learning Needs (Wales) Act 2018 we use the term SEN/ALN.

[2] Within each key stage the data is aggregated, for example, Years 3, 4, 5, and 6 represent Key Stage 2 (KS2).

multiple schools over time, whereas modelling often relies on a single school which limits its ability to reflect the reality of changes in school for many learners.

We had initially proposed to use propensity score matching (PSM) to compare the attainment of those with identified SEN with those who shared the same characteristics of those with SEN but who had not been identified. However, due to the large proportion (47.9%) of learners identified with SEN, it was not possible to select a matched group for these learners. Therefore, while the multilevel models allow us to examine the relationship between SEN and attainment, they do not allow for comparisons between a matched SEN and non-SEN group. Moreover, although the dataset enabled us to control for variables beyond what has been achievable in similar research previously, it does not permit us to draw causal conclusions. Instead, it indicates the strength of associations between variables.

Results:

What proportion of learners were identified with SEN/ALN?

We found that **nearly half of learners born in 2002/3 were identified with SEN/ALN at some point during their education** from Reception to Year 11 (47.9%). This challenges the notion that SEN/ALN is an issue affecting only a minority of learners. In fact, SEN/ALN extends across a significant portion of the student population, underscoring the broader relevance and importance of addressing SEN-related concerns in educational policy and practice.

What individual and environmental factors contribute to the identification of SEN/ALN?

Key Results 1:
When controlling for health and birth variables:

- Learners with free school meals (FSM) in every key stage were 4.1 times more likely to be identified with SEN and learners with no-FSM.
- As attendance increased, the odds of having SEN decreased – for every 1% increase in attendance, the odds of SEN identification decreased by 8%.
- Male learners were 5.5 times more likely to be identified with SEN then female learners.
- Those born in the most deprived neighbourhoods were 4.6 times as likely to be identified with SEN.
- Learners who experienced breastfeeding were 70% less likely to be identified with SEN.
- Learners born in the summer (and so were younger in the year) were 3 times more likely to be identified with SEN than learners born in the autumn.

When exploring the predictors of SEN/ALN the findings reveal a clustering of SEN within specific demographic groups. Notably, when accounting for utilisation of health services and health related variables, environmental variables such as **receiving free school meals, being from an area of higher deprivation, reduced school attendance (%), being male, not experiencing breastfeeding, and being younger in the year emerged as significant factors related to the identification of SEN.** This underscores the nuanced interplay of socioeconomic and environmental elements in influencing SEN status, providing a more

comprehensive understanding of the multifaceted dynamics associated with SEN identification. This raises concerns about the effectiveness of SEN identification processes, particularly given the unexpectedly high number of learners identified with SEN. It suggests a potential issue of over- or under-identification in certain demographic groups, which is seemingly influenced by social patterning.

How does being identified with SEN/ALN influence learners' academic outcomes in mainstream schools?

Key Results 2:

For every 1% increase in time spent with SEN there was a 4% decrease in the odds of meeting the national expectations at each Key Stage. This translates to:

- A learner who spent an average of 25% of time with SEN in each Key Stage had a 64% decrease in the odds of meeting the national expectations.
- A learner who spent an average of 50% of time with SEN in each Key Stage had an 87% decrease in the odds of meeting the national expectations.
- A learner who spent an average of 75% of time with SEN in each Key Stage had a 95% decrease in the odds of meeting the national expectations.
- A learner who spent an average of 100% of time with SEN in each Key Stage had a 98% decrease in the odds of meeting the national expectations.

Identified **SEN was the most influential predictor of attainment**. When accounting for numerous sociodemographic and health factors, when the proportion of time spent diagnosed with SEN increases, there is a corresponding decrease in the likelihood of achieving the nationally expected educational outcomes. This underscores the substantial impact of SEN on academic attainment, even after considering sociodemographic and health factors which also predict attainment. This is an important finding given the large proportion of learners being identified with SEN. This result leads us to suggest that the education system may have been unable to mitigate for the negative impact of SEN on a learner's educational outcomes. It also raises questions about the efficacy of employing national educational standards as a meaningful benchmark.

How do learner's educational outcomes differ by the type of need that is identified (i.e. ADHD, dyslexia, autism and BESD)?

Key Results 3:

- Every 1% increase in time spent with **dyslexia** on average in each Key Stage reduced the odds of meeting national expectations by 1%.
- Every 1% increase in time spent with **ADHD** on average in each Key Stage reduced the odds of meeting national expectations by 2%.
- Every 1% increase in time spent with **BESD** on average in each Key Stage reduced the odds of meeting national expectations by 2%.
- Every 1% increase in time spent with **autism** on average in each Key Stage reduced the odds of meeting national expectations by 3%.

We explored specific SEN/ALN diagnoses as both outcomes and predictors of attainment. We ran models on those identified with dyslexia; Attention Deficit Hyperactivity Disorder (ADHD); autism; and Behavioural Emotional and Social Difficulties (BESD). Learners

identified with ADHD and BESD exhibited higher levels of deprivation, however those with dyslexia and autism did not demonstrate the same association with deprivation. Those born more recently were significantly more likely to be identified with ADHD, autism, and BESD compared to those born in 2002/3 suggesting a shift in the prevalence of the identification of these specific needs over time. This could indicate evolving societal awareness, diagnostic criteria, or environmental factors that influence the identification of these needs. We also found that different needs have differing influence on attainment. From the results, dyslexia had the weakest influence on attainment, although it was still significant. Autism had the strongest influence on attainment, followed by BESD and then ADHD.

How does the age of SEN/ALN identification influence educational outcomes?

Key Results 4:
Compared to a learner with no SEN:

- A learner identified with SEN in **KS1** had a 99% reduction in the odds of meeting the national expectations at each key stage.
- A learner identified with SEN in **KS2** had a 97% reduction in the odds of meeting the national expectations at each key stage.
- A learner identified with SEN in **KS3** had an 86% reduction in the odds of meeting the national expectations at each key stage.
- A learner identified with SEN in **KS4** had an 87% reduction in the odds of meeting the national expectations at each key stage.

We explored the influence on attainment for those identified in key stages 1 to 4. We found that **the earlier the learner was identified with SEN, the more likely they were to not meet the nationally expected levels of attainment**. This finding shows that access to SEN provision for a longer period does not mitigate the negative impact of SEN on academic outcomes. This suggests a challenge in providing sustained and effective support to learners with SEN, demanding a closer examination of the existing support structures and strategies to better meet the evolving needs of these students over time.

Conclusions and recommendations

The results of our analysis underscore the intricate interplay of factors influencing the identification and influence of SEN/ALN in the Welsh educational context. Notably, the findings reveal a clustering of SEN within specific demographic groups, providing a nuanced understanding of the socio-economic and environmental elements associated with SEN/ALN status in Wales. Drawing awareness to these demographic differences is important in ensuring that stakeholders can critically examine how different factors, beyond individual health, contribute to the identification and support of students with SEN/ALN. In particular, the results lead us to question whether there is a biological basis for the higher levels of SEN identification in particular demographic groups or whether there may be a disproportionality due to differences including teachers' expectations and a schools' ability to provide an inclusive education system for these learners (Artiles et al., 2010; Coutinho & Oswald, 2000; Skiba et al., 2008; Waitoller et al., 2010). In Wales, this also raises important questions about the current ALN reforms, especially taking into consideration the ongoing major education system-level reforms. From this research it becomes evident that addressing SEN/ALN should

not solely fall within the remit of SEN/ALN teams; enhancing outcomes for this group of learners requires a comprehensive and cross-departmental approach which also includes examination of poverty, equity and subsequent access to resources and support services.

A further central conclusion is the substantial impact of SEN/ALN on academic attainment. Even after accounting for sociodemographic and health factors, SEN/ALN correlates with a decrease in the likelihood of learners in mainstream school achieving desired educational outcomes in each key stage. The temporal dimension adds a layer of complexity, revealing that the earlier a learner is identified with SEN/ALN, the more negative the impact on attainment. These findings highlight the enduring significance of addressing the challenges associated with SEN/ALN in order to address wider issues of attainment in Wales. As those included in the analysis were in mainstream education, and health related factors were controlled for (including health care usage, birth abnormalities and perinatal characteristics), the research leads us to question if the education system was adequately supporting the learning of these students. This is particularly pertinent when considering that a binary outcome for attainment was used which distinguished only whether the learner met national expectations at each key stage. Therefore, the research shows that learners with SEN in mainstream schools were significantly less likely to meet this basic baseline criteria, let alone to excel in these measures. Therefore, it raises questions about the education system as a whole and how these learners are effectively supported to show progression within the education system. Given the significance of this effect size it raises questions about the success of the previous system in Wales in supporting learners with SEN, with important considerations for the new emerging ALN system and wider education reforms.

This study not only offers a thorough exploration of SEN/ALN dynamics in Wales but also establishes a crucial baseline for evaluating the potential impact of the new ALN system on the identification and distribution of SEN/ALN, as well as its influence on academic outcomes.

The following **recommendations** are made:

- **Inclusive educational policies:** Develop, implement, and meaningfully evaluate inclusive educational policies that prioritise diversity and thus reduce the need for identification of SEN/ALN which is currently clustered in particular sociodemographic groups. This includes creating frameworks that recognise and celebrate the varied socio-economic and environmental factors influencing learning, ensuring an inclusive approach to education for all.
- **More effective cross-government policymaking**: Considering that almost half of learners in Wales encountered the SEN/ALN system during their educational journey, and the correlations with measures of deprivation among this demographic, it becomes evident that addressing SEN/ALN should not solely fall within the remit of ALN teams within the government and externally. Enhancing inclusion with the goal of improving attainment requires a comprehensive and cross-departmental approach. To effectively raise attainment levels, prioritising inclusion should be a central objective across the entire educational landscape in Wales, transcending specific teams to create a cohesive, collaborative effort that addresses the multifaceted challenges associated with SEN/ALN.

- **Review of ALN identification and support processes:** Examination and evaluation of the current methods used to identify ALN, with a focus on ensuring accuracy, fairness, and inclusivity. Furthermore, given the impact of socioeconomic status, season of birth and gender the results suggests that interventions and support structures should not only focus on individual cognitive or developmental factors but also consider the impact of sociodemographic, gender and age-related expectations.
- **Review national expectation criteria and assessment processes**: The research shows that learners with SEN were significantly less likely to meet the national expectations at each key stage. Therefore, a review of whether national expectations are effective ways of measuring attainment is required. As the assessment system meant that students with SEN were not meeting the national expectations, strategies should be explored to adapt and refine assessment practices to be more inclusive, taking into account various learning strengths, and needs. Consider incorporating flexible assessment formats, personalised approaches, and accommodations to create an environment where learners with diverse needs feel supported and empowered to succeed. This is certainly possible in Wales with the emerging curriculum and qualifications reforms.
- **Further national-scale research:** a longer-term evidence base is needed to develop a more thorough understanding of the challenges and potential systematic issues with identification of SEN/ALN and its subsequent impact on attainment.

BACKGROUND

Research previously conducted in the UK (Knight & Crick, 2021; Parsons & Platt, 2013) and internationally (King & Bearman, 2011; Lui, King & Bearman, 2010) has demonstrated that sociodemographic factors outside of biology and cognition (such as ethnicity, social class, season of birth, and neighbourhood characteristics) can impact who is identified with special educational needs (SEN) or additional learning needs (ALN). Bearman (2013) questions "what if the sequencing phenomenon is to be found not in the genome but instead in a better understanding of the social and cultural factors that shape health?" (p.11). Thus, understanding patterns in who is identified as having an SEN/ALN can shed light on the extent to which the current system of identification and subsequent support in Wales is impacted by social and cultural factors.

Children with SEN/ALN are known to show poorer academic performance during their school years in comparison to their same-aged peers (Parsons & Platt, 2017). This may, in part, be due to the specific issues associated with their particular learning need(s). However, recent SEN/ALN policy and subsequent practice has the intention that children with additional needs are able to progress at the same rate as their peers (UK Department for Education, 2015; Welsh Government, 2018). While it could be expected that children with SEN/ALN achieve at a lower level than their peers at the time of SEN/ALN identification and intervention, it remains unexplored — both in the UK and internationally — whether SEN provision following identification mitigates the negative impact of SEN on academic outcomes.

A corpus of research looking at the social impact of SEN/ALN identification on academic outcomes and outlook has shown mixed effects. Qualitative research highlights the benefits of SEN/ALN identification due to the alleviation of stigma and access to support (Ingesson, 2007; Glazzard, 2010; Leitão et al., 2017), while quantitative research, controlling for educational outcomes, shows a negative impact on academic self-concept (Polychroni, Koukoura, & Anagnostou, 2006; Knight, 2021). However, little research has been done which investigates the impact of SEN/ALN identification on academic outcomes. And where it has, it has been based on smaller-scale sample sizes which have not broken-down learners into categories of SEN/ALN (Parsons & Platt, 2017).

Context

The Welsh SEN/ALN system is currently transitioning to a new statutory support system for those aged 0-25 years with a learning difficulty or disability (Additional Learning Needs and Education Tribunal (Wales) Act, 2018). The transition phase started in 2022 and involves an overhaul of the system for learners with additional learning needs (ALN), the term that now replaces 'special educational needs' (SEN). This introduces a unified legislative framework for children and young people across the broader age range of 0-25 years and replaces statements with individual development plans (IDPs). However, there is currently no rigorous large-scale evaluation of the effectiveness of the previous system in supporting the progression of children with SEN/ALN (Knight & Crick, 2021; Knight et al., 2023). Furthermore, there are ongoing major education system-level reforms taking place in Wales, including a new national curriculum. Therefore, along with exploring the impact of SEN/ALN identification on learners more broadly, this research offers a baseline which can be followed

up in the future to view the effectiveness of the incoming education reforms in supporting learners with SEN/ALN.

In the previous system in Wales (from which we obtained the current data), children were placed on a SEN/ALN register in one of three strands: *School Action*, *School Action+* and a statement. School Action provided initial support within mainstream schools for students with SEN/ALN, involving tailored interventions to meet individual requirements. School Action+ represented a more intensive stage, with specialised support and collaboration with external specialists. The Statement System resulted in a formal assessment and the issuance of a legally binding statement outlining the child's needs and necessary provisions which was managed by the local authority. The new system aims to provide a more integrated system, replacing the three tiers with IDPs. Under the previous system there was a fluctuating level of around 20% of learners in Wales identified with SEN (Senedd Research, 2022). The number dropped by over 30% between 2020/21 (97,551 SEN learners, 20.8%) and 2022/23 (63,089 ALN learners, 15.8%), aligning with the implementation of the new ALN system (StatsWales, 2023). Consequently, approximately 34,000 fewer learners are now accessing the support provided by the new ALN system. Given the transition from SEN to ALN, it is important to understand the patterns in who was being identified with SEN in the previous system in order to evaluate the impact of the incoming system.

These education reforms are designed to address a growing attainment issue in Wales. Wales is showing decreasing scores on the Program for International Student Assessment (PISA) tests (OECD, 2023). Children in Wales scored significantly below the Organisation for Economic Cooperation and Development (OECD) average in English, Maths and Science in 2022, and showed an overall decrease since the previous tests in 2018 (Welsh Government, 2023). Compared to the other three nations of the UK, Wales had the lowest scores. The focus of Welsh education reform is to “continue our long-term programme of education reform, and ensure educational inequalities narrow and standards rise” (Welsh Government 2021, p.3). The PISA scores also highlight a significant achievement gap between the most and least disadvantaged groups (Senedd Cymru, 2023). This is particularly pertinent for Wales, given that nearly a third of its children live in poverty, and it has the highest proportion of low-paid employees in the UK (Office of National Statistics, 2019). Wales has consistently had a higher poverty rate than England, Scotland, and Northern Ireland over the past two decades, with the Children’s Commissioner for Wales emphasising poverty as the foremost issue affecting Welsh children and addressing it as the Welsh Government's primary objective (Senedd Cymru, 2023). However, the relationship between poverty measures and SEN remains unexplored in Wales. Given the ongoing academic underperformance of learners both with SEN and from disadvantaged backgrounds (StatsWales, 2023), it is imperative to examine the relationship between socioeconomic status and SEN to fully understand the complex factors contributing to achievement disparities and low PISA scores in Wales.

Within education policy globally, there is a notable shift from special education to inclusive education. This is underpinned in legislation by the United Nation’s Sustainability Development Goal 4 which ensures inclusive and equitable quality education that promotes lifelong learning opportunities for all learners (UNESCO, 2017). Within an inclusive education system, its argued that the need to label is diminished, as the environment is tailored to support all learners, regardless of whether their learning need has been identified (van Swet,

Wichers-Bots & Brown, 2009). Despite this, there is a global increase in those being recognised with a SEN or disability (Olusanya et al., 2022). This, therefore, suggests practices of special education, where individual needs are identified and supported, as opposed to practices of inclusive education (Florian, 2014; Slee, 2012). Within the changes to the Welsh system, it could be argued that there is a step towards more inclusive practices with an aim for fewer learners to be formally identified with special needs. However, without a baseline understanding of how the previous system was supporting learners in this category it will not be possible to evaluate the success of this new initiative.

Research Questions

1. What individual and environmental factors contribute to the identification of SEN/ALN?

2. How does being identified with SEN/ALN influence learners' academic outcomes in in mainstream schools?

3. How do learners' educational outcomes differ by the type of need that is identified (i.e. ADHD, dyslexia, autism and BESD)?

4. How does the age of SEN/ALN identification influence educational outcomes?

METHODS

Data sources

Data for this project was accessed from the Secure Anonymised Information Linkage (SAIL) Databank [https://saildatabank.com] based at Swansea University, a strategic administrative data asset and associated infrastructure funded by Health and Care Research Wales, Welsh Government and the ESRC. It contains billions of anonymised person-based records with a complete data linkage toolset. Working with the SAIL team, data was linked from:

- *Annual District Birth Extract Dataset* (ADBE);
- *Annual District Death Extract Dataset* (ADDE);
- *Congenital Anomaly Register and Information Service* (CARS);
- *Education Wales* (EDUW and EDUC);
- *Emergency Department Dataset* (EDDS);
- *Maternal Indicators Dataset* (MIDS);
- *National Community Child Health Database* (NCCHD);
- *Outpatients Patients Episode Database for Wales* (OPEDW);
- *Patient Episode Database for Wales* (PEDW);
- *Welsh Demographic Service Dataset* (WDSD);
- *Welsh Longitudinal General Practice Dataset* (WLGP).

As part of the SAIL Databank infrastructure and protocols, data anonymisation is used to prevent personally identifiable information from being made available publicly and is conducted in line with the UK Data Protection Act 2018. Robust information governance

arrangements underpin all aspects of the SAIL Databank. This project was reviewed by an independent Information Governance Review Panel (IGRP) for privacy risk, data governance and public benefit assessment. All statistical analyses have been reviewed by statistical disclosure control (SDC) to ensure no individual (or school, etc.) is identifiable from our outputs.

Constructing the dataset

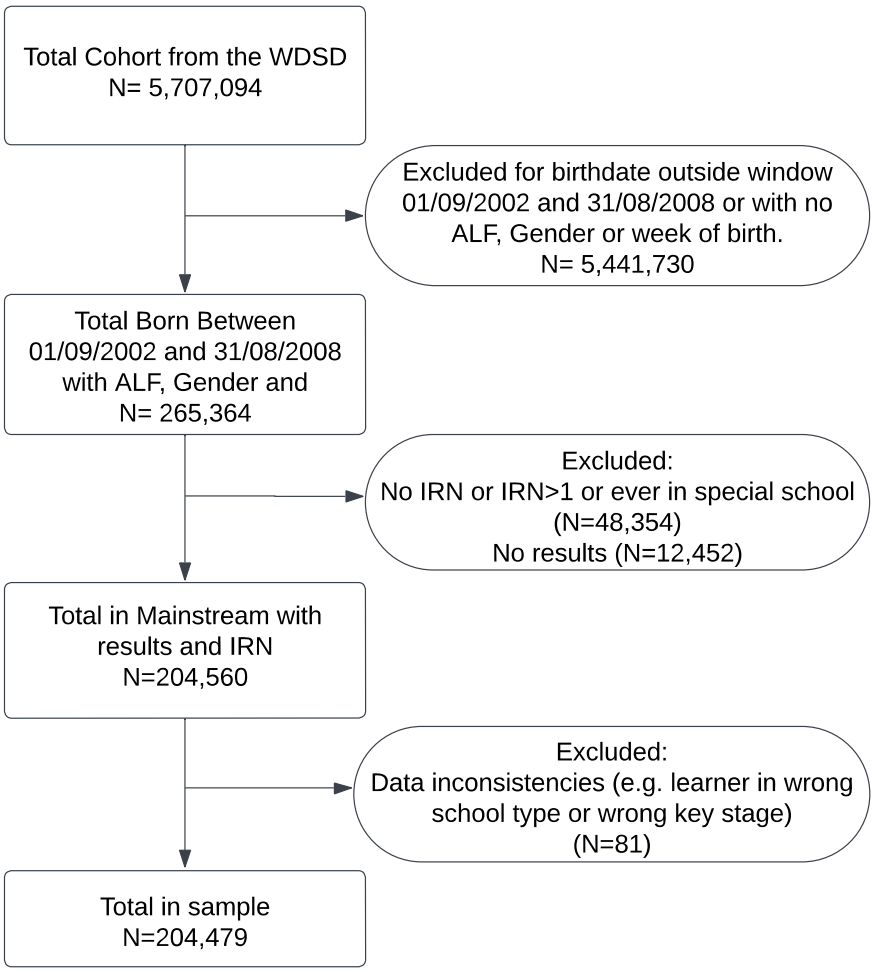
A base spine of all children born in Wales between the dates of 1 September 2002 to 31 August 2008 were identified through the WDSD. Table 1 shows the educational data available for respective children born in each year. Only those born in 2002/3 had a full educational trajectory available for modelling; this is due to educational data missing in 2019/20, 2020/21 and 2021/22 due to the COVID-19 pandemic.

Table 1 Data available for each birth cohort

	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008
KS1	Y	Y	Y	Y	Y	Y
KS2	Y	Y	Y	Y	Y	Y
KS3	Y	Y	Y			
KS4	Y					

Relevant outcome and cohort variables were then linked into this data. Appendix A shows an example of the dataset structure. Figure 1 shows a consort diagram of those who were removed from the data set during the data building phase This shows that learners were excluded from the dataset if they had no Anonymous Linking Field (ALF) or Individual Record Number (IRN). They were also excluded if they were ever in special school. The decision was made to only include learners in mainstream school as the educational experiences and academic trajectory of those in special schools meant that it was not possible to accurately track these learners longitudinally. Furthermore, it is likely that this group of learners were identified with SEN/ALN early and that their needs are more complex, making it harder to draw conclusions for the research question. Further cleaning of the data was done if a learner had missing education data or any data inconsistencies. Overall, we were left with a total of 204,479 learners in the dataset. The dataset was structured in the long format. This meant that initially each learner had multiple rows for each year that they were in the dataset and each variable was organised into columns.

Figure 1 Consort Diagram



Each year was then collapsed into Key Stage:

Key Stage 1: 5 - 7 years old, school years Reception, 1, and 2;

Key Stage 2: 7 - 11 years old, school years 3 – 6;

Key Stage 3: 11 - 14 years old, school years 7 – 9;

Key Stage 4: 14 - 16 years old, school years 10 and 11.

Where each row contained different information each year, an average, mode or most recent value was taken (explained further in Table 2 for each variable).

Key variables

Special Educational Needs

The SEN variable was used as both an outcome variable (RQ1) and a predictor variable (RQ2 and RQ4). For RQ1, a flag was created which identified if the learner had SEN in each key stage, we then used this as our outcome for analysis.

In RQ2 and RQ4, SEN was used as the predictor variable, whereby the variable indicated the proportion of time the learner was identified with SEN in each key stage, aggregated from the school years (e.g., a proportion of '100' would mean they were identified as SEN for the whole of the KS, '50' for half of the KS, and so on). In RQ4 the KS of first SEN identification was derived from the KS in which SEN was first flagged. This was included in the model in order to also see the impact of age of identification.

In RQ3 we specifically focused on dyslexia, ADHD, autism and BESD. These specific categories represent a diverse range of SEN, encompassing different cognitive, emotional, and behavioural challenges commonly encountered in educational settings. By focusing on these particular SEN categories, the research aims to provide a nuanced understanding of the unique dynamics associated with each condition. Schools provided information yearly on the need that the learner had, and they were able to select more than one need. There was a high level of co-occurrence of need identified within the dataset (explored below). To explore our research questions, we looked at those who had the need identified irrespective of whether it coexisted with other needs. This is because there was not a sufficient number of learners with the single need identified in each key stage. Therefore, this needs to be taken into consideration when interpreting the results.

Attainment

A binary variable of attainment was created at each key stage. If the learner met the expected levels at English/Welsh and Maths at KS1, 2 and 3 they were coded as 'met national expectation'. At KS4, if they had 5 or more GCSEs at A* to C grade (including English, Cymraeg (Welsh) and Maths) they were coded as 'met national expectation'.

Covariates

The table below shows the key variables that we were interested in when exploring the predictors of SEN and attainment for all learners in the cohort.

Table 2 Covariates included in analysis

Variable	**How variable was used in the models**
Fixed Covariates	
Sex	Sex reported at birth
Ethnicity	The most commonly occurring (mode) ethnicity reported for each learner (if more than one mode, the most recent reported ethnicity was taken)
Townsend Deprivation level	Level of deprivation in the area where the child was living in their first 4 months of life. It incorporates four variables:

	• Unemployment (as a percentage of those aged 16 and over who are economically active); • Non-car ownership (as a percentage of all households); • Non-home ownership (as a percentage of all households); and • Household overcrowding. A score from 1 - 5 is given (1 – least deprived, 5 - most deprived).
Season of birth	Autumn – September, October and November Winter – December, January and February Spring – March, April and May Summer – June, July and August
Birth cohort	The academic year a learner was born, i.e. 2002/3, 2003/4 etc.
Birthweight	The following categories are used: Extremely Low Birthweight Very low birthweight Low birthweight Normal birthweight High birthweight Very high birthweight Extremely high birthweight
Gestational age	The following categories are used: Term Pre-term Very pre-term Extremely pre-term Late term
Multiple births	Whether the child was a twin, triplet etc. (Yes/No)
Congenital anomaly	Whether an anomaly was reported at birth (None/Minor/Major)
Breastfeeding	Whether the child was ever breastfed in the first 6 weeks of life (Yes/No)
Covariates which can change in each key stage	

Average Attendance (%)	Attendance data was collected for each learner in each year. This was averaged across each key stage. Attendance data was centred around the mean in the multilevel models as the attendance does not have a meaningful 0 as no learner had an attendance of 0.
Health usage	This variable was derived by totalling the number of GP and hospital visits the child had over a key stage. Categorised as 'None' 'One or two' or 'Three or more'.
Free School Meals (FSM)	The proportion of time the learner had FSM in each key stage (0-100)
Hierarchical structure	
Time	The key stage in which the data was collected. This accounts for temporal dependencies or trends across different levels of the model.
School	The most commonly occurring (mode) school that the learner attended in each key stage (if more than one mode then the most recent was taken).
Local authority	The most commonly occurring (mode) local authority that the learner attended school in (if more than one mode then the most recent was taken).

Statistical tests

Exploratory analysis:

Our analysis was underpinned by an exploratory data analysis to provide an initial basis of understanding to answer the specific research questions. This included computing summary statistics and the empirical distribution of each variable, visualised through comparative boxplots, histograms, and scatter/matrix plots to communicate potential relationships among the represented data. The information informed the techniques used for our initial use of inferential statistics, using parametric or non-parametric tests as appropriate.

Multilevel Modelling:

For the purpose of the multilevel models, the data were organised as repeated measures in an unbalanced panel structure (Gelman & Hill, 2007). Multilevel models offer a powerful analytical framework for investigating the variables predicting attainment over time. These models enable the examination of the impact of the key covariates on SEN (RQ1) or attainment (RQ2 and 4). Simultaneously, multilevel models recognise the hierarchical structure inherent in the data, acknowledging that students are nested within schools, and schools are, in turn, nested within local authorities.

The longitudinal aspect of multilevel models accommodates the dynamic nature of educational data, capturing changes and trends in attainment and SEN in each key stage. Through the incorporation of random effects at different levels, the models account for variations between students but also quantify the extent of variability attributable to differences between schools and local authorities, providing a comprehensive understanding

of the complex interplay of factors influencing attainment. Furthermore, the model allows for learners who move between multiple schools over time (both from primary to secondary and if learners attended multiple schools). [3]

For each model the Interclass Correlation Coefficient (ICC) is calculated, this tells us the proportion of total variance in a variable that can be attributed to differences between groups (higher-level units, like classrooms or companies) compared to differences within groups (lower-level units, like individual students or employees). If the ICC is close to 1, it means that most of the variability is between groups, indicating that the group membership has a significant impact on the variable. If the ICC is close to 0, it means that most of the variability is within groups, suggesting that individual differences within the groups are more important than the group differences.

Within the models presented in the research questions 1, 2 and 4, the odds ratio (OR) column shows if there was a higher or lower probability of each variable's contribution to SEN identification or attainment. When holding the other covariates in the model constant and the random effect value constant (i.e. holding constant the variability between LAs, schools, pupils and waves), the odds ratios can be interpreted as:

- If the odds ratio is 1, it indicates that there is no association between the independent variable and the outcome variable.
- If the odds ratio is greater than 1, it suggests that as the independent variable increases, the odds of the event occurring also increase.
- If the odds ratio is less than 1, it suggests that as the independent variable increases, the odds of the event occurring decrease.

Poisson models were used for the research question 3 to predict ADHD, dyslexia, autism and BESD. A Poisson model is a statistical method used to analyse count data, where the outcome variable represents the number of occurrences of an event within a fixed unit of time (i.e. the count of ADHD identification). It assumes that the event of interest follows a Poisson distribution, which is characterised by a single parameter representing the mean and variance of the count data. The model estimates the relationship between predictor variables and the rate of occurrence of the event. Poisson models were used in these instances as the count of the key needs was low in certain key stages, making it difficult to produce well-fitting models. The Poisson models show the IRR (Incidence Rate Ratios) these show the rate in which attainment would increase for a 1% increase in the time spent with each need.

Across all models presented the term 'ref' means a reference category, and where we have groups, this is the group we compare to; for example, for deprivation we compare to the least deprived group.

[3] We were unable for adjust the model for multiple moves within a key stage, therefore the mode school in each key stage was taken. This means that if a learner moved multiple times within a key stage, this is not recognised in the models. If a learner did not have a mode, then we used the most recent school that they had attended.

Methodological constraints:

The original research plan was to conduct propensity score matching in order to compare a SEN and non-SEN group. However, due to the considerable number of learners identified with SEN/ALN at various stages of their education (shown in Table 5), it was not possible to establish a non-SEN comparison group with matched characteristics. Consequently, the presented attainment models compare individuals with SEN to those without SEN. The significance of our results could have been enhanced if we had compared individuals with SEN to a group possessing similar characteristics to those with SEN but had not been identified. This approach would have provided a more nuanced understanding of the impact of SEN by minimising potential confounding factors and offering a more meaningful basis for comparison.

Causality

We note that our analyses do not establish cause-and-effect relationships. Although we account for temporal sequences, such as SEN identification in KS1 followed by KS2 attainment, our research methods do not permit causal inferences. Nevertheless, the large sample size and population-level data provide strong evidence for the associations observed.

EXPLORATORY ANALYSIS

The following tables provide a breakdown of the key variables of interest.

Table 3 Number of learners with observations in each Key Stage

Key Stage	N
1	194,030
2	198,631
3	93,152
4	29,761

Special Educational Needs

Table 4 Number of Learners with SEN in each Key Stage

	Number of school years with SEN within each Key Stage									
	0		1		2		3		4	
	n	%	n	%	n	%	n	%	n	%
KS1	134757	72.15	20238	10.83	16271	8.71	15519	8.31	N/A	N/A
KS2	118809	63.85	11698	6.29	10757	5.78	10944	5.88	33864	18.20
KS3	60601	68.04	5428	6.09	4816	5.41	18222	20.46	N/A	N/A
KS4	21512	74.39	1225	4.24	6182	21.38	N/A	N/A	N/A	N/A

These were translated into proportions for analysis in research question 2. For example, if someone had spent 1 year with SEN in KS1 they would have a proportion of 33.33 for KS1.

Table 5 Years with SEN for those born in 2002/3

Years with SEN	0	1	2	3	4	5	6	7	8	9	10	11
Percent	52.09	7.54	5.66	5.09	4.81	3.59	3.8	3.83	5.2	3.89	4.3	0.2

For children born in 2002/3 (N=64,574) we were able to identify patterns in SEN identification and provision over time. Figure 2 shows that the proportion of learners with SEN fluctuates slightly between key stages (27% in KS1, 37% in KS2, 32% in KS3 and 26% in KS4). It also shows that considerable proportions of learners (4-14%) moved in and out of the SEN category between key stages. By the time the learners in the 2002/3 cohort were in KS4, 47% had been identified with SEN at some point during their education.

Figure 2 Changes in SEN identification between key stage

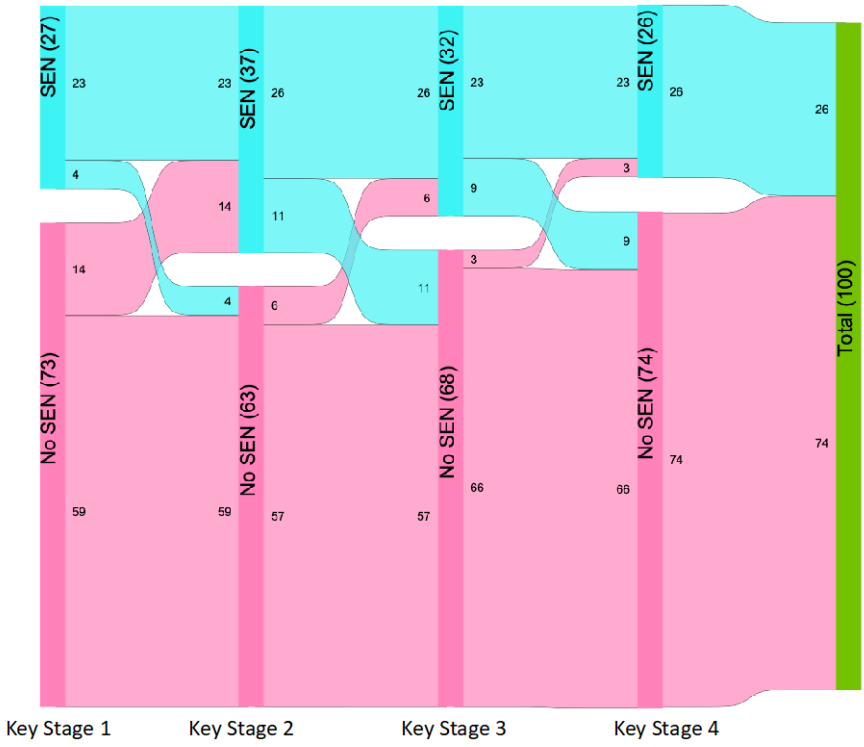
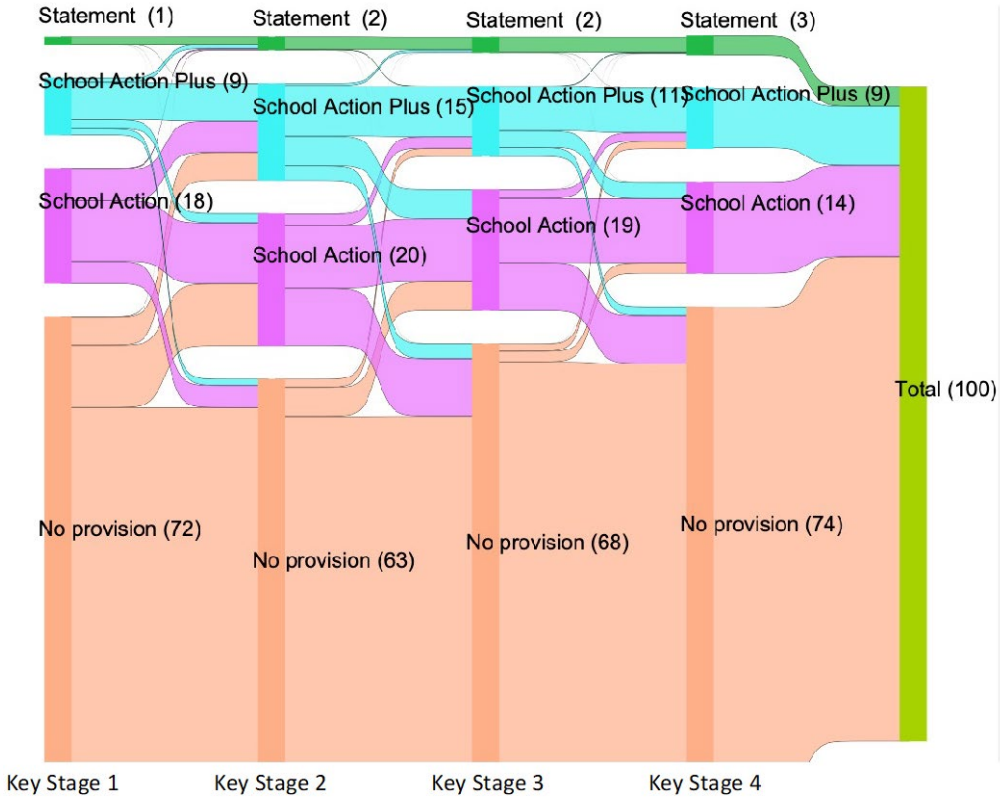


Figure 2 shows that the proportion of learners with no additional SEN provision only fluctuates slightly between the key stages (72% in KS1, 63% in KS2, 68% in KS3 and 74% in KS4). However there is considerable movement both between the no provision and additional provision types with the exception of those on statements (for learners managed by the local authority) where very little fluctuation was seen (Figure 3).

Figure 3 Changes in SEN provision between key stage



Key identified needs – ADHD, Dyslexia, Autism and BESD

Tables 6- 9 show the number of years learners spent identified with each label in each key stage. These were translated into proportions for analysis in research question 4. For example, if someone had spent 1 year with ADHD in KS1 they would have a proportion of 33.33 for KS1.

Table 6 Number of years identified with ADHD

	Number of school years with ADHD within each key stage									
	0		1		2		3		4	
	n	%	n	%	n	%	n	%	n	%
KS1	186594	99.90	147	0.08	35	0.02	9	0.00	N/A	N/A
KS2	184496	99.15	499	0.27	404	0.22	369	0.20	304	0.16
KS3	88039	98.85	195	0.22	197	0.22	636	0.71	N/A	N/A
KS4	28590	98.86	55	0.19	274	0.95	N/A	N/A	N/A	N/A

Table 7 Number of years identified with dyslexia

	Number of school years with dyslexia within each key stage									
	0		1		2		3		4	
	n	%	n	%	n	%	n	%	n	%
KS1	186123	99.65	530	0.28	122	0.07	10	0.01	N/A	N/A
KS2	179851	96.66	1997	1.07	1726	0.93	1528	0.82	970	0.52
KS3	85603	96.11	560	0.63	576	0.65	2328	2.61	N/A	N/A
KS4	27855	92.79	1227	4.09	937	3.12	N/A	N/A	N/A	N/A

Table 8 Number of years identified with Autism

	Number of school years with autism within each key stage									
	0		1		2		3		4	
	n	%	n	%	n	%	n	%	n	%
KS1	185627	99.38	347	0.19	270	0.14	541	541	N/A	N/A
KS2	183509	98.62	606	0.33	467	0.25	396	396	1094	0.59
KS3	87540	98.29	260	0.29	249	0.28	1018	1018	N/A	N/A
KS4	28392	98.18	70	0.24	457	1.58	N/A	N/A	N/A	N/A

Table 9 Number of years identified with BESD

	Number of school years with BESD within each key stage									
	0		1		2		3		4	
	n	%	n	%	n	%	n	%	n	%
KS1	178209	95.41	3391	1.82	2734	1.46	2451	1.31	N/A	N/A
KS2	172131	92.51	4271	2.30	3109	1.67	2508	1.35	4053	2.18
KS3	81681	91.71	2399	2.69	1663	1.87	3324	3.73	N/A	N/A
KS4	26504	91.65	630	2.18	1785	6.17	N/A	N/A	N/A	N/A

As schools could identify more than one need, it was necessary to explore how each of the chosen key needs was present alongside other needs (i.e. the co-occurrence of each need). Table 10 shows that there was a high level of reported co-occurrence for each identified need. ADHD was most likely to be reported alongside other needs in each key stage.

Table 10 Co-occurrence with other needs

		No other identified SEN		Another identified SEN	
		n	%	n	%
KS1	Dyslexic	356	53.78	306	46.22
	ADHD	41	21.47	151	78.53
	Autism	454	39.21	704	60.79
	BESD	3838	44.75	4738	55.25
KS2	Dyslexic	1221	44.16	1544	55.58
	ADHD	93	25.91	266	74.09
	Autism	158	34.35	302	65.65
	BESD	2850	58.99	1987	41.01

KS3	Dyslexic	239	76.36	74	23.64
	ADHD	28	30.43	64	69.57
	Autism	95	46.80	108	53.20
	BESD	1370	76.71	416	23.29
KS4	Dyslexic	657	61.69	408	38.31
	ADHD	78	23.64	252	76.36
	Autism	201	37.64	333	62.36
	BESD	1366	56.54	1050	43.46

Attainment

Table 11 Attainment at each key stage

	Meets expectations			
	Yes		No	
	N	%	N	%
KS1	162245	87.01	24214	12.99
KS2	173741	90.77	17658	9.23
KS3	80658	90.55	8421	9.45
KS4	14659	51.39	13866	48.61

Covariates

Table 12 - 14 show the covariates included in the model.

Table 12 Fixed categorical covariates included in the models

Variable	**Category**	**n**	**%**
Gender	Male	99316	51.2
	Female	94714	48.8
Ethnicity	White	179256	92.4
	Asian	5014	2.58
	Black	1534	0.791
	Mixed	5133	2.65
	Other	2088	1.08
	Unknown	946	0.488
Townsend Deprivation level	1 – Least deprived	24767	14.80
	2	31138	18.60
	3	47906	28.60
	4	41542	24.80
	5- Most deprived	21973	13.10
Birthweight	Normal birthweight	147533	81.40
	Extremely low birthweight	790	0.44
	Very low birthweight	1168	0.65
	Low birthweight	11041	6.09

	High birthweight	17450	9.63
	Very high birthweight	3183	1.76
Gestational age	Term	156437	88.10
	Extremely pre-term	486	0.27
	Preterm	10841	6.11
	Very pre-term	1505	0.85
	Late term	8272	4.66
Multiple births	No	188622	97.5
	Yes	4767	2.5
Breastfeeding Ever	No	74488	45.3
	Yes	89870	54.7
Birth anomalies	None	188640	97.2
	Minor	833	0.04
	Major	4557	2.5
Season of birth	Autumn	48897	25.2
	Winter	46956	24.2
	Spring	48363	24.9
	Summer	49820	25.7
Birth cohort	2002-3	30556	15.7
	2003-4	31401	16.2
	2004-5	31985	16.5
	2005-6	32239	16.6
	2006-7	33151	17.1
	2008-9	34698	17.9

Table 13 Longitudinal covariates by KS

		KS1		**KS2**		**KS3**		**KS4**	
		n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
FSM	Yes	137252	73.5	138154	74.2	70356	79.0	24044	83.1
	No	49533	26.6	47918	25.8	18713	21.0	4875	16.9
Health Usage	None	77951	40.2	64596	32.5	33269	35.7	13397	45.0
	One or two times	55139	28.4	54908	27.6	24442	26.2	7638	25.7
	Three or more times	60940	31.4	79127	39.8	35441	38.0	8726	29.3

Table 14 Percentage school attendance in each KS

	% School attendance	
	Mean	Standard deviation
KS1	93.5	5.27
KS2	94.7	4.45

KS3	94.3	6.10
KS4	93.2	8.85

RESULTS

Research Question 1: *What individual and environmental factors contribute to the identification of SEN/ALN?*

Table 15 shows the variables that were significant predictors of SEN over time.

Table 15 Model to predict SEN

Covariate	Category	Odds Ratio (OR)	Standard Error	p	95% CI	
Average attendance	(continuous)	0.92	0	<0.01	0.92	0.92
Free school meal	(continuous)	1.01	0.1	<0.01	1.01	1.01
Gender	Male (ref)					
	Female	0.18	0	<0.01	0.17	0.18
Ethnicity	White (ref)					
	Asian	0.39	0.03	<0.01	0.34	0.46
	Black	0.55	0.08	<0.01	0.41	0.73
	Mixed	0.6	0.04	<0.01	0.52	0.68
	Other	0.52	0.07	<0.01	0.41	0.67
	Unknown	1.02	0.16	0.89	0.75	1.39
Townsend Deprivation level	1 - least deprived (ref)					
	2	1.52	0.06	<0.01	1.41	1.64
	3	2.05	0.08	<0.01	1.91	2.21
	4	3	0.12	<0.01	2.78	3.25
	5 - most deprived	4.6	0.21	<0.01	4.2	5.03
Health utilisation	Never (ref)					
	Once or twice	1.2	0.02	<0.01	1.16	1.24
	Three or more	1.7	0.03	<0.01	1.65	1.76
Birthweight	Normal birthweight (ref)					
	Extremely low birthweight	2.96	0.57	<0.01	2.03	4.31

Covariate	Category	Odds Ratio (OR)	Standard Error	p	95% CI	
	Very low birthweight	3	0.49	<0.01	2.18	4.14
	Low birthweight	2.22	0.11	<0.01	2	2.45
	High birthweight	0.73	0.03	<0.01	0.68	0.79
	Very high birthweight	0.78	0.06	<0.01	0.67	0.92
Gestational age	Term (ref)					
	Extremely pre-term	3.32	0.85	<0.01	2.01	5.49
	Very pre-term	1.81	0.26	<0.01	1.37	2.4
	Preterm	1.21	0.06	<0.01	1.1	1.33
	Late term	0.95	0.05	0.27	0.86	1.04
Multiple births	No (ref)					
	Yes	1	0.07	0.96	0.87	1.14
Congenital Anomaly	None					
	Minor	2.58	0.38	<0.01	1.93	3.44
	Major	3.09	0.2	<0.01	2.73	3.5
Breastfeeding ever	No (ref)					
	Yes	0.56	0.01	<0.01	0.53	0.58
Month of birth	Autumn (ref)					
	Winter	1.41	0.04	<0.01	1.33	1.49
	Spring	2.01	0.06	<0.01	1.9	2.13
	Summer	2.98	0.09	<0.01	2.82	3.16
Birth cohort	2002/3 (ref)					
	2003/4	0.9	0.03	<0.01	0.84	0.97
	2004/5	0.88	0.03	<0.01	0.82	0.94
	2005/6	0.87	0.03	<0.01	0.81	0.93
	2006/7	0.87	0.03	<0.01	0.81	0.93
	2007/8	0.85	0.03	<0.01	0.79	0.91
Random Part		**Variance**		**S.D.**		
Between school variance within LAs		0.61		0.78		
Between LA variance		0.26		0.51		
Between pupil variance		8.20		2.87		

Covariate	Category	Odds Ratio (OR)	Standard Error	p	95% CI
Between wave variance		0.09		0.30	
Number of schools	1782				
Number of Local authorities	22				
Number of learners	153216				
Number of waves	4				

Table 16 ICCs for SEN within the model

Group	ICC
Between school within LAs	0.05
Between LA variance	0.02
Between pupil variance	0.69
Between wave variance	0.01

The odds of being identified with SEN are explained below. The results are true when controlling for the other variables in the model and holding the random effects value constant (i.e. holding constant the variability between LAs, schools, pupils and waves).

Attendance: A percentage increase in attendance decreased the odds of SEN identification by 8%.

Free school meals (FSM): For every 1% of time spent with FSM, the odds of having SEN increased by 1%. Therefore, someone who had SEN on average for 50% of the time over each key stage, was 64% more likely to be identified with SEN. Someone who had FSM 100% of the time was 2.7 times more likely to be identified with SEN.

Gender: Males were 5.5 times more likely to be identified with SEN compared to females.

Ethnicity: Asian, Black, Mixed and 'Other' ethnicity learners were less likely to be identified with SEN than White learners. Asian learners were 61% less likely to be identified, black learners were 45% less likely, mixed ethnicity learners were 40% less likely, those whose ethnicity was categorised as 'other ethnicity' were 48% less likely to be identified.

Deprivation: As the deprivation score increased, so did the likelihood of being identified with SEN. Those who were born in the most deprived areas were 4.6 time more likely to be identified with SEN than those in the least deprived areas.

Health usage: The odds of being identified with SEN were 20% higher for those who had used health services one or two times in a KS, and 70% higher for those who had used health services three or more times, compared to those who had not used health services in a KS.

Birthweight: Those with a high birthweight or very high birthweight were less likely to be identified with SEN than those with a normal birthweight (27% and 22% respectively). Those

with a low birthweight were 2.2 times more likely to be identified with SEN than those with a normal birthweight, while those with a very low birthweight were 3 times more likely and those with an extremely low birthweight were 2.96 time more likely.

Gestational age: Those who were pre-term, very pre-term or extremely pre-term were increasingly more likely to have SEN than those who were born at term, for example those who were extremely pre-term were 3.3 time more likely to be identified with SEN. Those who were late term were less likely to have SEN than those who were born at term.

Congenital anomaly: Those with either a major or a minor anomaly flag were more 3 times likely to have an identified SEN than those with no anomaly flag.

Breastfeeding: Learners who had experienced breastfeeding were 70% less likely to be identified with a SEN compared to those who had not been breastfed.

Month of Birth: Those who were born in the winter, spring and summer were increasingly more likely to be identified with SEN than those born in the autumn. Specifically, learners born in the summer were nearly 3 times more likely than those born in the autumn to be identified with SEN.

Birth Cohort: Those born in later cohorts were around 10% less likely to be identified with SEN than those in born in 2002/03.

School and Local Authority: As shown in Table 16, the school that the child attended within each local authority explained 4.9% of variance in the model. The local authority that the child attended explained 2.1% of the variance in the model.

Over-time and within person: The wave that the child was in explained 0.07% of variance in the model, meaning that there was little variance over time. The most variance is explained by changes within the child (65%), this means that the child having SEN in a previous KS predicted them having SEN in the following KS.

Key results and implications

Core Finding 1: Nearly 1 in 2 learners in Wales born in 2002/3 were identified with SEN at some point in their education from reception to year 11.

Implication: As the reported statistics indicate that the prevalence of SEN at each key stage ranges from 26% to 37%, there is an assumption that SEN/ALN impacts a relatively small proportion of the population. However, a different reality emerges here: almost half of learners encounter the SEN/ALN system at some point in their educational journey. This challenges the notion that SEN/ALN is an issue affecting only a limited subset of learners. In fact, the impact of SEN extends across a significant portion of the student population, underscoring the broader relevance and importance of addressing SEN-related concerns in educational policy and practice.

Conversely, this also raises the question of whether there was a potential over-identification of SEN in the previous system, prompting an examination of the criteria and procedures used in the SEN identification process. This raises questions about the reliability and consistency of SEN identification methods, calling for a more thorough understanding of the challenges and potential systematic issues within the identification process.

Core Finding 2: Figures 2 and 3 illustrate a dynamic pattern of inconsistency and shifting group affiliations concerning the identification of SEN across the key stages and corresponding changes in the provision allocated to individuals. The visual representation in these figures underscores the fluid nature of SEN identification, highlighting fluctuations in group composition and the corresponding support provided.

Implication: This finding challenges the conventional notion of static SEN identification, shedding light on the dynamic and evolving nature of students' needs over time. This understanding is essential for educators and policymakers as it emphasises the importance of adopting flexible and adaptive strategies to meet the changing requirements of students with SEN.

Moreover, the variability in provision linked to shifts in SEN identification has substantial implications for resource allocation within educational institutions. It suggests that rigid resource allocation frameworks may not effectively cater to the diverse and evolving needs of students.

The research finding also prompts a critical examination of the criteria and procedures used in the SEN identification process. The instability observed raises questions about the reliability and consistency of current identification methods, calling for a more thorough understanding of the challenges and potential systematic issues within the identification process. Addressing these concerns is important in ensuring that professionals are supported in developing their understanding of the diversity of learners.

Furthermore, the fluid nature of SEN identification emphasises the need for a more individualised and nuanced approach to supporting students with diverse needs. Educators must be equipped with the tools and training to adapt their strategies based on the changing landscape of SEN identification. This finding has broader implications for the development and implementation of education policies, urging policymakers to create frameworks that are not only responsive to evolving needs but also inclusive and supportive of the diverse student population. In essence, the research underscores the importance of a dynamic and tailored approach to SEN support within the larger context of education systems.

Core Finding 3: The findings reveal a clustering of SEN within specific demographic groups. Notably, when accounting for individual utilisation of health services, environmental and demographic variables such as FSM, levels of deprivation, school attendance, and season of birth emerge as influential factors shaping the identification of individuals with SEN. This underscores the nuanced interplay of potential biological, socio-economic and environmental elements in determining SEN status, providing a more comprehensive understanding of the multifaceted dynamics associated with SEN identification.

Implication: This result brings attention to the complex interplay of socio-economic and environmental elements in shaping who is identified with SEN and their subsequent educational experiences.

These results emphasise the multifaceted nature of SEN identification processes. They imply that beyond individual characteristics, the context in which a student is situated significantly influences the likelihood of being identified with SEN. This insight can inform more holistic and comprehensive approaches to SEN assessment and support, taking into account the broader socio-economic and environmental factors that might contribute to educational challenges.

In a broader context, this research result underscores the importance of considering social determinants in education. It prompts discussions on equity and fairness within educational systems, urging stakeholders to critically examine how different factors, beyond individual health, contribute to the identification and support of students with SEN. In particular, the results lead us to question whether there is a biological basis for the higher levels of SEN identification in particular demographic groups or whether there may be a disproportionality due to differences including in teachers' expectations and the ability of schools to provide an inclusive education system for these learners (Artiles et al, 2010; Coutinho & Oswald, 2000; Skiba et al, 2008; Waitoller et al, 2010). In Wales, this also raises questions about the current approach to ALN within the Government. From this research it becomes evident that addressing SEN/ALN should not solely fall within the remit of SEN/ALN teams. Consequently, enhancing outcomes for this group of learners requires a comprehensive and cross-departmental approach which also includes examination of poverty, equity and subsequent access to resources and support services.

Additionally, the finding sets the stage for further research inquiries, encouraging a deeper exploration of the specific mechanisms through which environmental variables influence SEN identification.

Core Finding 4: The school that the learner attended accounted for only 5% of the variance in the model.

Implication: This suggests some consistency in how Welsh schools were identifying SEN within the previous system. This may be due to the more consistent school types and funding structure in Wales in comparison to England where 40.7% of schools are multi-academy trusts (FFT Education Datalab, 2023). It will be beneficial to examine this pattern as the new ALN system is implemented, in order to provide insights into potential continuities or changes in the identification process between and within schools.

Core finding 5: Season of birth was a strong, significant predictor of a learner having SEN with those who were younger in the academic year (i.e. born in spring or summer) being significantly more likely to have SEN than those who were older in the academic year (i.e. born in autumn or winter).

Implication: The observed pattern aligns with findings from other research studies investigating SEN. Research by Anders et al. (2011), Crawford, Dearden & Greaves (2004), and

Zoega, Valdimarsdóttir and Hernández-Díaz (2012) has similarly identified a correlation between being younger in the academic year and an increased likelihood of having SEN.

Importantly, the absence of a neurobiological explanation for this association suggests that the link between age and SEN is likely influenced by social and demographic factors rather than inherent developmental differences. This raises questions about the labelling process and how external factors may play a role in the identification of SEN.

One plausible explanation for the higher likelihood of SEN identification among younger individuals in the academic year is rooted in social and academic expectations. It's conceivable that being younger may lead to developmental differences that manifest as underperformance when compared to older peers. This underperformance might then trigger a closer scrutiny of the individual's learning abilities, potentially prompting educators and professionals to seek SEN identification as a means of providing additional support.

In essence, the association between being younger in the year and SEN identification could be a reflection of the educational system's response to age-related developmental variations. The social and academic expectations within a given grade level may inadvertently contribute to the identification of learning challenges, possibly leading to a higher incidence of SEN labels for younger learners.

This interpretation emphasises the need for a nuanced understanding of the factors influencing SEN identification. It suggests that interventions and support structures should not only focus on individual cognitive or developmental factors but also consider the impact of age-related expectations and potential disparities in performance within a given age cohort.

Core Finding 6: There was a strong association between attendance and SEN whereby a decrease in attendance led to an increased likelihood of being identified with SEN.

Implication: Further research is needed to understand the direction of this relationship. Sprick, Bouck, Berg, and Coughlin (2020) propose that attendance should factor into identifying SEN because learning difficulties might stem from insufficient instruction. However, it is possible that learners with SEN are less inclined to attend school due to their learning needs. In both the former and current SEN/ALN system in Wales, SEN/ALN is identified if a learner does not respond to intervention for their learning needs (Welsh Government, 2021). However, if a learner is frequently absent, the opportunity for intervention decreases. It is unclear how this impacts the identification process. Given the current policy emphasis on attendance (Welsh Government, 2023), comprehending the direction of its relationship with with SEN is important for informing and guiding this policy direction.

Research Question 2: *How does being identified with SEN/ALN influence learners' academic outcomes in mainstream schools?*

Table 17 shows the variables that were significant predictors of attainment. If the learner met the expected levels at English/Welsh and Maths at KS1, 2 and 3 they were coded as 'met national expectation'. At KS4, if they had 5 or more GCSEs at A* to C grade (including English, Cymraeg (Welsh) and Maths) they were coded as 'met national expectation'.

Table 17 Model to predict attainment.

Covariate	**Category**	**Estimate (B)**	**Standard Error**	**p**	**95% CI**	
SEN	(continuous)	0.96	0	<0.01	0.96	0.96
Average attendance	(continuous)	1.09	0	<0.01	1.09	1.09
Free school meal	(continuous)	0.99	0.01	<0.01	0.99	0.99
Gender	Male (ref)					
	Female	1.45	0.03	<0.01	1.4	1.5
Ethnicity	White (ref)					
	Asian	1.16	0.09	0.05	1	1.34
	Black	1.01	0.13	0.91	0.79	1.31
	Mixed	1.08	0.07	0.21	0.96	1.21
	Other	1.28	0.15	0.04	1.02	1.62
	Unknown	0.91	0.12	0.51	0.7	1.19
Townsend Deprivation level	1 - least deprived (ref)					
	2	0.84	0.03	<0.01	0.78	0.91
	3	0.69	0.02	<0.01	0.64	0.74
	4	0.6	0.02	<0.01	0.56	0.64
	5 - most deprived	0.52	0.02	<0.01	0.48	0.56
Health utilisation	Never (ref)					
	Once or twice	0.92	0.02	<0.01	0.89	0.96
	Three or more	0.91	0.02	<0.01	0.88	0.95
Birth weight	Normal birthweight (ref)					
	Extremely low birthweight	0.48	0.07	<0.01	0.36	0.65

Covariate	Category	Estimate (B)	Standard Error	p	95% CI	
	Very low birthweight	0.42	0.05	<0.01	0.33	0.53
	Low birthweight	0.63	0.03	<0.01	0.58	0.68
	High birthweight	1.25	0.04	<0.01	1.17	1.33
	Very high birthweight	1.12	0.08	0.11	0.97	1.29
Gestational age	Term (ref)					
	Extremely pre-term	1.11	0.22	0.6	0.75	1.63
	Very pre-term	1.21	0.14	0.08	0.98	1.51
	Preterm	1.06	0.04	0.14	0.98	1.15
	Late term	0.99	0.04	0.78	0.91	1.08
Multiple births	No (ref)					
	Yes	1.18	0.07	<0.01	1.05	1.32
Congenital Anomaly	None					
	Minor	0.71	0.08	<0.01	0.56	0.88
	Major	0.77	0.04	<0.01	0.7	0.85
Breastfeeding ever	No (ref)					
	Yes	1.43	0.03	<0.01	1.37	1.48
Month of birth	Autumn					
	Winter	0.79	0.02	<0.01	0.75	0.83
	Spring	0.65	0.02	<0.01	0.62	0.68
	Summer	0.54	0.01	<0.01	0.51	0.57
Birth cohort	2002/3 (ref)					
	2003/4	1.18	0.04	<0.01	1.1	1.25
	2004/5	0.71	0.02	<0.01	0.66	0.75
	2005/6	0.84	0.03	<0.01	0.79	0.9
	2006/7	0.94	0.03	0.08	0.88	1.01
	2007/8	1.02	0.03	0.65	0.95	1.08
Random Part		Variance		S.D.		
Between school variance within LAs		0.39		0.63		

Covariate	Category	Estimate (B)	Standard Error	p	95% CI
Between LA variance		0.04		0.19	
Between pupil variance		2.26		1.50	
Between wave variance		3.93		1.98	
Number of schools	1776				
Number of Local authorities	22				
Number of learners	152168				
Number of waves	4				

Table 18 ICCs for attainment within the model

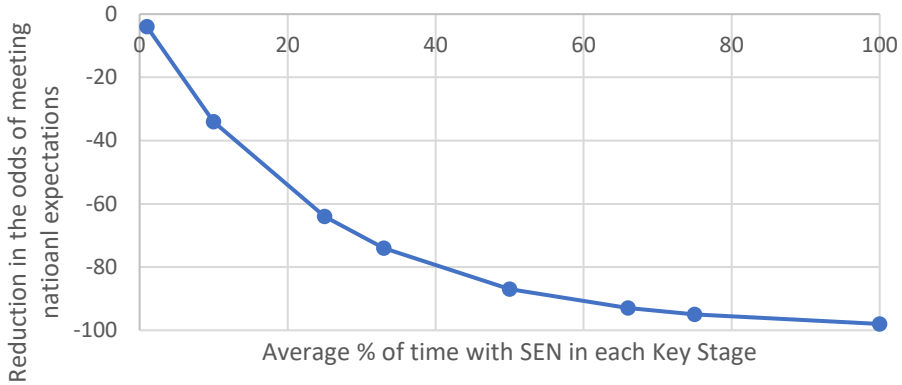
Group	ICC
Between school within LAs	0.05
Between LA variance	<0.01
Between pupil variance	0.21
Between wave variance	0.37

For every 1% of time spent with SEN, the odds of meeting the national expectation decreased by 4%.

Using this odds ratio, we can understand the influence of having SEN on attainment for different proportions of time when holding the other covariates in the model constant and the random effect value constant (i.e. holding constant the variability between LAs, Schools, pupils and waves). Figure 4 shows the influence of length of time with SEN identification on the decrease in odds. These can be interpreted as:

- A learner who spent an average of 1% of time with SEN in each KS had 4% decreased odds of meeting the national expectations.
- A learner who spent an average of 25% of time with SEN in each KS had 64% decreased odds of meeting the national expectations.
- A learner who spent an average of 50% of time with SEN in each KS had 87% decreased odds of meeting the national expectations.
- A learner who spent an average of 75% of time with SEN in each KS had 95% decreased odds of meeting the national expectations.
- A learner who spent an average of 100% of time with SEN in each KS had 98% decreased odds of meeting the national expectations.

Figure 4: Impact of average time spent identified with SEN in each Key Stage on the odds of meeting national expectations



Key results and implications

Core finding:

When accounting for sociodemographic and health factors, as the amount of time that a learner spends with SEN increases, there is a corresponding decrease in the likelihood of their achieving the nationally expected educational outcomes. This was stronger than any other in the model, for example, the influence of SEN on attainment was four times the strength of FSM on attainment. This underscores the substantial influence of SEN on academic attainment.

Implications:

This demonstrates the critical role of SEN in shaping academic attainment. The fact that SEN emerges as the most influential predictor of attainment suggests that addressing the challenges associated with SEN is paramount for improving educational outcomes. This is particularly important given that nearly half of the population born in 2002/3 were identified with SEN at some point in during their education. The significance of this result is heightened by the fact that it maintains its influence even after accounting for sociodemographic and health factors. This emphasises its substantial contribution to educational outcomes over time and highlights that the education system was not able to mitigate the negative impacts of SEN on learning outcomes.

Research Question 3: *How do a learner's educational outcomes differ by the type of need that is identified (i.e. ADHD, dyslexia, autism or BESD)?*

In order to answer this question, we first explored the predictors of each specific need, before looking at the influence on academic outcomes. Due to the small numbers of learners identified with a key need in certain key stages, Poisson models were used. Table 19 shows the variables that were significant predictors of each identified need over time in all four key stages.

Table 19 Model to predict ADHD, dyslexia, autism and BESD

		ADHD			Dyslexia			Autism			BESD		
Covariate	**Category**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**
Average attendance	(continuous)	0.98	0.01	<0.01	1.00	0	0.51	0.98	0	<0.01	0.97	0	<0.01
Free school meal	(continuous)	1.00	0.15	0.01	1.00	0.07	0.49	1.00	0.09	0.3	1.01	0.05	<0.01
Gender	Male (ref)												
	Female	0.25	0.04	<0.01	0.65	0.04	<0.01	0.27	0.03	<0.01	0.35	0.01	<0.01
Ethnicity	White (ref)												
	Asian	0.24	0.21	0.11	0.27	0.11	<0.01	0.45	0.24	0.13	0.48	0.04	<0.01
	Black	0.1	0.27	0.39	0.31	0.25	0.14	0.82	0.66	0.81	1.16	0.16	0.28
	Mixed	0.5	0.3	0.25	0.71	0.17	0.16	0.86	0.31	0.69	0.88	0.06	0.07
	Other	0.25	0.39	0.37	0.54	0.28	0.23	0.67	0.5	0.59	0.55	0.08	<0.01
	Unknown	0.83	0.93	0.87	1.47	0.59	0.33	1.15	0.83	0.85	1.01	0.17	0.94
Townsend Deprivation level	1 (least deprived) (ref)												
	2	1.53	0.48	0.18	1.38	0.16	0.01	1.25	0.24	0.26	1.32	0.06	<0.01
	3	1.83	0.53	0.04	1.24	0.14	0.05	1.34	0.24	0.1	1.66	0.07	<0.01
	4	2.17	0.63	0.01	1.16	0.13	0.19	1.43	0.27	0.05	2.02	0.08	<0.01
	5 (most deprived)	2.87	0.88	<0.01	1.24	0.16	0.1	1.25	0.27	0.3	2.69	0.12	<0.01
Health utilisation	Never (ref)												
	Once or twice	1.12	0.13	0.31	1.06	0.04	0.14	1.16	0.07	0.01	1.17	0.03	<0.01
	Three or more	1.81	0.18	<0.01	1.06	0.04	0.13	1.45	0.08	<0.01	1.48	0.03	<0.01

		ADHD			Dyslexia			Autism			BESD		
Covariate	**Category**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**
Birth weight	Normal birthweight (ref)												
	Extremely low birthweight	1.25	1.37	0.84	1.14	0.68	0.83	0.86	0.87	0.88	1.29	0.25	0.19
	Very low birthweight	1.23	1.16	0.82	1.58	0.74	0.33	0.87	0.75	0.87	1.4	0.23	0.04
	Low birthweight	1.41	0.44	0.27	1.2	0.19	0.24	1.29	0.32	0.31	1.27	0.07	<0.01
	High birthweight	0.79	0.2	0.36	0.99	0.11	0.95	1.1	0.18	0.56	0.88	0.03	<0.01
	Very high birthweight	0.86	0.47	0.78	1.06	0.25	0.82	1.2	0.42	0.6	0.91	0.08	0.24
Gestational age	Term (ref)												
	Extremely pre-term	2.02	2.5	0.57	0.64	0.58	0.62	1.77	1.98	0.61	0.96	0.25	0.88
	Very pre-term	1.26	0.98	0.76	0.93	0.4	0.88	0.96	0.66	0.95	0.88	0.13	0.39
	Preterm	0.96	0.31	0.91	1.04	0.16	0.78	0.95	0.24	0.83	1	0.05	0.97
	Late term	0.83	0.31	0.63	0.83	0.14	0.28	0.97	0.24	0.9	1.03	0.05	0.51
Multiple births	No (ref)												
	Yes	0.65	0.34	0.41	0.94	0.2	0.79	0.93	0.33	0.84	0.9	0.07	0.17
Congenital Anomaly	None												
	Minor	1.07	0.92	0.94	0.97	0.45	0.95	1.2	0.77	0.77	0.98	0.15	0.91
	Major	0.89	0.36	0.77	0.93	0.19	0.73	1.29	0.35	0.35	0.89	0.06	0.09
Breastfeeding ever	No (ref)												
	Yes	0.95	0.14	0.72	1.06	0.07	0.35	1.11	0.12	0.33	0.84	0.02	<0.01
	Autumn												

		ADHD			Dyslexia			Autism			BESD		
Covariate	**Category**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**	**Incidence Rate Ratio (IRR)**	**Standard Error**	**p**
Month of birth	Winter	1.05	0.22	0.8	1.05	0.1	0.59	1.05	0.16	0.72	1.01	0.03	0.69
	Spring	1.19	0.24	0.38	1.1	0.1	0.28	1.03	0.15	0.86	1.11	0.03	<0.01
	Summer	1.27	0.25	0.22	1.25	0.11	0.01	1.06	0.15	0.68	1.19	0.04	<0.01
Birth cohort	2002/3 (ref)												
	2003/4	1.4	0.32	0.14	1.1	0.11	0.36	1.18	0.21	0.33	1.1	0.04	0.01
	2004/5	1.59	0.35	0.04	1.04	0.1	0.71	1.32	0.22	0.1	1.17	0.04	<0.01
	2005/6	2.18	0.54	<0.01	1.32	0.15	0.01	1.63	0.31	0.01	1.27	0.05	<0.01
	2006/7	2.2	0.54	<0.01	1.11	0.13	0.36	1.92	0.34	<0.01	1.36	0.05	<0.01
	2007/8	2.18	0.53	<0.01	1.08	0.12	0.48	2.04	0.35	<0.01	1.48	0.06	<0.01
Wave	4 (ref)	-	-	-	-	-	-	-	-	-			
	1	-	-	-	-	-	-	-	-	-	1.7	0.03	<0.01
	2	-	-	-	-	-	-	-	-	-	2.12	0.04	<0.01
	3	-	-	-	-	-	-	-	-	-	2.33	0.08	<0.01
Number of schools	1782												
Number of learners	153216												
Number of waves	4												

Table 20 ICCs in ADHD, Dyslexia, autism and BESD models

	ADHD	**Dyslexia**	**Autism**	**BESD**
	ICC	**ICC**	**ICC**	**ICC**
Between school	-	0.002	-	-
Between pupil variance	0.88	0.85	0.88	0.44
Between wave variance	<0.01	<0.01	<0.01	-

The rates of being identified with each are explained below. The results are true when controlling for the other variables in the model and holding the random effects value constant (i.e. holding constant the variability between schools, pupils and waves).

Attendance: Attendance was a significant predictor of the identification of ADHD, autism and BESD. For ADHD and autism, a 1% increase in attendance is associated with a 2% decrease in the rate of identification. For BESD, a 1% increase in attendance is associated with a 3% decrease in identification. There was no impact of attendance on dyslexia identification.

Free school meals: FSM is a significant predictor of the identification of ADHD and BESD. A 1% increase in the time spent with FSM on average in each KS increases the rate of ADHD identification by 0.4%. The effect was larger for BESD whereby a 1% increase in the time spent with FSM increased the rate of BESD identification by 1%. There was no impact of FSM on dyslexia or autism.

Gender: Across all the needs, males had a significantly higher rate of identification than females. This was most pronounced for ADHD, with which males were 4 times more likely than females to be identified.

Ethnicity: Asian learners had a 73% lower rate of dyslexia identification and 52% lower rate of BESD identification than white learners. Those categorised as having 'other ethnicity' were 45% less likely to be identified with BESD than white learners.

Townsend Deprivation level: Neighbourhood deprivation at birth was a significant predictor of the identification of ADHD and BESD. The rate of identification of ADHD in the most deprived area neighbourhood was 2.87 times the rate of identification in the least deprived neighbourhood. Likewise, the rate of BESD identification in the most deprived neighbourhood was 2.29 times the rate of identification in the least deprived neighbourhood. The rate of those identified with dyslexia was significantly higher in the 2nd and 3rd least deprived areas while the rate of ASD identification was significantly higher in the 2nd most deprived area.

Health utilisation: Health utilisation was a significant predictor of the rate of ADHD, autism and BESD identification. Those who had accessed health care three or more times in each key stage had an 81% higher rate of ADHD identification, a 45% higher rate of autism identification and a 48% higher rate of BESD identification.

Birthweight: The only need which was impacted by birthweight was BESD where those with a high birthweight had a 12% lower rate of BESD identification and those with a low birthweight had a 27% higher rate of BESD identification.

Gestational age: There was no impact of gestational age on the identification of any of the needs.

Congenital Anomaly: There was no impact of congenital anomalies on the identification of any of the needs.

Breastfeeding: Whether the child experienced breastfeeding was a significant predictor of identification of BESD. Those who had experienced breastfeeding had a 16% lower rate of BESD identification.

Month of birth: Having a summer birthday meant that learners had a 25% higher rate of dyslexia identification than those with an autumn birthday. Those with a spring birthday had a 11% higher rate of BESD identification and with a summer birthday a 19% higher rate of BESD identification than those with an autumn birthday.

Birth cohort: The birth cohort that the learner was in influenced the rate of identification of each need apart from dyslexia. This effect was strongest for ADHD where those born in 2007/8 and 2006/7 had over twice (2.2 and 2.18 times respectively) the rate of ADHD identification than those born in 2002/3. The rate of autism identification was 2.4 times higher for those born in 2007/8 than those born in 2002/3. BESD identification had a gradual significant increase of identification with those born in 2007/8 with a 48% higher rate of identification than those born in 2002/3. This differs from the general SEN model which shows a decrease in the likelihood of identification among the more recent birth cohorts.

Key results and implications

Due the limited statistical power in some models, we report these findings **with medium confidence.**

Core Finding: Unlike the general SEN model, which saw a gradual decrease in SEN identification over time, there was an increase in the rates of identification of ADHD, autism and BESD for those born in the later cohorts.

Implication: While this may indicate an increased prevalence of these needs, it also suggests evolving societal awareness, diagnostic criteria, and/or environmental factors. This should prompt examination of the diagnostic processes around these needs, taking into account their interaction with other significant indicators such as sociodemographic factors.

Core finding: Boys had a significantly higher rate of identification across all needs, compared to girls.

Implication: As is shown in other research (Arnett et al., 2017), boys are more likely to be identified with all SEN than girls. Research has argued that this observed gender disparity may be influenced by girls' tendency to mask their SEN and thus their decreased likelihood of coming to the attention of teachers (Corscadden & Casserly, 2021; Platt, 2011). If girls are indeed less likely to be identified due to masking, there is a risk of delayed or inadequate support for their specific needs. Educators need to be aware of this potential bias and develop strategies that account for gender-specific differences in the manifestation of educational needs. Recognition of this can help ensure that both boys and girls receive appropriate support based on their unique challenges.

Core finding: Health and birth indicators are weaker predictors of specific needs (ADHD, dyslexia, autism and BESD) compared to their predictive power for identifying overall SEN.

Implication: ADHD, dyslexia and autism are identified in the absence of health-related indicators, suggesting that they may genuinely stem from learning differences rather than being attributable to birth abnormalities or health-related factors. On the other hand, in cases where there are no birth or health-related conditions present, there may be a tendency to seek a specific label rather than a broader identification of learning needs. In order to fully understand this, qualitative research is needed to understand the processes and decision making behind SEN identification and labelling of particular needs.

Core finding: Dyslexia and autism are less influenced by measures of deprivation than BESD and ADHD.

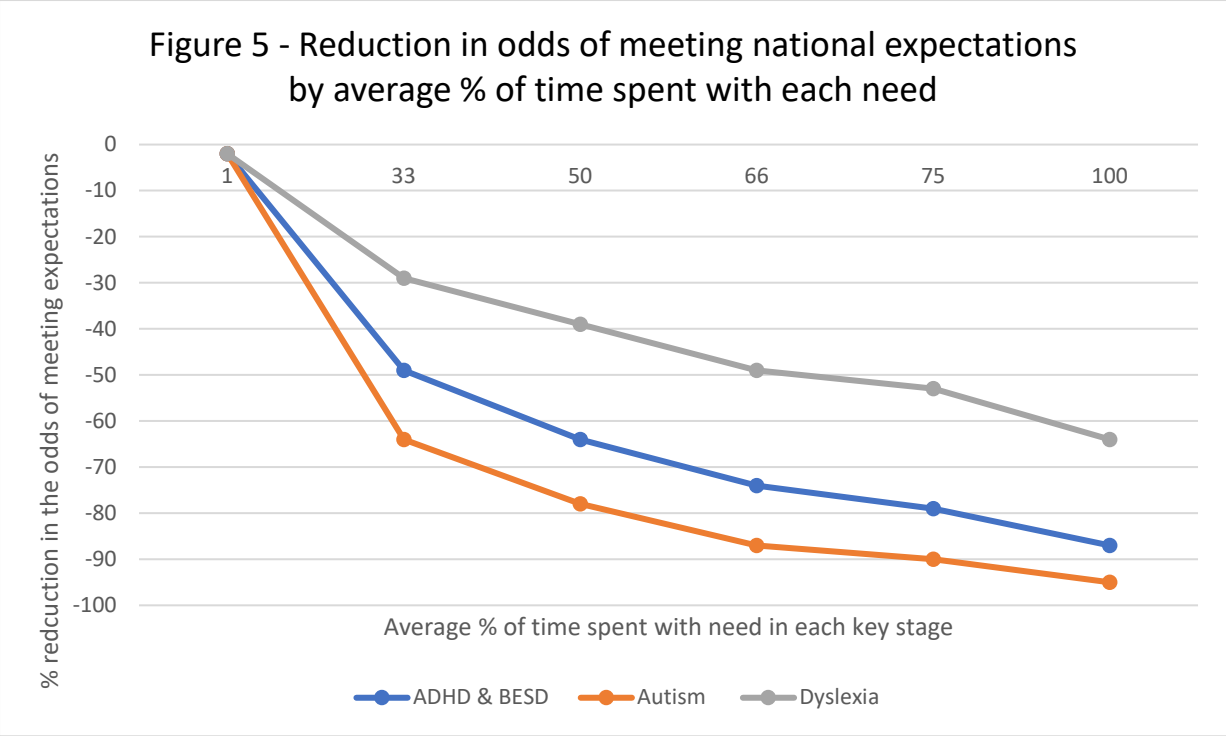
Implication: Understanding the heightened influence of socioeconomic factors on ADHD and BESD suggests the need for comprehensive strategies that address not only the learning, behavioural and emotional aspects of these needs but also the social and economic challenges that students from disadvantaged backgrounds may face. It also raises the question of whether the ADHD and BESD labels are more likely to be assigned to learners from less advantaged sociodemographic groups, while alternative labels, like dyslexia or

autism, might be disproportionally assigned to individuals who do not come from more deprived backgrounds. This highlights potential socioeconomic bias in the labelling and a need for further research to fully understand these patterns.

In Table 21, we only present the associations of each need with attainment due to covariates (i.e. health and sociodemographic variables) showing the same direction to those in the attainment model in Table 17.

Table 21 Model for attainment with ADHD, Dyslexia, autism and BESD

		Model											
		ADHD			**Dyslexia**			**Autism**			**BESD**		
Covariate	**Category**	**Odds ratio**	**Standard Error**	**p**	**Odds ratio**	**Standard Error**	**p**	**Odds ratio**	**Standard Error**	**p**	**Odds ratio**	**Standard Error**	**p**
Identified Need	No ADHD (ref)	-	-	-	-	-	-	-	-	-	-	-	-
	ADHD	0.98	0.13	<0.01	-	-	-	-	-	-	-	-	-
	No dyslexia (ref)	-	-	-	-	-	-	-	-	-	-	-	-
	Dyslexia	-	-	-	0.99	0.07	<0.01	-	-	-	-	-	-
	No autism	-	-	-	-	-	-	-	-	-	-	-	-
	Autism	-	-	-	-	-	-	0.97	0.10	<0.01	-	-	-
	No BESD	-	-	-	-	-	-	-	-	-	-	-	-
	BESD	-	-	-	-	-	-	-	-	-	0.98	0.05	<0.01



When holding the other covariates in the model constant and the random effect value constant (i.e. holding constant the variability between LAs, Schools, pupils, and waves), Figure 5 shows the reduction in the odds of meeting the national expectations as the average time spent with each need increased. The reduction for ADHD and BESD was the same. The reduction in the odds of meeting national expectations was least pronounced for dyslexia; however, it was still highly significant. The relationship was most pronounced for Autism.

Key results and implications

Core finding:

Different needs have differing influence on attainment. From the results, dyslexia has the lowest influence on attainment, although every 1% of time spent with dyslexia was associated with a 1% decrease in the odds of meeting the national expectations. Autism had the biggest influence on attainment with a 3% reduction in the odds of attaining for 1% spent with autism. It is noteworthy that all four of these needs have a lower level of impact on attainment than the overall SEN group explored in RQ2 (a 4% reduction for every 1% of time spent with SEN). Hence, it is likely that other needs identified as SEN have a substantially larger impact on attainment than the key needs chosen for this analysis.

Implication:

Further awareness is needed as to how different identified needs impact attainment. While dyslexia is categorised as a cognition and learning need, it has less influence on attainment than autism (which is typically categorised as a communication and interaction need), ADHD and BESD (which are typically categorised and social, emotional and mental health needs). Practitioners should recognise the varying impacts of different needs on academic achievement and should be knowledgeable about employing differentiated approaches to effectively support learners with diverse needs. This may involve implementing early interventions, providing ongoing support, and fostering a more inclusive and accommodating learning environment.

Research Question 4: *How does the age of SEN/ALN identification impact educational outcomes?*

Table 22 shows the relationship between the independent variables and SEN, along with the relationship between the covariates and attainment.

Table 22 Model for Stage of identification

Covariate	Category	Odds Ratio	Standard Error	p	95% CI	
SEN identification	Never identified (ref)					
	Identified in KS1	0.01	0	<0.01	0.01	0.01
	Identified in KS2	0.03	0	<0.01	0.03	0.04
	Identified in KS3	0.14	0.01	<0.01	0.12	0.16
	Identified in KS4	0.13	0.02	<0.01	0.09	0.18
Average attendance	(continuous)	1.11	0	<0.01	1.10	1.11
Free school meal	(continuous)	0.99	0.01	<0.01	0.99	0.99
Gender	Male (ref)					
	Female	1.36	0.03	<0.01	1.3	1.43
Ethnicity	White (ref)					
	Asian	1.32	0.13	0.01	1.09	1.61
	Black	1.06	0.19	0.76	0.75	1.5
	Mixed	1.12	0.09	0.18	0.95	1.31
	Other	1.42	0.23	0.03	1.03	1.96
	Unknown	0.8	0.15	0.23	0.56	1.15
Townsend Deprivation level	1 - least deprived (ref)					
	2	0.81	0.04	<0.01	0.74	0.89
	3	0.65	0.03	<0.01	0.60	0.71
	4	0.56	0.03	<0.01	0.51	0.62
	5 - most deprived	0.47	0.03	<0.01	0.42	0.52
Health utilisation	Never (ref)					
	Once or twice	0.9	0.02	<0.01	0.86	0.94
	Three or more	0.82	0.02	<0.01	0.79	0.86
Birth weight	Normal birthweight (ref)					
	Extremely low birthweight	0.43	0.09	<0.01	0.29	0.63
	High birthweight	1.27	0.05	<0.01	1.17	1.39
	Low birthweight	0.57	0.03	<0.01	0.51	0.63
	Very high birthweight	1.07	0.1	0.47	0.89	1.29
	Very low birthweight	0.37	0.06	<0.01	0.27	0.5
Gestational age	Term (ref)					
	Extremely pre-term	1.05	0.27	0.84	0.64	1.74

Covariate	Category	Odds Ratio	Standard Error	p	95% CI	
	Late term	1	0.06	0.97	0.89	1.12
	Preterm	1.06	0.06	0.28	0.95	1.18
	Very pre-term	1.21	0.18	0.19	0.91	1.61
Multiple births	No (ref)					
	Yes	1.28	0.10	<0.01	1.10	1.48
Congenital Anomaly	None					
	Minor	0.53	0.08	<0.01	0.39	0.71
	Major	0.64	0.04	<0.01	0.57	0.73
Breastfeeding ever	No (ref)					
	Yes	1.43	0.04	<0.01	1.37	1.51
Month of birth	Autumn					
	Winter	0.79	0.03	<0.01	0.74	0.85
	Spring	0.66	0.02	<0.01	0.62	0.70
	Summer	0.55	0.02	<0.01	0.52	0.59
Birth cohort	2002/3 (ref)					
	2003/4	1.32	0.06	<0.01	1.21	1.44
	2004/5	0.71	0.03	<0.01	0.66	0.78
	2005/6	0.85	0.04	<0.01	0.78	0.93
	2006/7	0.97	0.04	<0.01	0.89	1.06
	2007/8	1.04	0.05	<0.01	0.95	1.13
Random Part		**Variance**	**S.D.**			
Between school variance within LAs		0.53	0.73			
Between LA variance		0.09	0.30			
Between pupil variance		4.99	2.23			
Between wave variance		4.81	2.19			
Number of schools	1774					
Number of Local authorities	22					
Number of learners	145927					
Number of waves	4					

Table 23 ICCs for attainment within the model

Group	ICC
Between school within LAs	0.04
Between LA variance	<0.01
Between pupil variance	0.37
Between wave variance	0.35

This demonstrates that being identified as having SEN during KS1 has a more significant detrimental influence on academic achievement over time compared to those identified in later stages (KS2, KS3, and KS4). A student identified with SEN during KS1 experienced a 99% decrease in the odds of meeting national expectations compared to a student without SEN. This negative impact lessens as the age of identification increases: a student identified in KS2 experiences a 97% reduction in the odds of meeting national expectations, in KS3 an 86% reduction, and in KS4 an 87% reduction.

Key results and implications

Core finding: The earlier the learner was first identified with SEN, the more negative the influence on their attainment.

Implications: This finding suggests that access to SEN provision for a longer period does not mitigate the negative impact of a SEN on academic outcomes. This suggests a challenge in providing sustained and effective support to learners with SEN, demanding a closer examination of the existing support structures and strategies to better meet the evolving needs of these students over time.

FINAL CONCLUSIONS AND RECOMMENDATIONS

The results present the following key conclusions for each research question:

RQ1: ***What individual and environmental factors contribute to the identification of SEN/ALN?***

The following factors influenced the likelihood of identification with SEN/ALN:

Health: Higher health usage, lower birth weight, lower gestational age, and congenital anomalies.
Individual: Lower attendance, not experiencing breastfeeding (a complex proxy related to parenting and health literacy), being white, being male, being younger in the school year, being in an earlier birth cohort.
Environmental: Having free school meals, higher levels of deprivation.

We also found that nearly half of learners in the 2002/3 birth cohort were identified with SEN at some point during their education. This is due to a dynamic picture of SEN for these learners whereby many learners were moving in and out of the SEN category over time.

RQ2: ***How does being identified with SEN/ALN influence learners' academic progression in mainstream schools?***

We found that being identified with SEN was the most influential predictor of whether a learner met national expectations for attainment in each key stage. A 1% increase in the proportion of time spent with SEN decreased the odds of attaining the national expectations by 4%. This demonstrates the critical role of SEN in shaping academic attainment.

RQ3: ***How does a learner's academic trajectory differ by the type of need that is identified?***

Dyslexia had the lowest impact on attainment, although it was still significant. Autism had the most significant influence on academic achievement, followed by BESD and then ADHD. However, overall SEN had the largest impact on attainment (RQ2). This may be because other needs which are included as 'SEN' but were unexplored within this research had a larger impact on attainment.

Interestingly, rates of identification of ADHD, autism, and BESD were higher among recent birth cohorts than among learners born in 2002/3, likely indicating a change in identification practices of these specific needs over time. This differs from overall SEN, which showed lower rates of identification among the more recent birth cohorts.

RQ4: ***How does the age of SEN/ALN identification influence academic outcomes?***

Individuals first identified with SEN in KS1 exhibit a more substantial and enduring negative relationship with their academic attainment over time, in contrast to those identified in KS2, KS3, and KS4. Although all identification significantly impacts attainment (RQ2), learners first identified in KS3 demonstrate a slightly lesser impact on attainment compared to those first

identified in KS1, 2, and 4. Nevertheless, the overarching trend emphasises that the earlier a learner first is identified with SEN, the more pronounced and lasting the negative influence on their academic achievement.

Overall conclusions

The research findings highlight a clustering of SEN/ALN within specific demographic groups in Wales. This clustering pattern suggests that certain socio-economic and environmental factors, which are unrelated to biological or health related indicators, contribute to a higher level of SEN/ALN identification within distinct groups of the population. The identification of these demographic clusters is crucial for understanding the nuanced dynamics associated with SEN/ALN identification, as it provides insight into the broader societal and contextual influences that may contribute to the manifestation of learning needs.

Moreover, the research reveals a substantial and persistently negative impact of SEN/ALN on academic attainment. Even when accounting for health and socio-economic factors that predict the identification of SEN/ALN, the negative relationship with attainment remains pronounced. This suggests that the challenges associated with SEN/ALN extend beyond individual health or economic circumstances and are deeply ingrained in the educational experiences of those identified with such needs.

In the context of the emerging major education system-level reforms in Wales (including the start of the new Curriculum for Wales, phasing in from September 2022 onwards), the results provide a baseline from which to view the effectiveness of the new ALN policy. It is clear that the policy is already having an impact on who is identified with ALN; the number of pupils in schools identified as having ALN decreased by more than 20% between 2020/21 and 2022/23, coinciding with the start of the new ALN system (StatsWales, 2023). Therefore, there are approximately 34,0000 fewer learners accessing the support available through the ALN system. It is vital to understand the demographics of those who were previously identified with SEN who are no longer identified, along with the group of learners who continue to be identified with ALN. This insight is crucial both during the initial implementation of the new system and for ongoing evaluation of the system in the future. Furthermore, it will now be possible to explore if there is a beneficial or negative impact of being removed from the SEN/ALN system on academic attainment.

Limitations:

Despite the population level data used for this analysis, we acknowledge a number of limitations within the research which are important to consider when interpreting the results.

- Due to the considerable number of learners identified with SEN/ALN at various stages of their education, it was not possible to establish a non-SEN comparison group with matched characteristics. Consequently, the presented attainment models compare individuals with SEN to those without SEN. The significance of our results could have been enhanced if we had compared individuals with SEN to a group possessing similar characteristics but without identified SEN. This approach would have provided a more

nuanced understanding of the impact of SEN by minimising potential confounding factors and offering a more meaningful basis for comparison.

- There are small numbers of learners with ADHD, dyslexia and autism. Therefore, these models lack the power to be able to draw conclusions with a high level of confidence. However, as the models show that the number of learners with these needs is increasing it is likely that this analysis will be possible with future birth cohorts.
- Due to the data available the research can only explore the relationship between SEN and academic attainment. However, it is important to acknowledge that aspects other than attainment are important in assessing the effectiveness of education such as overall well-being, student belonging, and future destinations.

Wider recommendations for policy and practice:

Based on the findings from the research we propose the following recommendations:

- **Inclusive educational policies:** Develop, implement and meaningfully evaluate inclusive educational policies that prioritise diversity and thus reduce the need for identification of SEN/ALN which is currently clustered in particular sociodemographic groups. This includes creating frameworks that recognise and celebrate the varied socio-economic and environmental factors influencing learning, ensuring an inclusive approach to education for all.
- **More effective cross-government policymaking**: Considering that 47% of learners in Wales encountered the SEN/ALN system during their educational journey and the evident correlations with measures of deprivation among this demographic, it becomes evident that addressing SEN/ALN should not solely fall within the remit of ALN teams within the government and externally. Consequently, enhancing inclusion with the goal of improving attainment requires a comprehensive and cross-departmental approach. To effectively raise attainment levels, prioritising inclusion should be a central objective across the entire educational landscape in Wales, transcending specific teams to create a cohesive, collaborative effort that addresses the multifaceted challenges associated with SEN/ALN.
- **Educational practitioner professional development:** There should be a renewed focus on supporting teachers and other educational practitioners to work with learners with diverse needs in inclusive learning environments. This clearly aligns to the Welsh Government's aspirations as defined in national policy, as well as their national approach to professional learning and National Professional Learning Entitlement.
- **Review of ALN identification and support processes:** Examination and evaluation of the current methods used to identify ALN, with a focus on ensuring accuracy, fairness, and inclusivity. Furthermore, given the impact of socioeconomic status, season of birth and gender the results suggests that interventions and support structures should not only focus on individual cognitive or developmental factors but also consider the impact of sociodemographic, gender and age-related expectations.
- **Review national expectation criteria and assessment processes**: The research shows that learners with SEN were significantly less likely to meet the national expectations at each key stage. Therefore, a review of whether national expectations are effective ways of measuring attainment is required. As the assessment system meant that

students with SEN were not meeting the national expectations, strategies should be explored to adapt and refine assessment practices to be more inclusive, taking into account various learning strengths, and needs. Consider incorporating flexible assessment formats, personalised approaches, and accommodations to create an environment where learners with diverse needs feel supported and empowered to succeed. This is certainly possible in Wales with the emerging curriculum and qualifications reforms.

Recommendations for research:

- **Replication of current research:** This research should be repeated following the full implementation of the new ALN system in Wales to better understand its impact and effectiveness.
- **Qualitative follow-up research:** Follow-up qualitative research should be conducted to further understand and explain the patterns observed within the data. In particular, qualitative research can provide a more thorough understanding of the challenges and potential systematic issues with identification of SEN/ALN.
- **Integration with existing national cohort studies:** Follow-up research which links administrative data with cohort studies (e.g. School Health Research Network) would allow exploration of factors outside of educational attainment such as overall wellbeing and post-16 destinations.
- **Comparisons with other education jurisdictions:** The work should be replicated across all the four nations of the UK, as well as other comparable jurisdictions embarking on major education reform journeys, in order to see how differing policy initiatives impact the trends seen. In particular it would be valuable to explore how sociodemographic factors contribute to SEN identification in different nations, and how effectively support systems are working to support learners with SEN/ALN to achieve.
- **Patterns in types of provision:** The work should be repeated to see if there are differences in the sociodemographic profile of learners with each type of provision (i.e. school action, school action + and statement) and the impact of provision types on attainment.
- **Explore the direction of the relationship between attendance and SEN:** Further research should be conducted to explore whether SEN is identified in learners with lower attendance as a result of less instruction, or whether learners with SEN are less likely to attend due to an impact of their learning need. Quantitative analysis such as Bayesian Structural Equation Modelling, specifically Random-Intercept Cross-Lagged Panel Models can be used to analyse this relationship.

Recommendations for Data Collection:

- To allow for the present study to be used as a baseline, the following key information should continue to be collected:
    - Attainment indicators at the end of each key stage
    - Whether the learner has ALN with an IDP
    - Whether the learner is recognised as having ALN but does not have an IDP
    - Sociodemographic measures (particularly in the absence of FSM indicators)

- To improve on this analysis and to make more advanced and nuanced conclusions, access to the following would be beneficial:
    - School entry performance
    - Verbal and non-verbal ability measures
    - A record of those who were previously identified with SEN who are now no longer identified as having an ALN in the new system.
- Continue long term support for harmonising and linking Welsh Data.
- Improve information to support researchers in accessing and using the data in order to improve data accessibility and to ensure the quality of research conclusions.
- Simplify access to and updates of datasets for researchers.

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APPENDICES

Appendix A – example dataset structure

ALF_E	Education year	Key Stage	RALF	Sex	Age	SEN	FSM	Etc.
12345	1	1	1	F	7	0	0	
12345	2	1	1	F	11	0	0	
12345	3	2	1	F	14	1	0	
12345	4	2	1	F	16	0	0	
23456	1	1	1	M	7	1	0	
23456	2	1	2	M	11	1	1	
34567	1	1	2	F	7	0	1	
34567	2	1	2	F	11	0	0	
34567	3	2	2	F	14	0	1	