

Educational Attainment Dynamics in Wales: Insights through Data Linkage and Geographically Weighted Regression

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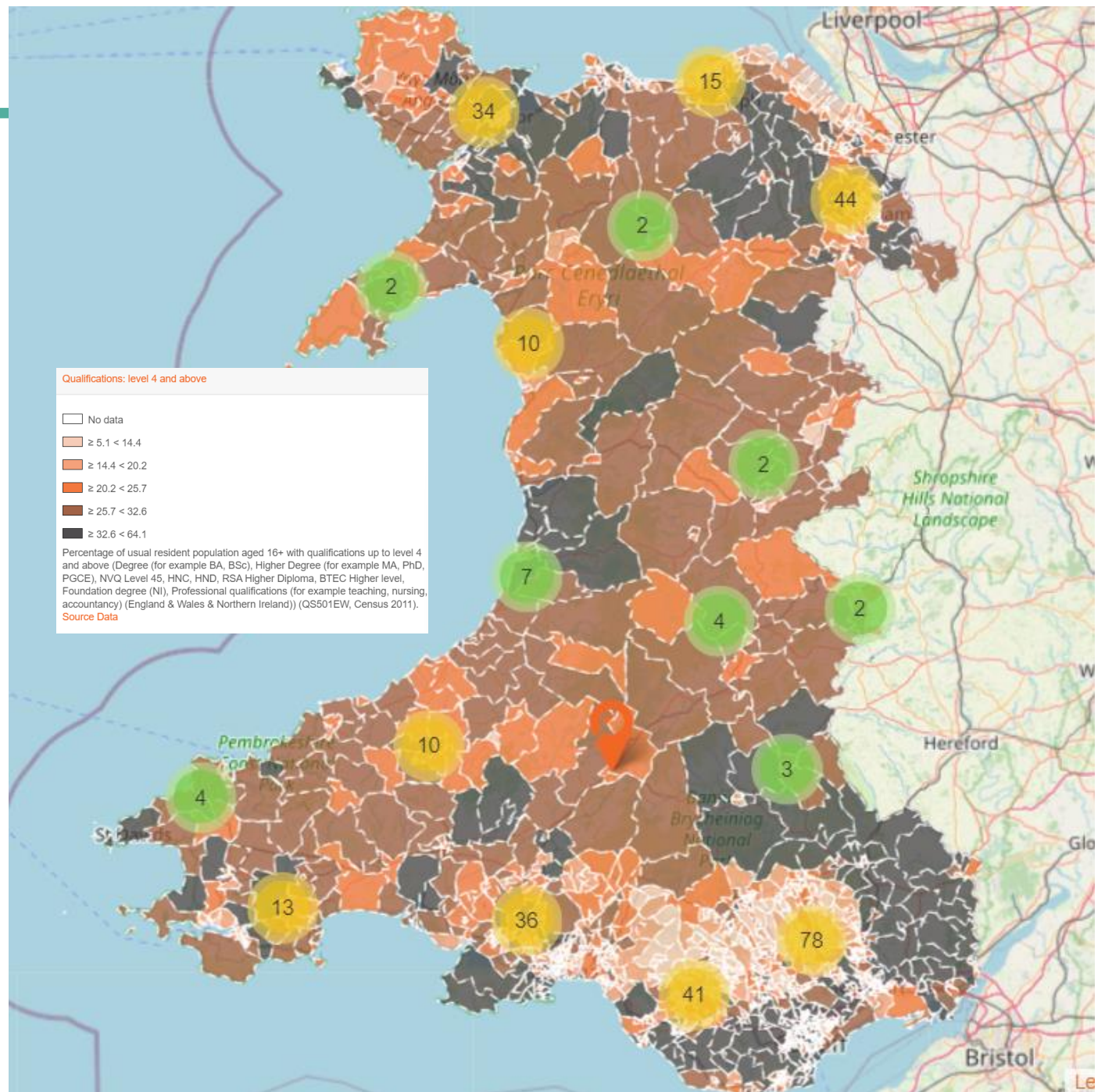
Rob French

Jen Keating

IPDLN Conference, Chicago, September 17th 2024

BACKGROUND

- Wales
- Low levels of education compared to UK nations
- Evidence of geographic variation – but often unaccounted for in attainment modelling



AIMS OF THE STUDY

Identify and examine

- Factors affecting academic attainment in Wales using administrative data;
- Geographic variations in the relationships between these factors and pupils' educational outcomes;

Inform Policy & Practice

- Provide valuable insights for policymakers, educators, and stakeholders in Wales to support improved pupil educational outcomes & reduce educational disparities;

Contribute to the existing body of knowledge

- Provide evidence of family and household characteristics and their influence on education;
- On spatial patterns of academic achievement across Wales



RESEARCH QUESTIONS

RQ 1

- How important are different measures of socio-economic status in determining educational outcomes in Wales?

RQ 2

- How do the effects of these factors on pupils' educational outcomes vary geographically across small geographies (LSOAs) in Wales?



DATA & METHODOLOGY

Administrative examination data

2011 Key Stage 4 results:
Achieving the Core Subject Indicator (CSI)

Census 2011

Family type;
4 household deprivation measures;
Working adults within the household;
Household highest qualification.

Administrative Pupil data

Eligibility for free school meals (eFSM);
Special Education Needs (SEN);
Ethnicity (% minorities);

Welsh Index of Multiple Deprivation

Area-level deprivation (quintiles)

*Logistic regression
(individual level data)*

METHODS

*OLS and GWR
(LSOA-level aggregated data)*

RESULTS

Factors influencing pupils' attainment (individual level data)



POSITIVE and NEUTRAL ASSOCIATIONS

- ✓ Girls have **15% higher** odds of achieving CSI compared to boys;
 - ✓ Pupils from HH where at least one member has a degree have **112% higher** odds of achieving CSI compared to pupils from households with no degree holders;
 - ✓ Pupils from married couple households have **33% higher** odds of achieving CSI .
- Urban-rural classification was not significant
 - Ethnicity was not significant
 - Economic activity was significant, but did not increase the odds

Ethical concerns:

Potential stigmatisation: Presenting certain family types as risk factors may perpetuate stereotypes or stigmatise those families unfairly.

Policy implications:

Care must be taken in translating these findings into policies to avoid unintended negative consequences.

NEGATIVE and NEUTRAL ASSOCIATIONS

- Pupils with SEN have **85% lower odds** of achieving CSI;
- Pupils eligible for FSM have **36% lower odds** of achieving CSI compared to those not eligible;
- All types of deprivation were associated with lower odds of achieving CSI;
- Pupils living in lower WIMD quintiles had **24% lower odds**
- Households with more than 2 dependent children were associated with lower odds (**23%**)

Education deprivation - **39% lower odds**
Health deprivation - **5% lower odds**
Employment deprivation - **22% lower odds**
Housing deprivation - **36% lower odds.**

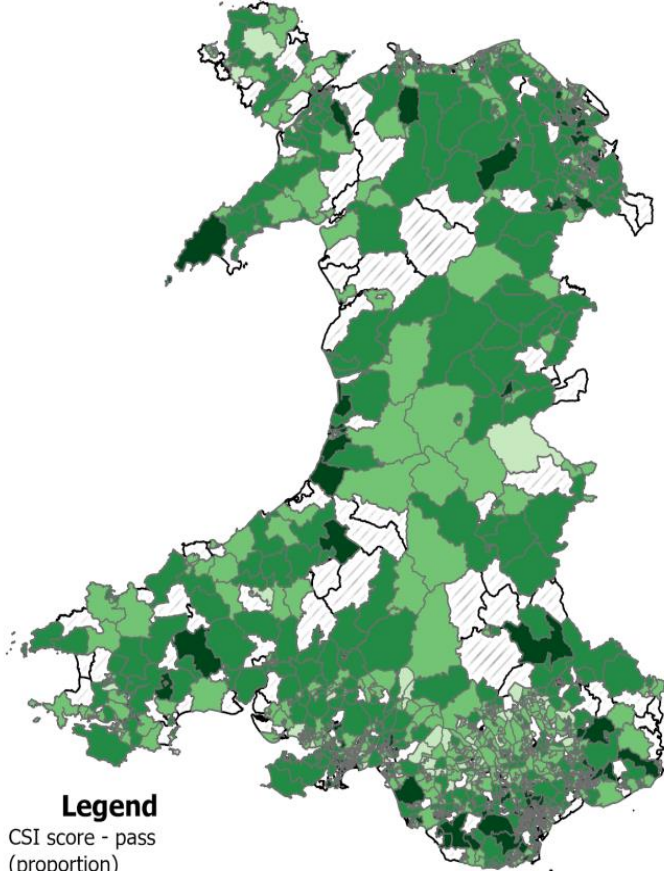


RESULTS

**Factors influencing pupils' attainment
(local level – LSOA level – aggregated data)**



Global Moran's I Summary
Moran's Index: 0.30
Z-score: 26.26
p-value: 0.00

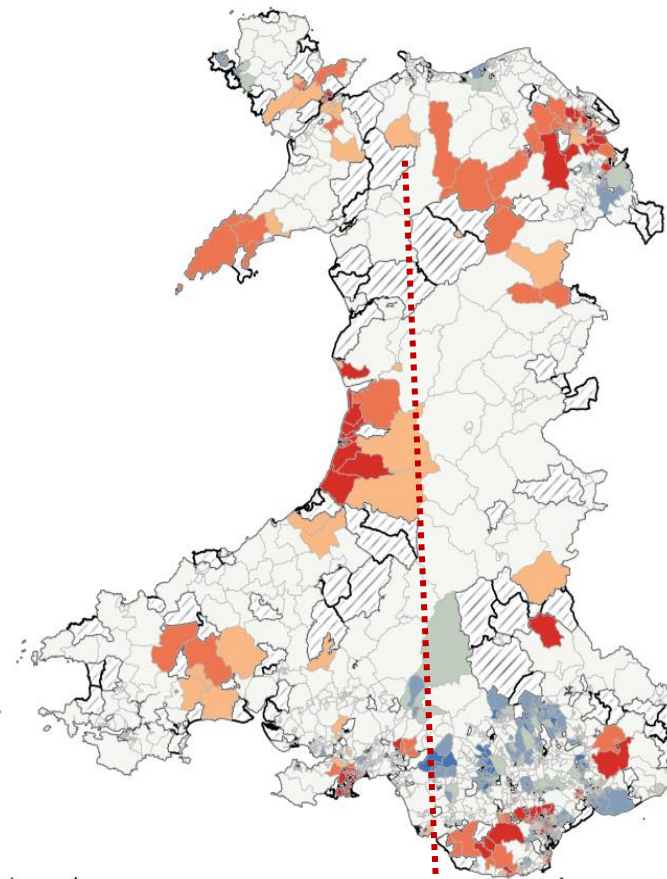


Legend
CSI score - pass
(proportion)

0.0 - 0.25
0.26 - 0.50
0.51 - 0.75
0.76 - 1.00

/// Insufficient data (< 11 pupils)

0 25 50 100 Km



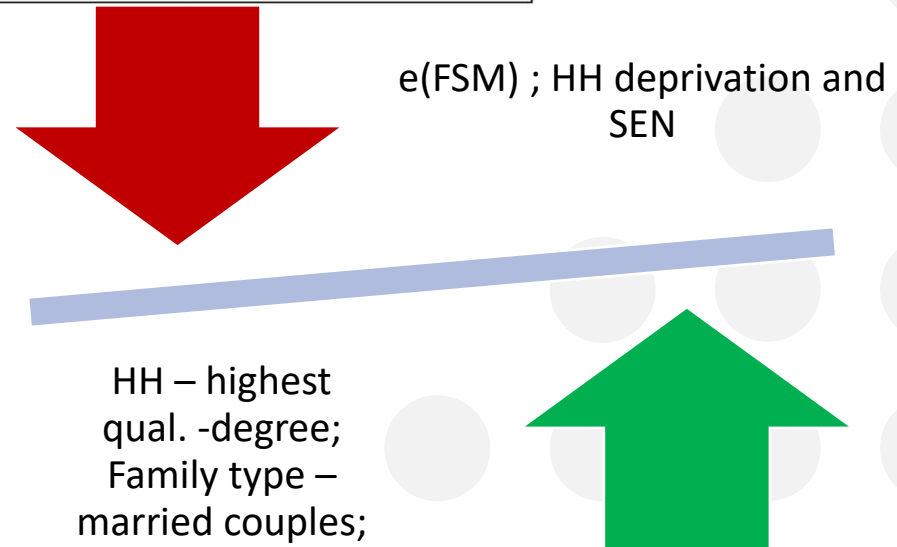
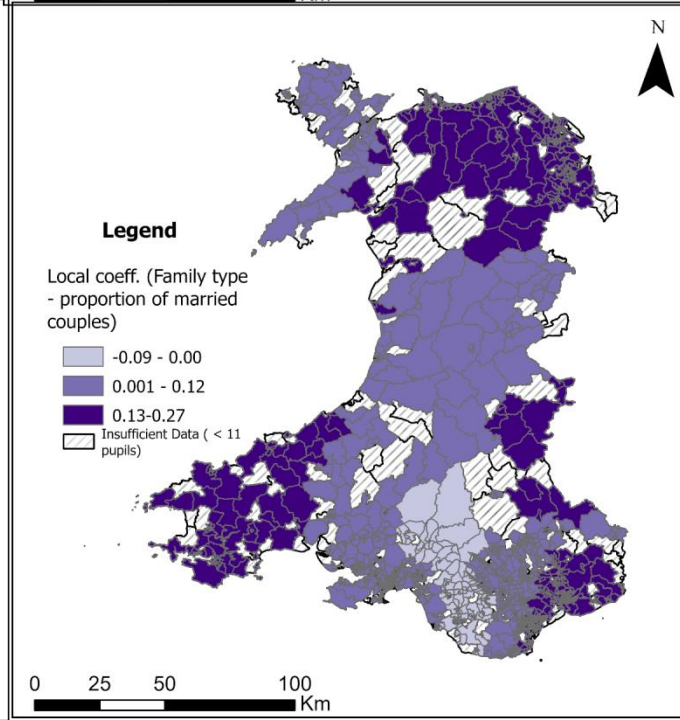
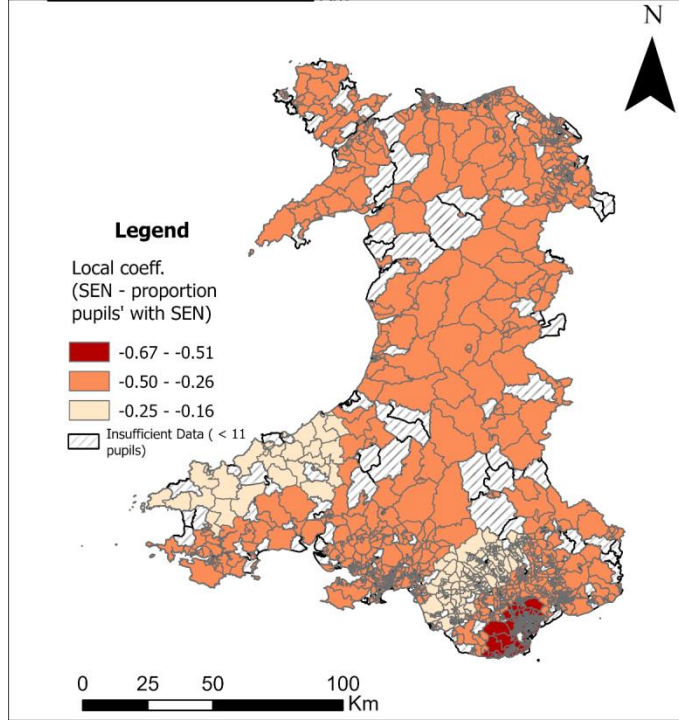
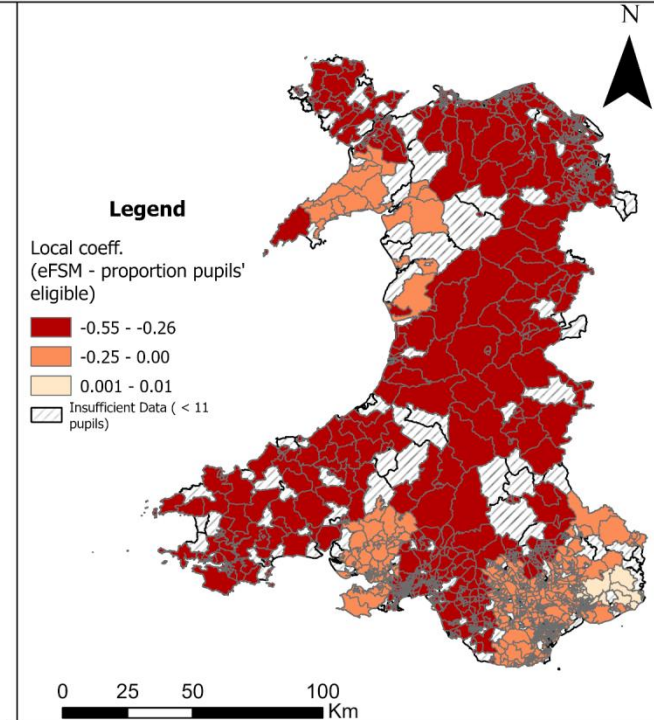
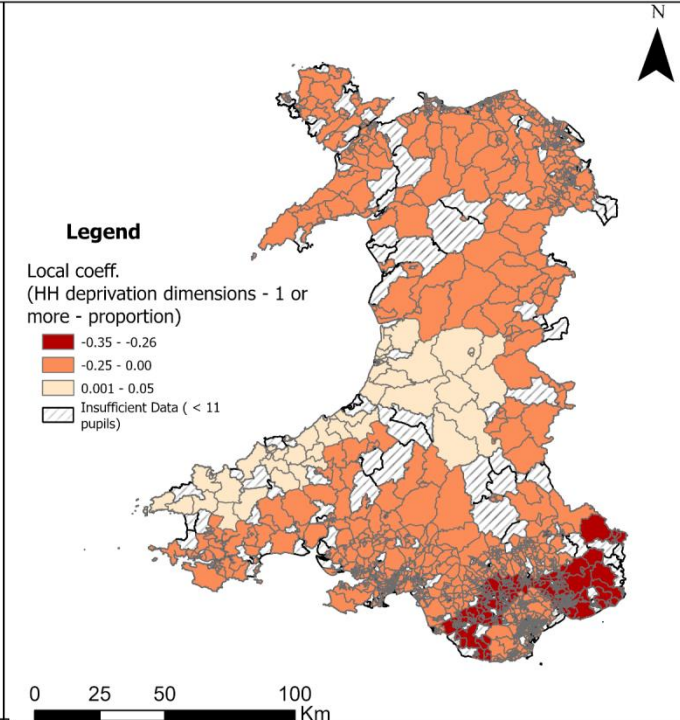
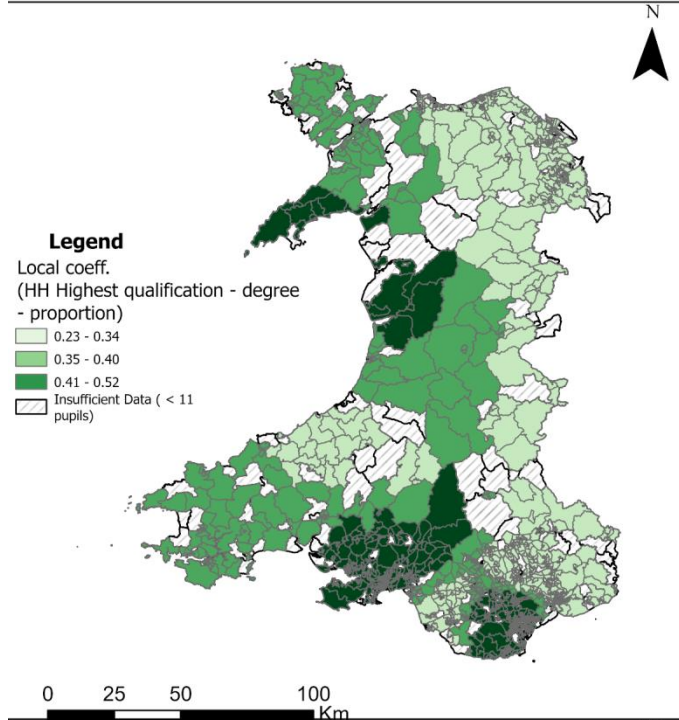
Legend
Hot Spot Analysis (CSI score)
Gi_Bin

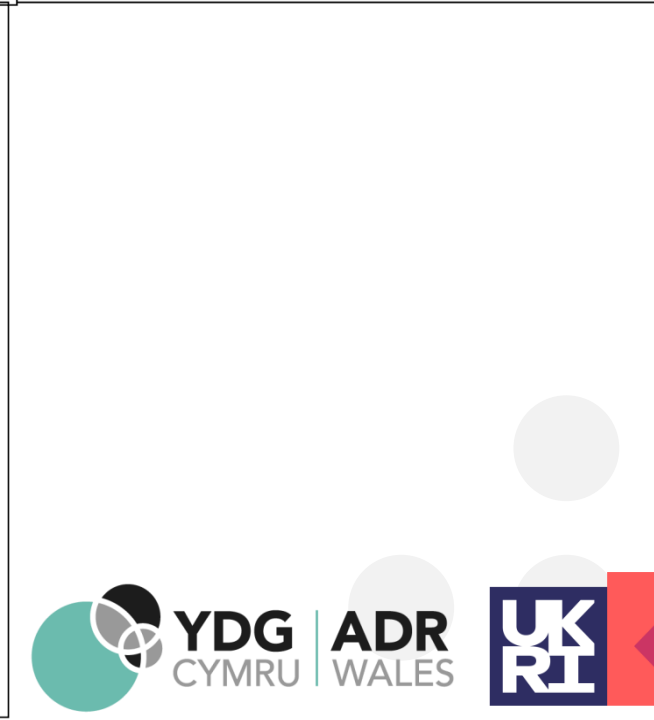
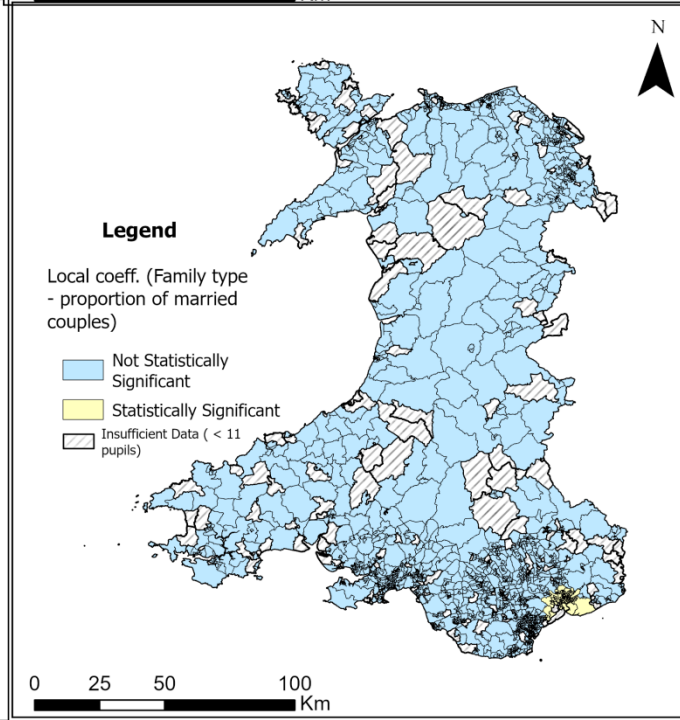
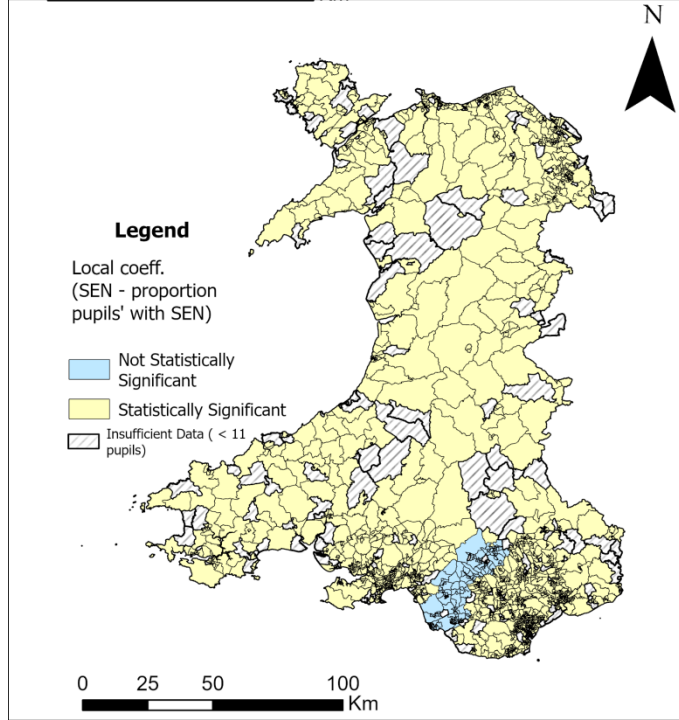
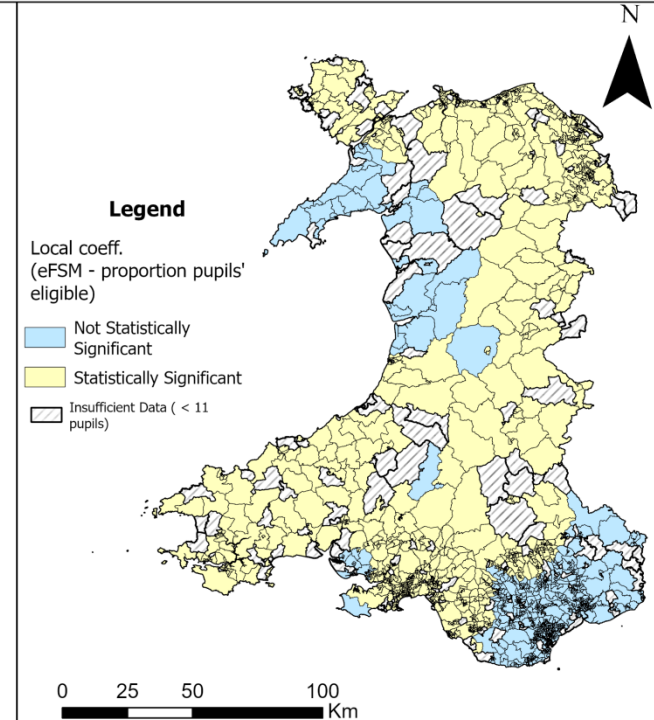
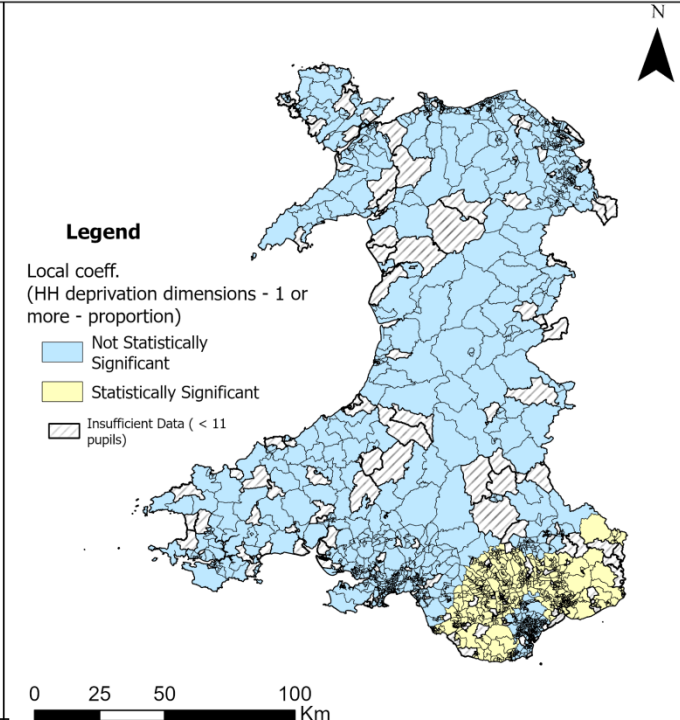
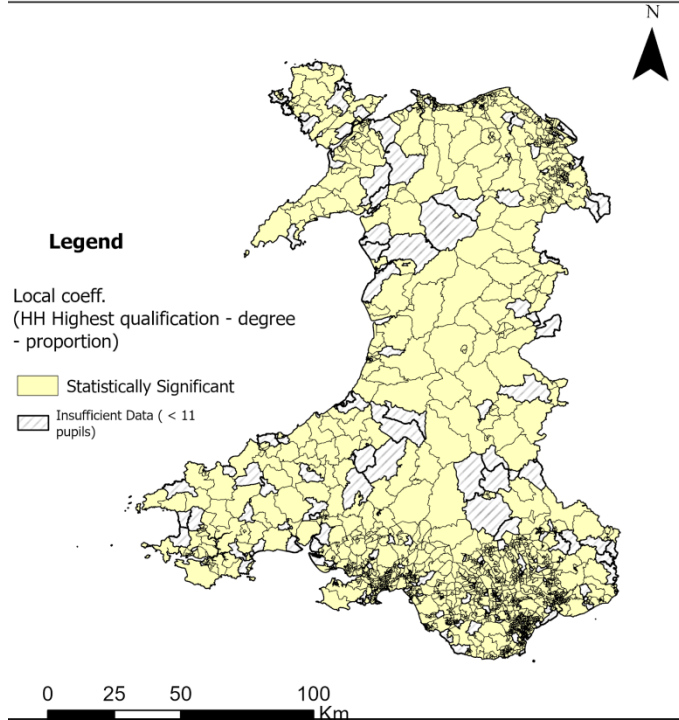
Cold Spot with 99% Confidence
Cold Spot with 95% Confidence
Cold Spot with 90% Confidence
Not Significant
Hot Spot with 90% Confidence
Hot Spot with 95% Confidence
Hot Spot with 99% Confidence

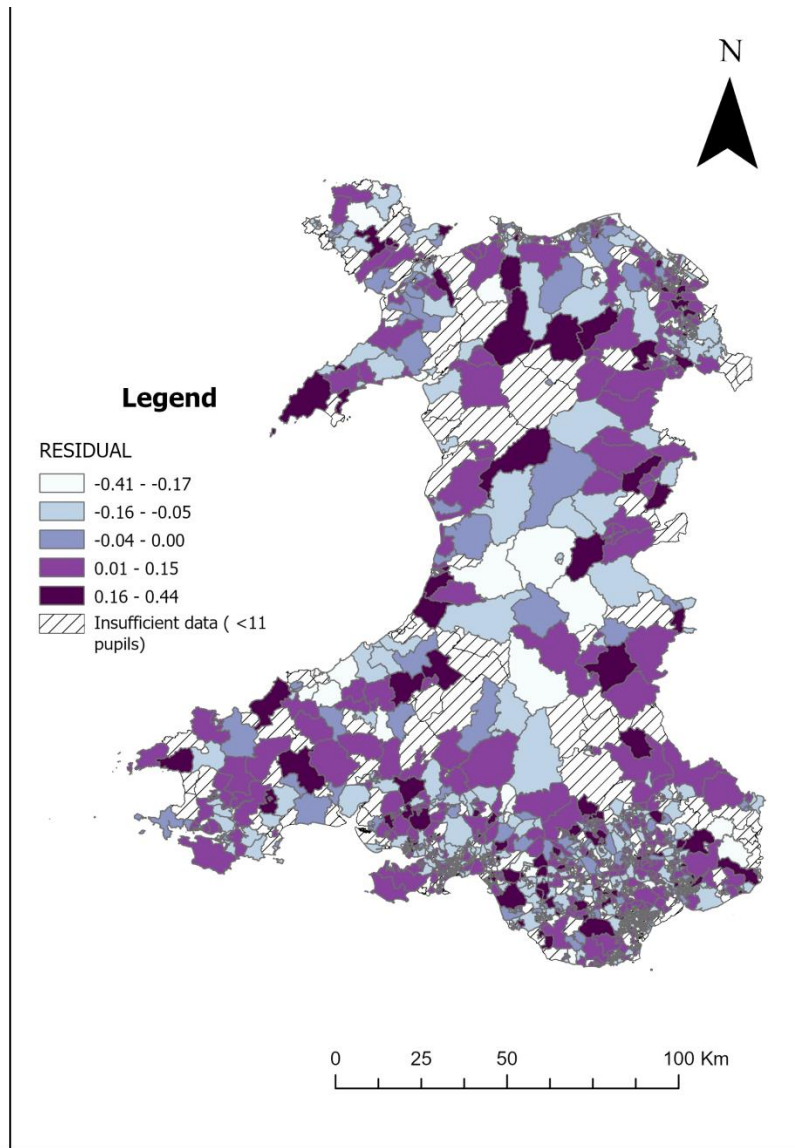
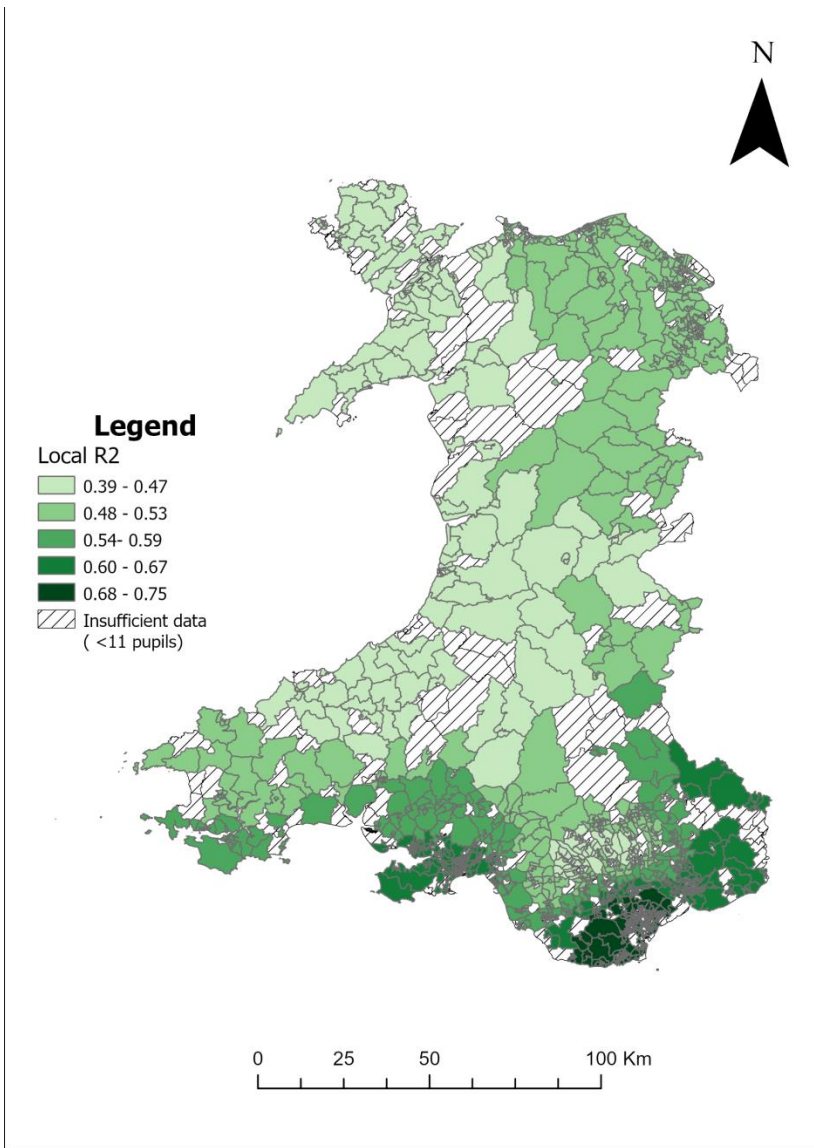
/// Insufficient Data (< 11 pupils)

0 25 50 100 Km

- ❖ Most of Wales shows moderate to high pass rates;
- ❖ There are some areas, particularly in the south and parts of the central Wales with lower pass rates;
- ❖ Hot spots (high performance clusters) are evident in parts of North Wales, some coastal areas, and scattered locations in central Wales
- ❖ Cold spots (low performance clusters) are primarily concentrated in South Wales, particularly in and around Cardiff and other urban areas;
- ❖ Urban-Rural Divide?







- The model performs best in S-E Wales, where it explains up to 75% of the variation in educational outcomes.



- There seems to be a trend of better model fit in more urban areas (particularly in the south)



- The spread of residuals across Wales indicates that while the model performs well overall, there are local variations that it doesn't fully capture => other factors at play that warrant further investigation;

GLOBAL VS LOCAL RESULTS

Variable	Local Results (GWR)					Global Results (OLS)
	Mean of β s	SD of β s	Min	Max	Median	β (SE)
Intercept	0.48	0.04	0.36	0.66	0.48	0.50 (0.03)***
Highest Qualification in the household (degree)	0.38	0.06	0.23	0.52	0.36	0.39 (0.02)***
Household deprivation dimensions (1 or more dimensions)	-0.16	0.09	-0.35	0.05	-0.16	-0.20 (0.03)***
eFSM (eligible)	-0.28	0.13	-0.55	0.01	-0.27	-0.30 (0.04)***
SEN (additional needs)	-0.36	0.12	-0.67	-0.16	-0.33	-0.29 (0.03)***
Family type (married couples)	0.1	0.07	-0.09	0.27	0.11	0.09 (0.03)***
R-squared	0.57					0.55

GWR slightly outperforming OLS;

The effects of most variables on KS4 pass rates vary across different areas of Wales, justifying the use of GWR;

CONCLUSIONS

- Household education level is a very strong predictor of a pupils' academic success
=> important questions about the cycle of educational advantage and disadvantage across generations in Wales;
- SEN and eFSM emerge as robust predictors of lower pass rates
=> we need to understand more about the complex interplay between education, health, and socio-economic factors;
- The widespread significance of eFSM suggests that immediate, individual-level economic hardship has a consistent impact on education across Wales
=> What local factors mitigate or exacerbate its impact?

CONCLUSIONS

- Spatial heterogeneity in the factors influencing KS4 pass rates within Wales highlights the importance of considering local context in educational policy and interventions
 - => educational policies and interventions need to be tailored to specific regions, as the factors influencing KS4 pass rates are not uniform across Wales;
- A 'one-size-fits-all' approach may inadvertently perpetuate or even exacerbate educational inequalities
 - => educational policy as a dynamic, adaptive system tailored to the unique needs and characteristics of different Welsh communities.



Thank you !

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