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Title: Mapping GCSE Underperformance Risk in England: A Repeated Cross-Sectional Bayesian Approach to Youth Provision Accessibility

Compared to other developed nations, disadvantaged English students rank low in academic performance. This matters because academic attainment in secondary school paves the way for future higher education opportunities, which in turn open up economic and cultural benefits for students throughout their lives. To examine these disparities, this study employs a repeated cross-sectional Besag-York-Mollié (BYM) model at the MSOA level across five academic years from 2016 to 2025, offering insight into how socioeconomic and environmental factors shape GCSE (General Certificate of Secondary Education) performance across England, and how these patterns cluster geographically over time. While the Department for Culture, Media & Sport's 2023 report highlighted the educational, physical, and mental health benefits of youth club attendance, this study addresses a gap in the literature by examining how the saturation of youth provisions surrounding schools relates to GCSE attainment, measured as the number of students within an MSOA failing to score a Grade 5 or above on their English and Math GCSEs. The study highlights the strong influence of economic factors, particularly the proportion of students qualifying for free school meals, in driving the risk of GCSE underperformance. Youth provision accessibility also showed a small but consistently credible effect across all study years, with lower surrounding provision associated with increased underperformance risk. Other covariates, including the proportion of female students and area urbanization, showed only occasionally credible effects across the study period, in contrast to youth provision accessibility's sustained credibility throughout. To understand this risk further, case studies were conducted, examining MSOAs in local authority districts that showed persistent increased or decreased risk over the study period.

Results showed considerable differences in the profiles of the non-selective, non-PRU secondary schools within them. Youth provision accessibility is scored on a decile scale, where 1 indicates high saturation and 10 indicates no walkable provisions from the school. The average decile was 6.3 among schools in the case study Local Authorities identified as persistent increased risk (Cumberland, Manchester, and Wirral), compared to 3.7 among schools in those identified as persistent decreased risk (Barnet, Hillingdon, and Redbridge). Overall, this study highlights regional differences in GCSE underperformance across England, indicating the need for future policy intervention in the areas identified as at increased risk. Additionally, the credible effect of youth provision saturation on GCSE outcomes provides valuable information to inform future policy and funding decisions.