

## Correspondence

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### School achievement and adolescent self-harm: methodological issues may have led to misleading conclusions in a highly powered national study

We welcome the work of Rahman and colleagues whose study on school achievement, depression and self-harm using routinely collected data contributes to the limited evidence base on educational risk factors for adolescent mental health problems.<sup>1</sup> Although they found little evidence for an association between early school achievement and later self-harm, because of a number of methodological issues we found their findings hard to interpret.

First, the exposure variable, school achievement, is dichotomised into two broad groups, meaning that within-group changes in achievement that do affect later mental health outcomes may be masked.

Second, the authors adjust for a range of poorly defined potential confounders. For example, the terms intellectual 'disability' and 'difficulties' are used interchangeably. Particularly with the latter, there is a risk of co-linearity with the exposure. How 'conduct disorder' is defined is also unclear as it appears to comprise a heterogeneous group of problems including eating disorders, autism and speech and language disorders, even reading disorder.

Third, the authors do not comment on whether high-risk subgroups, such as those with special educational needs, have been included in the analysis. These individuals may not be expected to follow the national curriculum and would therefore be omitted from the study. Similarly, linkage of health and education data is less likely to be possible for more mobile, socioeconomically deprived populations.<sup>2</sup> Exclusion of such groups would create a biased sample and the possibility of underestimating the association.

Finally, the absence of key demographic, social and mental health variables within the routinely collected education and health data-sets raises the question of whether the study's findings could be explained by residual confounding. Ethnicity, adverse childhood experiences, bullying and substance misuse could each act as confounders.<sup>3</sup> We would also recommend controlling for absence and exclusion from school given their association with poor outcomes.<sup>4</sup> Most pertinently, it is not clear whether depression has been considered a potential confounder of the association between achievement and self-harm.<sup>3</sup>

In addition to these methodological issues, two further points are worth raising. The results show that low achievement at age 7, but not age 11, is associated with adolescent self-harm. The authors state that 'among those who self-harm there was no evidence of a decline in attainment in primary school'. However, the authors provide no analysis in support of this interpretation, as they did not report the effect of within-individual changes in attainment between age 7 and 11.

The authors have hypothesised that there is a more acute relationship between achievement and self-harm in adolescence, but this rich longitudinal data has not been used to disentangle the nature and direction of this acute relationship. This huge linked data-set offers a wealth of opportunities to better understand the relationship between school achievement and self-harm and we look forward to seeing further analyses, the results of which have the potential to make an important contribution to health and education policy.

## References

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## Authors' reply

We agree with the author that in this initial paper we present broad findings exploring novel relationships at scale in a large longitudinal electronic cohort linking primary care and educational data. We agree that a finer-grain analysis of individual pupils' achievements and scores within key stages may give interesting results. We focused on dichotomised achievements at key stages as this is the indicator relevant to and generally acted on by schools.

We agree that we have used the terms intellectual disability and difficulty interchangeably and this may be considered problematic. We have defined intellectual disability within the paper and this is based on previously published work.<sup>1</sup> However, pupils with intellectual disability will be less likely to achieve their key stage results (exposure) and may be more likely to have depression or self-harm (the outcome). As such having intellectual disabilities is considered a confounder related to both the outcome and the exposure. If we had considered it as a variable with co-linearity (for example achievement can be predicted from having an intellectual disability so there is no need to include both in the model) and left it out of the model we run the risk of confounding bias in our analysis. We chose to take a conservative approach and treat it as a confounder and include it in the model.

In our paper, we included, as supplementary material, the Read codes used to identify conduct disorder. These were developed in conjunction with two clinicians. Lists developed in this way are used frequently in e-cohort studies of this type. However, ideally