Editorial on ''socioeconomic variation in height: analysis of National Child Measurement Programme data for England''

Title: Inequalities in childhood height persist and may vary by ethnicity in England

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Height is the joint product of genetic and environmental influences, and is an important marker of nutritional status and health in early life. While height steadily increased throughout the 20th century as living standards improved, socio-economic inequalities in height persisted in many populations (whereby individuals from more socio-economically deprived backgrounds were, on average, shorter). It has been postulated that 20% of the variation in height observed within contemporary populations is explained by environmental exposures, such as maternal smoking in pregnancy, overcrowding, childhood illness, and diet (1). These environmental influences are thought to contribute to socio-economic inequalities in height. Research from a contemporary cohort (the Avon Longitudinal Study of Parents and their Children) indicated that height inequalities in middle childhood had already been established at birth, and that prenatal, genetic, or epigenetic factors were the most important drivers (2).

In high income countries, there is evidence to suggest that socio-economic gradients in height have been diminishing. One study comparing the 1958 British birth cohort (a predominantly White population) and their offspring showed that childhood height increased by 1 cm between the two generations, and that the degree of socio-economic inequality narrowed, due to a greater height gain among offspring from more disadvantaged backgrounds (3). Comparisons of childhood height between the more recent UK cohorts (the 1970 British Birth Cohort Study and the Millennium Cohort Study) also found weakening inequalities in height (4).

In this issue of *Arch Dis Child*, Hancock et al. demonstrate that socio-economic inequalities in childhood height still remain, using an impressive data source, the National Child Measurement Programme (NCMP) (5). The NCMP has collated the heights and weights of all 4-5 and 10-11 year old children attending state maintained primary schools in England since 2006/7. The authors examined data for 646,097 White children

measured in 2012/13, and 374,668 Asian and 192,465 Black children measured from 2008/9 to 2012/13 (to maximise numbers in ethnic minority groups). They found that the heights of White and Asian children were socio-economically distributed, according to an area-level measure of disadvantage (the Income Deprivation Affecting Children Index (IDACI) score). For example, 10-11 year old White children living in areas in the least deprived quintile were on average 1.6 cm (boys) and 1.2cm (girls) taller than those living in the most deprived quintile. In Asian children of the same age, the differences were 1.3 cm for boys and 0.9 cm for girls. In contrast, no inequalities were observed in Black children (5).

The socio-economic differences found in the heights of White children in the NCMP were not dissimilar to those reported in a cohort of predominantly White children born around a decade earlier (2). Given the growing ethnic diversity of Britain, it is crucial for us to have a better understanding of socio-economic differentials in height across all ethnic groups. However, evidence is limited, possibly due to inadequate numbers of ethnic minority children in national samples. The findings from Hancock et al. are therefore important, although we recommend some care when interpreting them, for two reasons.

First, the use of area-level indicators as a proxy for individual socio-economic position (SEP) can lead to an underestimation of inequalities. As the authors point out, there was little socio-economic variation amongst Black children, who were mostly resident in the more deprived areas in England (only less than 10% were living in the 50% least deprived areas). It is therefore plausible that the IDACI is a better representation of family-level SEP in White (and Asian) than Black children. Indeed, an analysis of 2011 census data showed that Black ethnic groups face similar levels of unemployment regardless of what area they live in, whereas in White groups, unemployment steadily increased with level of area deprivation (http://www.ethnicity.ac.uk). Therefore area deprivation may not be the optimal measure for comparing socio-economic inequality between ethnic groups.

Second, Asian and particularly Black children were, on average, taller than their White peers at 4-5 and 10-11 years, despite being (on average) more socio-economically disadvantaged. While similar differences have been noted in other childhood populations (6), these patterns are not reflected in adult data, where Black and Asian ethnic groups are no taller than their White counterparts. As already noted, today's children are more likely to achieve their height potential than their parents' generation, and it is possible that intergenerational gains in height have been greater for minority ethnic groups. Alternatively, growth trajectories in children may vary by ethnic background; for example Black children have been shown to have faster pre-pubertal growth and mature earlier than their White UK counterparts (7). Similarly, height difference between the most and least deprived quintiles observed in White children may reflect differences

in developmental age and these differences could diminish by the time they reach adulthood. However, like shorter stature, delayed growth and maturation may be reflective of unfavourable early life conditions, which could still be detrimental for adult health regardless of catch-up growth. Longitudinal data will be needed in order to establish the long term impact of the childhood height differences observed by Hancock et al.

An additional limitation of this study is its inability to take into account the role of parental height. It is well established that children from more disadvantaged backgrounds are more likely to have shorter parents. Parental height can be a proxy for the genetic component of height, and also reflects the early life environmental experiences of the parents themselves. Thus, adjustment for parental height would account for the genetic influence, but also the intergenerational transmission of disadvantage and thus height inequalities.

Assessing socio-economic inequality in growth (or health in general) in children from a range of different ethnic backgrounds poses challenges. Study power is likely to be an issue due to low numbers of ethnic minority children in national samples. Specialist datasets (over-sampling minority children) are essential to help us expand our knowledge of the processes which underlie ethnic differences in growth and socio-economic inequality in contemporary children in the UK and elsewhere. There is also a need to explore a broader range of indicators for SEP that are culturally meaningful and capture the individual, family and neighbourhood environment. In the meantime, the persistence of height inequalities, as shown in White children by Hancock et al. in this issue of *Arch Dis Chil* (5), could have important public health implications for future adult health. Differences in childhood height of the magnitude shown here (~1.4-1.6cm), have been linked to elevated risks of cardiovascular disease and some forms of cancer in adulthood. This reaffirms the need to maintain and reinforce efforts to tackle inequalities in the early years.

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