

Poverty and reductions in fitness levels in children and adolescents in upper-middle-income countries

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Increasingly it is recognised that that what happens in childhood has a significant impact on health in adulthood. As we and others have shown - social, emotional, cognitive and physical development in childhood and adolescence tracks through to later life (1, 2). The paper by Tomkinson and colleagues (3) examined trends in cardiorespiratory fitness levels (CRF) in childhood and adolescence. It is an important piece of work because poor fitness levels in adolescence are significantly linked with higher all-cause mortality rates later in life(4) and because, as the authors illustrate in their comprehensive study, CRF fitness levels in children and adolescents in high and high-middle income countries have significantly declined since the 1980s.

There is some relief in the fact that since 2000 the rate of decline has slowed significantly. A question to ask is whether the reason for a slower decline to do with the fact that there is not much more 'fitness' to cut back on? We are also interested in the sex differences between base levels of fitness but the paper doesn't extend that far, and there is also no mention of the technological revolution seen in terms of children's modern 'toys', and the proliferation of tablets, phones, game consoles and multi-channel television, that might have influenced the behaviours associated with CRF trends. A number of questions that relate to the 'why' that could be considered by future researchers in the field.

A key finding from the paper is the link with income inequality. There was a strong negative association between trends in income inequality (as measured by the Gini index) post 2000 in 18 countries and trends in

CRF. Countries with reducing levels of income inequality had more favourable trends in CRF - improvements or small declines. A fuller test of the degree to which this association is causal will entail specifying a detailed causal model that can be empirically tested. In particular, missing from the analysis is how trends in CRF vary within countries by some measure of socioeconomic position; education, for example. That said, the strength of the association between trends in the Gini and CRF alerts us to its importance. A better understanding of causal pathways can lay the basis for action to improve cardiovascular fitness.

In the debate over the relation of income inequality to health two kinds of pathways have been identified. First, in general, higher inequality goes along with greater poverty levels, absolute and relative. The authors acknowledge the poverty pathway – but we should distinguish between the effects of material and relative poverty; and second - higher inequality damages social cohesion.

Absolute poverty is on a material pathway and relates to having insufficient income to buy essential items for health and wellbeing. It should perhaps be noted that if an increase in income inequality is caused by an increase in income at the top end of the distribution, without detriment to those at the bottom, whose incomes are sufficient from wages and/or protected by decent social protection systems then this will not result in more absolute poverty. A count of the numbers in absolute poverty and analyses of the exercise levels of different income groups would be valuable. However, without this, we know that, in today's society, increasing income inequalities likely mean a reduction in the income available to those at the bottom end of the distribution and/or an increase in the numbers of those with low incomes (5).

Relative poverty is related to the level of income inequality *per se* and is on a psycho-social pathway. This pathway relates most to the measure looked at – the changing *gap* in income levels. Adolescents are sensitive to image, we have heard the ‘mum/dad, don't wear/do that – you're so embarrassing’ phrase and we know many readers will relate - adolescents are defining their identities, they want others to see themselves in the best light, from selfies in favourable locations to branded sportswear, the pressure is immense. Where inequalities are higher, those at the bottom end of the income distribution, not able to keep up with the highly publicised life styles of their peers, let alone the richest, could suffer from poorer self-esteem that could potentially lead to lower social participation in general. Could this be on the pathway to poorer fitness levels? To have created a society where children and adolescents may be hiding away and not participating in

e.g. sports and exercise for fear of bullying or embarrassment is of concern for their mental health, and as we see in this paper, potentially, for their longer term physical health. Should we be equipping teachers with the tools to deal with the perils of conspicuous consumption, greed and inequality?

The authors suggest a reduction in income inequality might help to improve CRV if the correlation is causal. We advocate for governments and employers to ensure households have a minimum income for healthy living(1, 6), a wage set at an appropriate level to support good health and well-being, based on a wealth of research on outcomes, and this research appears to add weight to these recommendations. There are other approaches to be explored in addition – cheaper/free/subsidised activities, better and safer design of public places for teenagers and children to play and exercise.

Ultimately we need the causal analyses, how much of the variation is explained by the *level* of inequality and what percentage by the impact of increasing inequality on low income? This will help to hone recommendations, but in the meantime there is much here that we can act on from research that we have done already on the social determinants of health that might help to mitigate against further damages in children's health (1).

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