Lessons Learned From Australia: Social Disadvantage and Pubertal Timing

Marcia E. Herman-Giddens, PA, MPH, DrPH

In the past 70 or so years, the tempo and substance of cultural and environmental changes influencing the health and development of children have increased. In many parts of the world, children are entering puberty earlier than ever before. This is associated with a range of adverse health outcomes later in life. To that end, and in an effort toward determining public health interventions to reverse this phenomenon, Sun et al in this issue of Pediatrics prospectively examined the cumulative effects of family and neighborhood domains among a birth cohort of 5107 Australian infants followed until they were 10 to 11 years old. Cumulative exposure to extremely unfavorable socioeconomic position (SEP) was associated with 4 times the risk of early puberty in boys and 2 times the risk in girls. A brief historical perspective may help inform the results.

When this journal published the study by Pediatric Research in Office Settings (PROS) on the age of onset of puberty in US girls in 1997, a firestorm ensued. In contrast to the widely used norms published by Marshall and Tanner in the late 1960s, we reported that girls in the United States were starting puberty 6 months to 1.5 years earlier depending on race. The decrease in the pubertal age of onset was startling enough. That we found a considerable difference in age of onset between whites and African Americans not previously recognized added more to the storm of questions and criticism. A panel was summoned to Chicago to debate the existing data. Later, further studies corroborated our findings.

Fifteen years after the girls study, another PROS study found that US boys were also entering puberty earlier and had similar racial differences. The influence of prematurity, endocrine disruptors, stress, SEP, family constellation, epigenetics, and a myriad of other factors now known to affect the age of onset of puberty were largely unknown. Conditions such as famine, war, chronic infections, and poverty have been known since the Middle Ages to delay puberty. As the environment in developed and certain less developed countries began to change in the last few decades of the 20th century to one where high physical activity was not required for life maintenance and high-calorie food served in ever-increasing portions became inexpensive and abundant, overweight ensued. This decline in physical activity and increase in intake of nonnutritious, high-calorie foods, along with the decrease of malnutrition and infectious disease, is thought to be the principal factor in the last century’s reversal of the relationship between deprivation and later pubertal age to the current advanced pubertal age onset in low-SEP households as demonstrated in this study.

This study’s findings offer some tantalizing aspects to consider. The dose–response relationship shown in Fig 3 on the ever-lowering age of pubertal onset with worsening household SEP is convincing. The models adjusting for confounding factors known to affect the age of pubertal onset were not particularly different from one another. Neither was a neighborhood effect found when family SEP was taken into account.
The authors point out that current adiposity was strongly correlated with early pubertal onset, though proportions cannot be determined from their analytic approach.

Why boys would have twice the proportion of increase in early puberty as compared with girls is intriguing. Boys have not been considered as sensitive to environmental influences as girls, but that may be because they have been studied less. This is further intriguing when one considers that the boys were presumably much further along in puberty as compared with girls. Although the authors use “early puberty” for both sexes, the derived Pubertal Development Scale largely defines early puberty for girls (eg, breast growth, growth spurt) and mid-to-late puberty for boys (eg, growth spurt, facial hair). Parents are not highly accurate in assessing the pubertal stage of their children; however, their response to questions like these should be sufficiently reliable for this study. Although the reader has no way of knowing the proportions of these characteristics for a given group of boys, this study suggests that many Australian boys are entering puberty early. The first pubertal sign in boys is testicular enlargement, which this study had no way of measuring. Therefore, finding that ~12% of boys from favorable households up to 35% from deprived households are probably in midpuberty at ages 10 to 11 suggests earlier development than among US boys. It also implies they are starting puberty at least as early as girls, if not earlier, a finding suggested by the PROS boys study.5

Teasing out causes and associations for these findings will help with what we need to know to stem the tide of early pubertal onset, now agreed to be unhealthful. In the meantime, the complexities and controversies of life history theory aside, the money appears to be in efforts to increase physical activity and plant foods and decrease intake of cheap, calorie-dense, high-carbohydrate foods. Twenty-seven percent of Australian children ages 7 to 15 are now overweight or obese, and their prevalence of severe and morbid obesity is increasing.7

ABBREVIATIONS

PROS: Pediatric Research in Office Settings
SEP: socioeconomic position

REFERENCES


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