**GETTING TO THE HEIGHT OF THE MATTER: THE RELATIONSHIP BETWEEN STATURE AND ADIPOSITY IN PRE-PUBERTAL CHILDREN**

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**INTRODUCTION**

Numerous studies conducted in adults have established an inverse association between height and the prevalence of cardiometabolic diseases, which appears to be connected with obesity status.1–3 Historically, shorter adults have been observed to have greater adiposity and paralleled heightened prevalence of cardiovascular disease and type 2 diabetes relative to taller counterparts.2,4–7 Speculatively, insulin resistance, more prevalent among shorter adults, has provided a link between adiposity and chronic disease risk. Albeit limited, investigations of the height-fat nexus in children, however, report greater adiposity in tall children relative to those who are shorter.2,8–10 The underlying reason(s) for the opposed associations according to life stage is not sufficiently understood.

Indeed, beyond the documented increasing BMI observed over the past three decades across various life stages, recognizable changes on body composition, especially adipose tissue accrual, have been identified. The contemporary environment in which children interact is increasingly ‘obesogenic,’ which has manifested into altered metabolic pathways, particularly that involving insulin homeostasis. The metabolic consequences of excess adipose tissue accrual, and consequential dysregulated insulin dynamics, may provide some insight into how early life growth processes may underlie initiation and progression of metabolic diseases. As the pediatric population continues to be burdened by ever-present obesity prevalence, investigation of underlying growth-related determinants is warranted.

Attainment of maximal adult stature is contingent on an optimal physiologic environment. Beyond the clear direct role of reproductive hormones, pubertal onset through associated hormonal changes secondary to adiposity, is largely encompassed by permissive effects of adipocytokines, which interact with growth factors. Insulin action and metabolic response to insulin is of particular importance as a key signaling factor. At the cellular level, insulin provides the means by which nutrients are metabolized and circulating concentration largely reflects developmental requirements. Marked changes throughout pubertal maturation influence insulin dynamics,11,12 thereby altering metabolic and growth-related processes. Circulating insulin levels, particularly during growth when tissues are highly sensitive to mitogenic exposures, may represent a link between stature and metabolic risk.

Numerous investigations have demonstrated similarities in body composition trajectory as well as metabolic control across the sexes and among racial groups prior to reproductive maturation. However, peri-pubertal changes in insulin dynamics are well-established to display differences across groups. We and others have reported greater puberty-related insulin resistance with an attenuated rebound to pre-pubertal levels among African Americans (AA). In addition, the timing and tempo of reproductive maturation is accelerated among AA.12–14 Of note, rapid linear growth early in the life course underlies theoretical framework of the developmental origins of health and disease. Conceivably, dysregulated insulin concentration and peripheral insulin resistance may contribute to growth-related differences between European American (EA) and AA boys and girls. Given unequal distribution of cardiometabolic disease risk among EA

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**Objective:** Height has been inversely associated with cardiometabolic disease, with adiposity as the proposed contributor. Childhood represents a time when underlying metabolic pathways converge to determine growth. Although the extent to which influence is relevant, insulin, as a key growth signaling factor, likely provides key insight into mechanisms linking height and adiposity. Insulin concentration displays well-established sex and racial differences, with hyperinsulinemia more common among African Americans (AA) females relative to European Americans (EA). The objective of our study was to evaluate the relationship between height and adiposity in children. In addition, a secondary objective was to evaluate potential moderation by insulin concentration.

**Design:** Seventy-two prepubertal children aged 4–10 years (μ=6.6 ± .2) participated.

**Main Outcome Measures:** Percent fat was assessed by DXA and fasting insulin by serum assay.

**Results:** Height was positively associated with percent fat in the overall sample (P=.04). When evaluated according to age, an association was identified at age seven years (P=.02). When evaluated by sex, a positive relationship was apparent only in AA girls (P=.05). Inclusion of insulin in the model attenuated all significant associations, barring marginal significance in those aged seven years (P=.08).

**Conclusions:** A positive relationship between height and adiposity is apparent, particularly among those in younger years, which is contrary to what has been consistently reported in adults. Interestingly, age seven years was identified as a point of race-associated divergence in body composition. The degree to which growth-related processes in childhood underlie developmental origins of health disparities warrants further study. (Ethn Dis. 2013;23(1):71–76)

**Key Words:** Height, Adiposity, Growth, Racial Disparities, Insulin