

Novel Early Predictors for Targeted Interventions to Mitigate Childhood Obesity

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Background: 39M children worldwide are overweight or have obesity. Current interventions have failed to reduce obesity. Early life targeted interventions could prevent childhood obesity (ChOB); however, accurate ways are needed to identify high-risk children who would benefit. We previously identified early BMI as the best predictor of childhood obesity at 10 years; however, it explains only 18% of the variability in childhood obesity ($\%var_{BMI}$). New early biomarkers are needed to predict ChOB. Hence, we evaluated novel early longitudinal BMI measures as ChOB predictors at 5, 8 and 10-years.

Methods: Conventional (birthweight (BW) and early BMI) and novel early longitudinal BMI measures were evaluated as predictors of ChOB against BMI at 5, 8, and 10 years in the Raine Study (n=2252). The novel measures, described by the EGG consortium, include the rate of change in BMI ($Slope_{BMI}$) and exposure to excessive weight (AUC_{BMI}) in the first 1000 days.

Results: Positive associations were observed between all predictors and all childhood BMI outcomes ($p<0.001$). The best multivariable models, including BW, early BMI (age 2-3), and $Slope_{BMI}$, explained 74.1%, 69.8%, and 72.6% of $\%var_{BMI}$ at 5, 8, and 10 years, respectively. By contrast, multivariable models using conventional predictors alone explained only 47%, 34%, and 24% of $\%var_{BMI}$. Similar effects of ChOB predictors were observed in both sexes.

Conclusions: Accounting for novel early longitudinal BMI measures demonstrated up to a threefold increase in $\%var_{BMI}$ at 5, 8, and 10 years compared with models using conventional early BMI predictors. Intervention studies in obesity prevention targeted at children with rapid increases in early BMI could offer the greatest potential to prevent childhood obesity.