

Promoting Healthier Child Growth

Introduction

The epidemic of childhood obesity in the UK is associated with a major burden of physical and psychological morbidity and early mortality. This epidemic is one of the most daunting public health threats facing the UK and presents a potential health time bomb that threatens to reverse gains made in longevity made over the last 100 years. Two recent reports (Wanless and Foresight) have provided dire warnings that without significant improvements in efforts to tackle childhood obesity, the future of the NHS is in jeopardy. The Foresight report concluded that preventing obesity requires major change in the environment, behaviour; in organisations, communities, families and individuals.

Childhood obesity has major impact on health and wellbeing in childhood and through to adult life. Obese children experience poor health related quality of life and low self-esteem and are at increased risk of hypertension, hyperlipidaemia and diabetes. Half of obese children grow up to be obese adults at greater risk of heart disease, diabetes, stroke and cancers. The National Audit Office estimated in 2001 that obesity is responsible for 9,000 deaths each year in England and reduces life expectancy by on average 9 years.

Children of South Asian origin in the UK are growing up with particularly high risks of developing central obesity, cardiovascular disease and diabetes. It is estimated that approximately 40% of South Asian adults have diabetes or impaired glucose tolerance and there is evidence to suggest that this higher risk begins in childhood or even from birth. In addition to ethnic disparities, social class differs significantly in the prevalence of obesity, particularly in women. The Health Survey for England showed that 14% of men and women in professional groups were obese compared to 28% of women in unskilled manual occupations.

The aim of this care pathway was to improve the early identification of overweight and obesity in children and promote improved self-monitoring and school and health care support

Obesity risk tool 1

A proof of concept obesity risk tool has been developed, the methodology and results of which were published in 2013¹. This tool used anthropometry and childhood obesity risk data from 1868 UK-born White British and south Asian children obtained as part of a BiB sub-cohort study called BiB-1000. Logistic regression was used to develop prediction equations (at 6±1.5, 9±1.5 and 12±1.5 months) for risk of childhood obesity (BMI at 2 years > 91st centile and weight gain from 0-2 years > 1 centile band) incorporating sex, birth weight, and weight gain as predictors. The discrimination accuracy of the equations was assessed by the area under the curve (AUC); internal validity by comparing area under the curve to those obtained in bootstrapped samples; and external validity by applying the equations to an external sample. An App was built to incorporate six final equations (two at each age, one of which included maternal BMI). The equations had good discrimination (AUCs 86-91%), with the addition of maternal BMI marginally improving prediction. The AUCs in the bootstrapped and external validation samples were similar to those obtained in the development sample. The App was user-friendly, requires a minimum amount of information, and provided a risk

assessment of low, medium, or high accompanied by advice and website links to government recommendations.

Obesity risk tool 2

As part of the Promoting Healthier Growth CHC programme, new equations were developed (at 4-11, 12-23 and 24-35 months) to predict risk of childhood obesity (BMI at 4 to 5 years >98th centile) and overweight and obesity (BMI at 4 to 5 years >91st centile) using the same methodology as the first obesity risk tool. A total of 6807 participants in the BiB cohort were included in this study, with growth data obtained from BiB research and routine sources (Healthy Child Programme, National Child Measurement Programme (NCMP)). Predictors consistently associated with the outcomes in all equations for both outcomes were child birthweight and weight change z-score, and maternal BMI. Additional predictors for the risk of obesity were ethnicity in all equations, smoking during pregnancy in equations 1 and 2, and an interaction between weight change and sex in equation 4. For overweight and obesity, socioeconomic status additionally predicted the outcome in equations 1 and 2, and smoking during pregnancy and gestational diabetes were significant in equation 4. The discrimination of the equations was poorer than those for prediction overweight/obesity at 2 years, with AUCs at around 65%.

Future plans – the Healthy Weight Index

Our next objective is to build on our previous work by developing equations using pseudonymised health visitor, primary care and NCMP data that have been linked as part of Connected Yorkshire. Given the results from the equations developed using BiB cohort data, we will focus on identifying risk of overweight and obesity at two years. We are currently working with TPP, who deliver the SystmOne software that is used by all primary care practices within Bradford, to establish a way of embedding the Healthy Weight Index in clinical and school electronic health records. This would facilitate immediate feedback to parents on the risk of their children developing excess weight following routine height and weight measurements, in addition to automating referral to obesity prevention interventions. We will also develop a new mobile phone app which will be available to the wider population, enabling parents to monitor their own child's growth. The clinical index and mobile phone app will be evaluated by conducting a qualitative study to assess the feasibility and acceptability of the tools, and by monitoring the growth of children in Bradford following the implementation of the clinical index.

References

- 1 Santorelli, G. *et al.* Developing prediction equations and a mobile phone application to identify infants at risk of obesity. *PLoS One* **8**, e71183, doi:10.1371/journal.pone.0071183 (2013)