Data for Children Collaborative WITH UNICEF

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THE UNIVERSITY of EDINBURGH
Data-Driven Innovation
Part of the Edinburgh & South East Scotland City Region Deal

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GNC Predictive Analytics Workshop

Agenda

- Overview of the Collaborative
- Our Obesity Project
- The Problem in Scotland
- Growing Up in Scotland Survey
- Research Questions
- Methods
- Questions

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Read our annual report here

Who are we?

The Data for Children Collaborative with UNICEF is a unique partnership between UNICEF, The Scottish Government and the University of Edinburgh, hosted by The Data Lab

By leveraging expertise from each of the partner organisations and their networks, we aim to address existing problems using innovative data science techniques and ultimately improve children's lives.

Why do we exist?

Almost a billion children live in countries where the SDGs remain out of reach. Many children are at risk from issues such as climate change, conflict and disease. We aim to reach children across the globe.

In today's fast-paced technological landscape, where data is a driving force and evidence is vital to decision making. We want to provide the platform that brings together the data, skills and expertise to produce real-world impacts that help the world's children.

What are our priorities?

We have six key themes that we currently focus on: Climate Change, Mental Health, COVID-19, Nutrition, Population & Poverty. We have projects running under each of these themes, using a variety of different types of data, methodologies and different collaborative teams to answer the challenge questions posed by UNICEF and other delivery partners.

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Analyses of the “Growing up in Scotland (GUS)” child cohort to inform the design of obesity/overweight surveillance systems internationally

The Problem in Scotland

- In Scotland, almost a quarter of children are starting school overweight or obese
- Poorest children at over twice the risk (13.3% versus 6.4%) of the wealthiest of being obese
- Influx of cheap and convenient processed foods in our supermarkets means that this has steadily become more of an issue for more disadvantaged families
- Routine wt/ht measurements in Scottish schools only occur once, at age 5-6 (P1); they have proven challenging re: maintaining high levels of parental acceptance/GDPR regulations, pupil coverage, and measurement quality, while avoiding stigmatisation
- Many countries have yet to develop a successful method by which to regularly monitor the height and weight of a large national sample of children at any age.
- Could a validated predictive algorithm, based on routinely collected and universally available data, provide high quality predictive and outcome data?

Growing Up In Scotland Survey

- Growing Up in Scotland (GUS) is commissioned and funded by the Scottish Government
- Follows the lives of a national sample of Scotland's children from infancy through to their teens
- Seeks to describe the characteristics, circumstances and experiences of children in their early years (and their main carers) and to generate a better understanding of how children's start in life can shape their longer term prospects and development with particular reference to the role of early years service provision.
- Began in 2005
- Among 3430 children still in the Growing Up in Scotland Cohort at age 12 (recruited at age 10 months in 2004-5 and representative of entire Scottish infant population at that time)

Research Questions

1. What is the pattern of risk factors for obesity at age 12 (when it is likely to persist): i.e. its strength of association (RR) with child/family characteristics routinely-collected earlier in life, and/or previously found (or suspected) to be risk factors for/predictors of child obesity?
2. What is the predictive validity (Sensitivity, Specificity, Predictive Values, Area-Under-Receiver-Operating-Curves, various indices of multivariate model fit) – of a minimum set of these risk (predictive) factors, for obesity at age 12, which are typically routinely-collected/machine-readable for all children, and so could be used in NOSSs to screen ALL children at school entry (about age 5-6) for early treatment referral?

SUBQUESTIONS:

a. Does a Scottish-style universal weight/height measurement at age 5-6 improve the accuracy of screening children at risk of obesity at age 12, enabling early/ preventive intervention?

b. Do markers of family socio-economic status (parental education, household equivalised income and Scottish Index of Multiple Deprivation of residence) independently predict child obesity at age 12?

c. Do Adverse and Protective Childhood Experiences (i.e. those for which proxy measures are routinely collected) also independently predict obesity at age 12?

d. Do any of the above “most predictive” algorithms also predict obesity unrecognized by parents/the child at ages 12 (a target group potentially more amenable to preventive intervention)?

Methods

- **Source of data**: this study used data from the GUS cohort (sweep 1 to 9) from 'Birth cohort 1' born in 2004/5, with families first interviewed when the child was aged 10 months, and followed-up to age 12 – the latest age for which follow-up data are available.
- **Outcome**: obesity at age 12, defined according to the Information Services Division Scotland (child obesity as a BMI greater than or equal to 95th centile of a UK historical population's "normal" distribution, before the obesity pandemic set in)
- **Predictors**: 21 potential predictors were chosen to start with, based on our hypotheses , availability in the GUS cohort, and their feasibility for routine collection in HICs
- **Missing data**: the analysis of missing data patterns showed that variables did not tend to be jointly missing data; thus complete cases were used, given that only two variables were missing more than 3.5% of subjects with obesity data at age 12 (see Appendix 3).
- **Statistical analyses methods:**
  1) Bivariate analyses (logistic regression) to assess the strength of association (OR~RR) between obesity at age 12 and potential predictors
  2) Bivariate correlation analyses (to warn of potential multicollinearity in models)
  3) Predictor-variable reduction by stepwise selection (backwards and forwards) → informed by Akaike Information Criterion (AIC)
  4) Internal validation of models by bootstrapping, application of shrinkage factors (to correct for such models' tendency to be more accurate initially than later)
  5) Assessment of the discriminatory performance of the models and selection of optimal cut-off point by Youden's Index - maximising the sum of (SENS +SPEC)

Questions