מודלים לניבוי מוקדם של עודף משקל והשמנה בגיל הרך

מ ח ק ר - ל א ו מ י

Multivariable Prediction Models for Early Identification of Overweight and Obese Children- A National Study

Irit lior Sadaka[1], **Itamar Grotto**[2], **Yair Sadaka**[3], **Roni Eilenberg**[4], **Moshe Uziel**[4], **Assaf Peleg**[5], **Dan Greenberg**[1]

[1]Department of Health Policy and Management, School of Public Health, Faculty of Health Sciences, Ben-Gurion University of the Negev, Be'er-Sheva, Israel
[2]Department of Epidemiology, Biostatistics and Community Health Sciences, School of Public Health Faculty of Health Sciences, Ben-Gurion University of the Negev, Be'er-Sheva, Israel [3]Child Development Center Mental Health Institute, Be'er Sheva, Israel [4]Timna Initiative, Israel Ministry of Health, Jerusalem, Israel
[5]The Department of Computer Science, Ben-Gurion University of the Negev, Be'er-Sheva, Israel

Introduction

Global prevalence of adult obesity has nearly tripled over the last four decades. This trend now extends to adolescents, children and infants, causing a significant public health concern. Given the importance of early-life intervention in reducing future obesity, screening models to identify infants at risk more accurately are crucial. The aim of this study was to develop models for better predicting childhood obesity then the current WHO growth charts.

Methods

This retrospective cohort study included all children born in Israel between August 2014 and June 2016 who were followed for at least 18 months with available records in our database. The database Preventive care and health promotion services for early childhood provided in Israel through healthcare mother and child centers ("Tipat Halav"). Three different models were extracted for the following time periods: 0–3, 3–6, and 6–12 months of age.

The ***dependent variable*** (target variable): weight-for-height (or weight-for length) percentile at the age of 18–36 months was equal or greater than the 97th percentile. The ***independent variables*** (predictors): **1**). demographics **2**). birth variables **3**). mother's characteristics **4**). child growth measurements **5**). nutrition

The models

The three models are presented in **Figure 2.** Feature selection was conducted using a **Random Forest** machine learning algorithm. Variables with high relative importance were included in the **XGBoost** algorithm. We estimated the performance of each model by calculating Lift and receiver operating characteristics (ROC) area under the curve (AUC).

Results

The study cohort for Models 1, 2 and 3 is summarized in the following **Figure 1**:

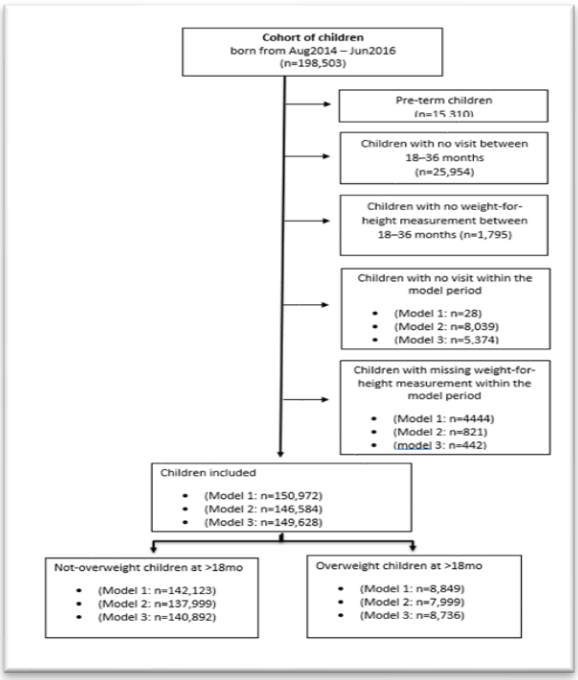
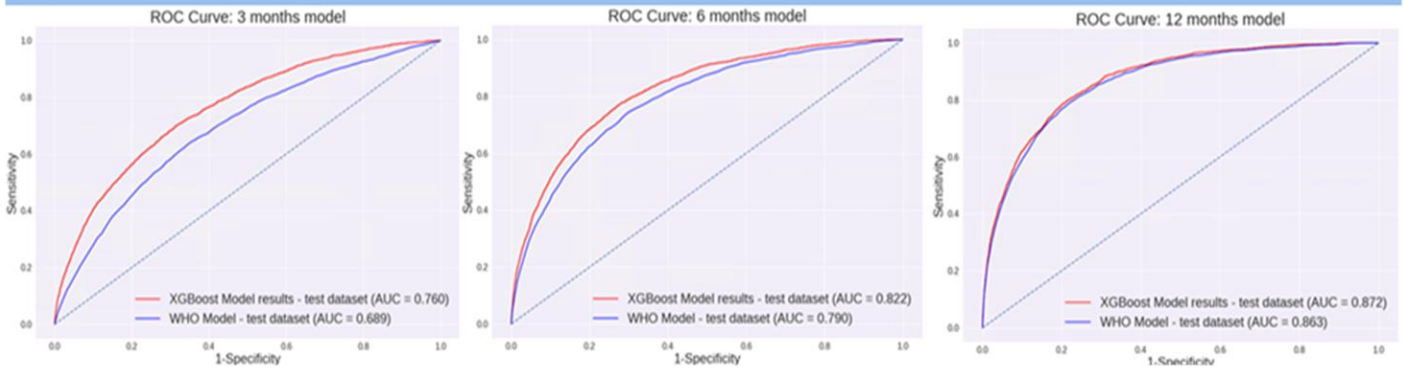


Figure 2: ROC Curves of the modals [receiver operating characteristics (ROC) area under the curve (AUC)]



Results (continued)

Our models demonstrate a higher ROC AUC performance over WHO Child Growth Standards for the 0–3 and the 3–6 month however, for 6–12 months, we could not establish a significantly better model. We tested separately prediction for target growth measurement at 18–24 months and 24–36 months, and the AUC was not affected significantly.

Conclusions

We analyzed multiple variables including demographics, birth variables, mothers' characteristics, and nutrition; however, most significant predictors were based on growth measurements.

Using these models for infants up to the age of 6 months, will make it possible to start an earlier and more accurate intervention for the population at risk of being overweight and obese later.

Link for early childhood overweight risk **calculator** is provided:

https://www.yeled-dev.org/risk-of-overweight-calculator/