Supplementary Online Content

Hakola L, Miettinen ME, Syrjälä E, et al. Association of cereal, gluten, and dietary fiber intake with islet autoimmunity and type 1 diabetes. *JAMA Pediatr*. Published online August 12, 2019. doi:10.1001/jamapediatrics.2019.2564

eMethods

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This supplementary material has been provided by the authors to give readers additional information about their work.

eMethods

Cereal calculations

The cereal calculations are based on the constantly updated national food composition database Fineli (National Institute for Health and Welfare, Finland, www.fineli.fi) that includes over 8000 food items including cereals as such (e.g. brans), home-made foods, commercial baby foods, and many other commercial foods, and snacks (cereal bars, meal mixes and cereal drinks). The database has been updated regularly for commercial baby foods. The Fineli database includes core dishes and ingredients (e.g. crisp bread and mixed flours) that are not broken down into individual cereals in calculation, and therefore, the in-house software (Finessi) cannot take all sources of cereals into account in the calculation of amounts of individual cereals. The existing food groups in Fineli were manually re-grouped into respective individual cereal food groups, and new coefficients for dry cereal content in foods were created. This new classification and calculation enabled us to study the consumption of individual cereals more precisely than before.

Joint model

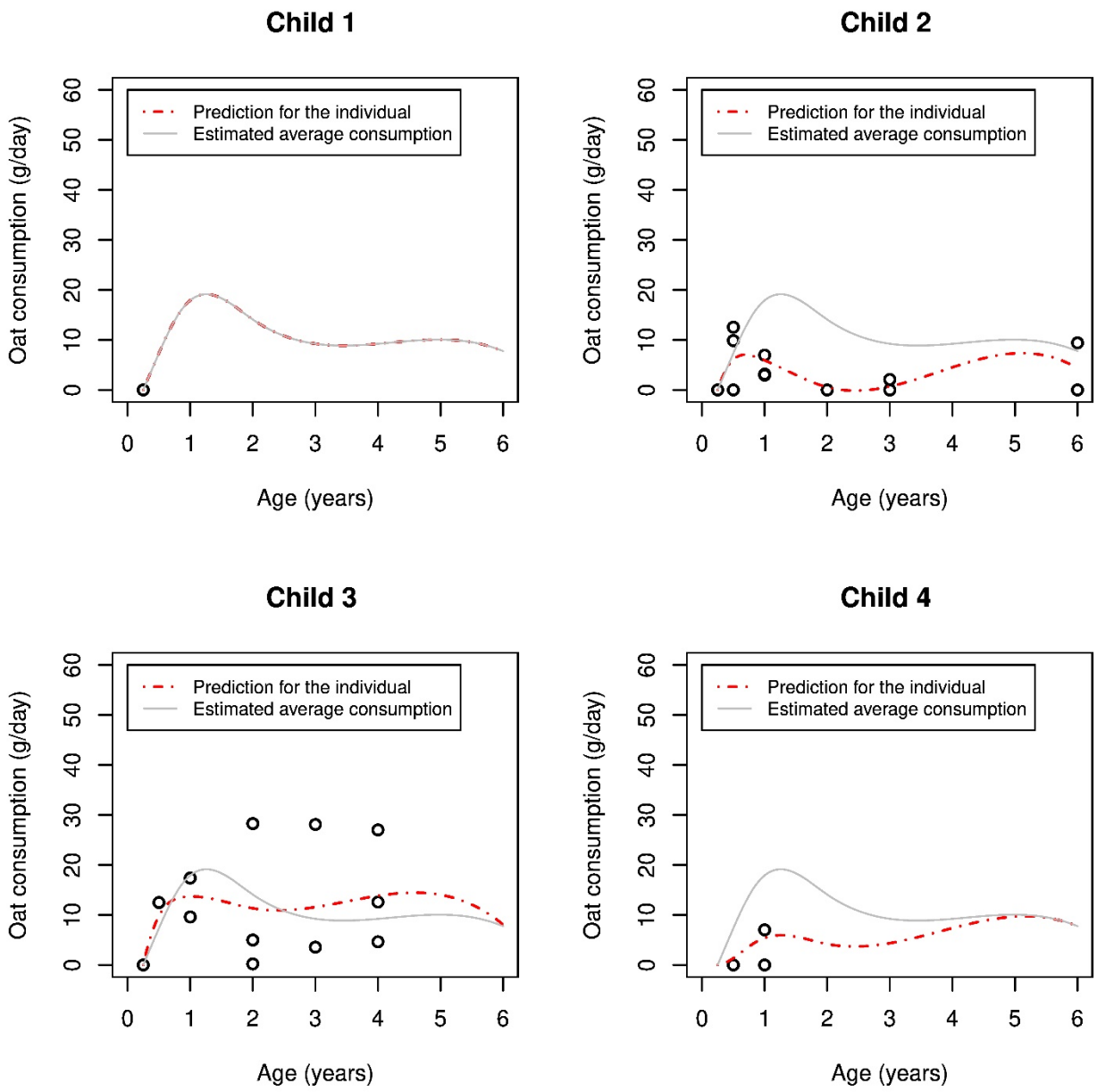
The formula of the joint model for child *i* were of the form:

$$\begin{cases} y_i(t) = m_i(t) + \epsilon_i(t) = \beta_0 + b_{0i} + \sum_{k=1}^{5} (\beta_k + b_{ki}) B_k(t) + \epsilon_i(t) \\ h_i(t|M_i(t), w_i) = e^{\gamma^T w_i + \alpha m_i(t)} h_0(t), \end{cases}$$

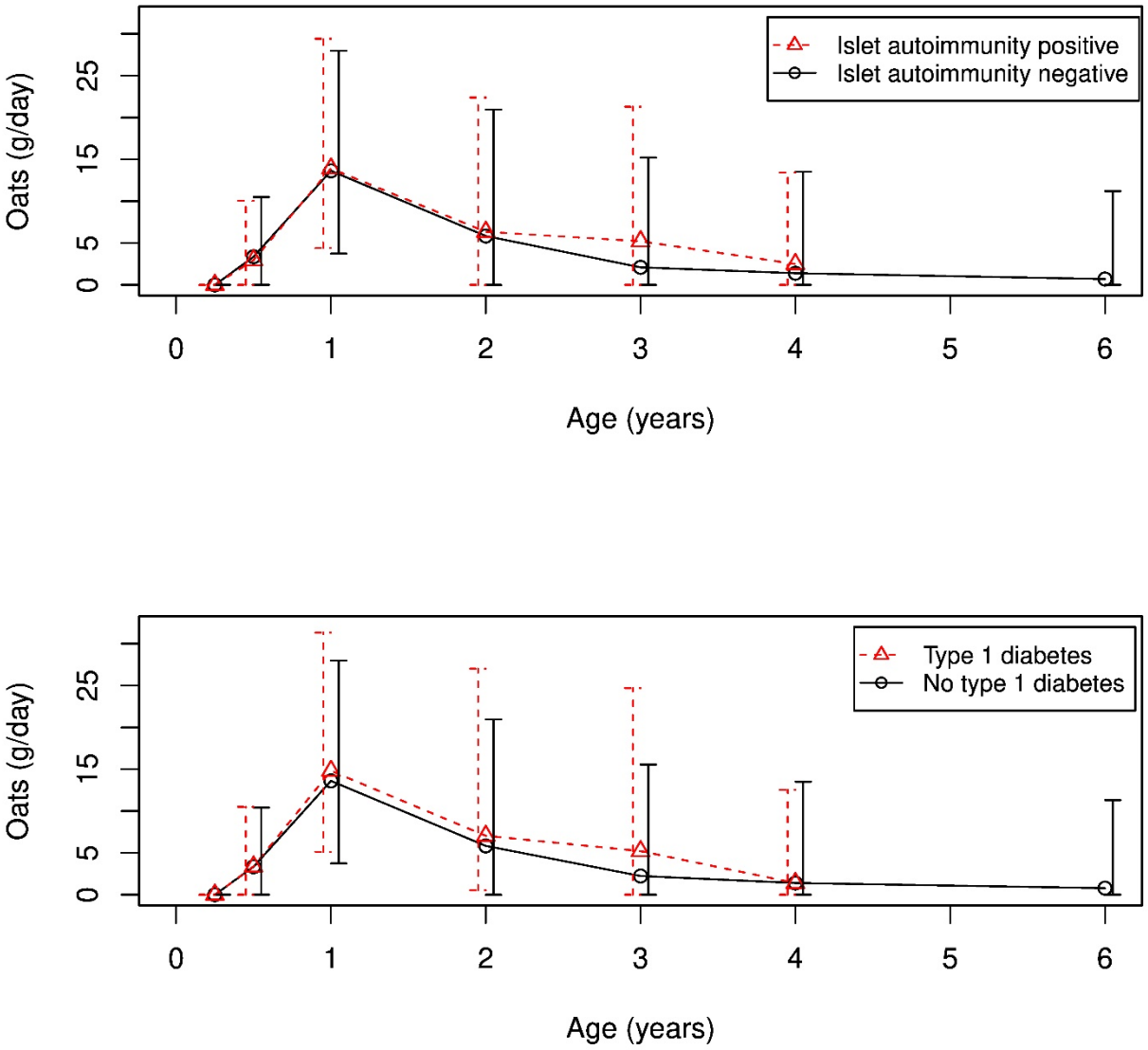
where β denote the fixed part and b denote subject specific random part of the intercepts and regression parameters. $B_k(t)$ is the value of kth B-spline basis function for a spline at age t and $\epsilon_i(t) \sim N(0, \sigma^2)$ are errors. $M_i(t) = \{m_i(s), 0 \leq s < t\}$ denotes the history of the cereal consumption profile until t, w_i is a vector of baseline covariates with a vector of regression parameters γ and $h_0(t)$ is the baseline hazard. The assumed covariance structure for the random effects was a diagonal matrix with unequal diagonal elements (variances). Two knots were used after finding a balance that allowed sufficient flexibility and avoided overfitting. The positions for two knots were selected based on the Bayesian information criterion from all relevant knot combinations.

Times-to-event for children with islet autoimmunity were set to the middle of the time interval between the last measurement, when child was not repeatedly positive for ICA and a biochemical autoantibody, and the measurement when child was repeatedly positive for ICA and at least one biochemical autoantibody.

eFigure 1. Examples of individual oat consumption profiles estimated by linear mixed effects model for 4 children.

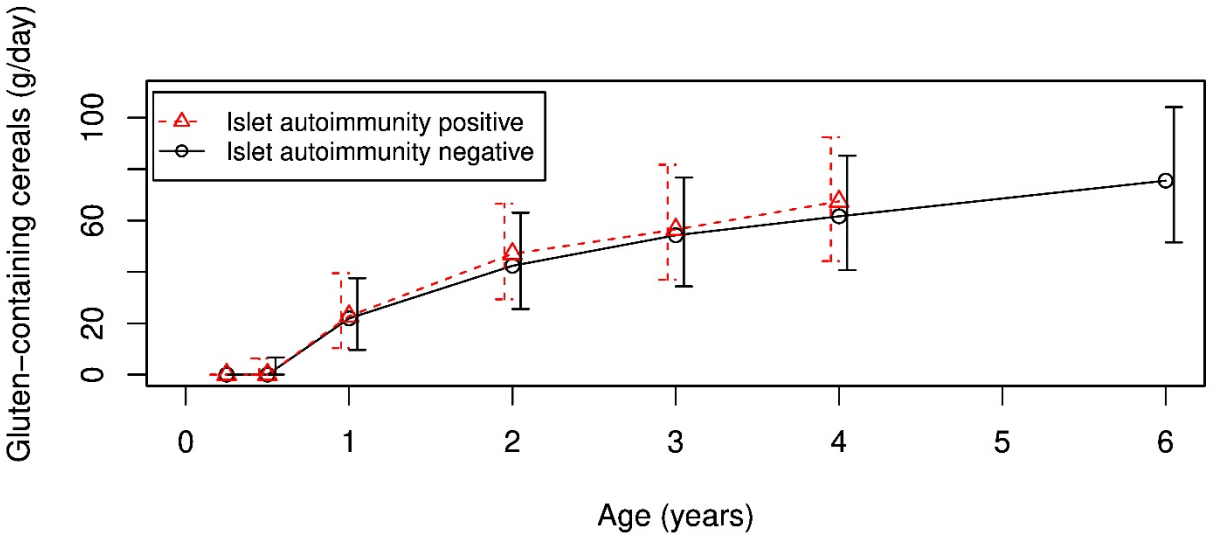


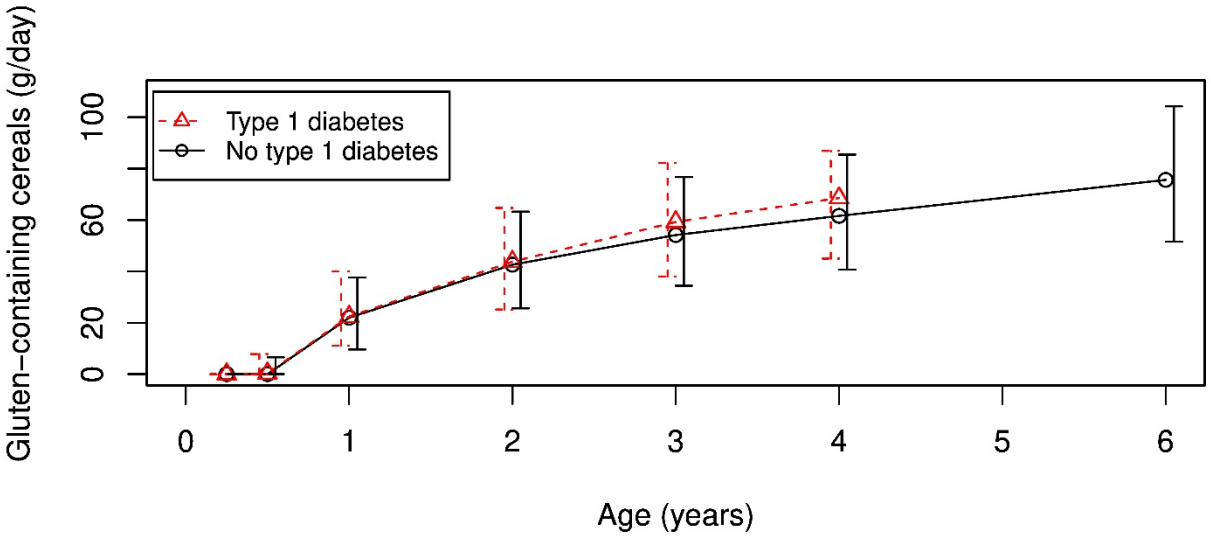
eFigure 2. Median (IQR) consumption of oats in children with and without islet autoimmunity and with and without type 1 diabetes by age.



The medians and interquartile ranges are based in daily oat intake in 246 children with autoimmunity, 5299 children without autoimmunity, 90 children with type 1 diabetes and 5624 children without type 1 diabetes.

eFigure 3. Median (IQR) consumption of gluten-containing cereals in children with and without islet autoimmunity and with and without type 1 diabetes by age.





The medians and interquartile ranges are based in daily intake of gluten-containing cereals (wheat, rye and barley) in 246 children with autoimmunity, 5299 children without autoimmunity, 90 children with type 1 diabetes and 5624 children without type 1 diabetes.