AN AUTOMATED ALGORITHM TO ESTIMATE INFANT NUTRIENT INTAKE

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BACKGROUND

- Assessment of nutritional intake in infancy is important in understanding the influence of early life factors on long-term health.
- Food frequency questionnaires (FFQ) are commonly used to estimate the nutritional intake.
- We have previously developed and validated a four-day complementary food frequency questionnaire (CFFQ) for assessing nutrient intake in New Zealand infants aged 9-12 months.[1]
- Analysis of FFQ is usually via manual input into nutritional software, allowing for individualisation of non-standard items, but this is time consuming and not feasible for large studies.

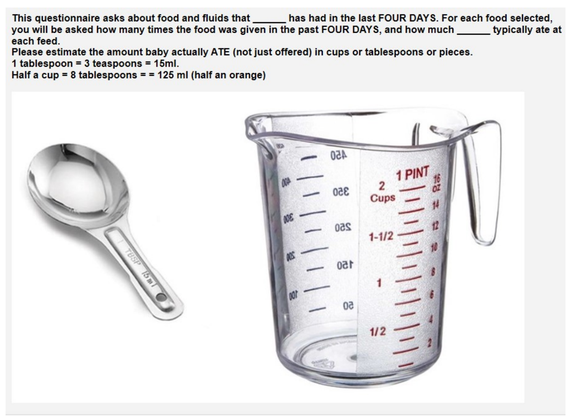

Figure 1 : Screenshot of electronic CFFQ administered online

AIM

To develop an automated algorithm for estimating nutrient intake from the CFFQ and compare accuracy to individualised analysis by nutritional software.

METHODS

50 electronic CFFQ administered in BabyGEMS study
(25 sequential questionnaires at 9 and 12 months)

NUTRIENT ANALYSIS

FOODWORKS (FW) ANALYSIS

- Manual entry of reported portion size and frequency of food consumed per day for 50 CFFQ
- Nutrient content was analysed using inbuilt databases in FoodWorks (Xyris software, 2018)
- For non-standard items, the nutrient information was entered into FW using the nutrition information panel (NIP) of the product

AUTOMATED ALGORITHM

- CFFQ data exported to Excel
- An algorithm was developed in SAS® 9.4 that combined frequency of consumption, amount and nutritional content per unit
- Non-standard items were excluded
- For commercial foods, a representative brand was chosen
- The code was checked and debugged in an iterative manner before final analysis

STATISTICAL ANALYSIS OF METHODS

Nutritional output from the Automated Algorithm was compared to FW using Bland-Altman analysis, including bias (95% CI) and 95% limits of agreement (LOA).

RESULTS

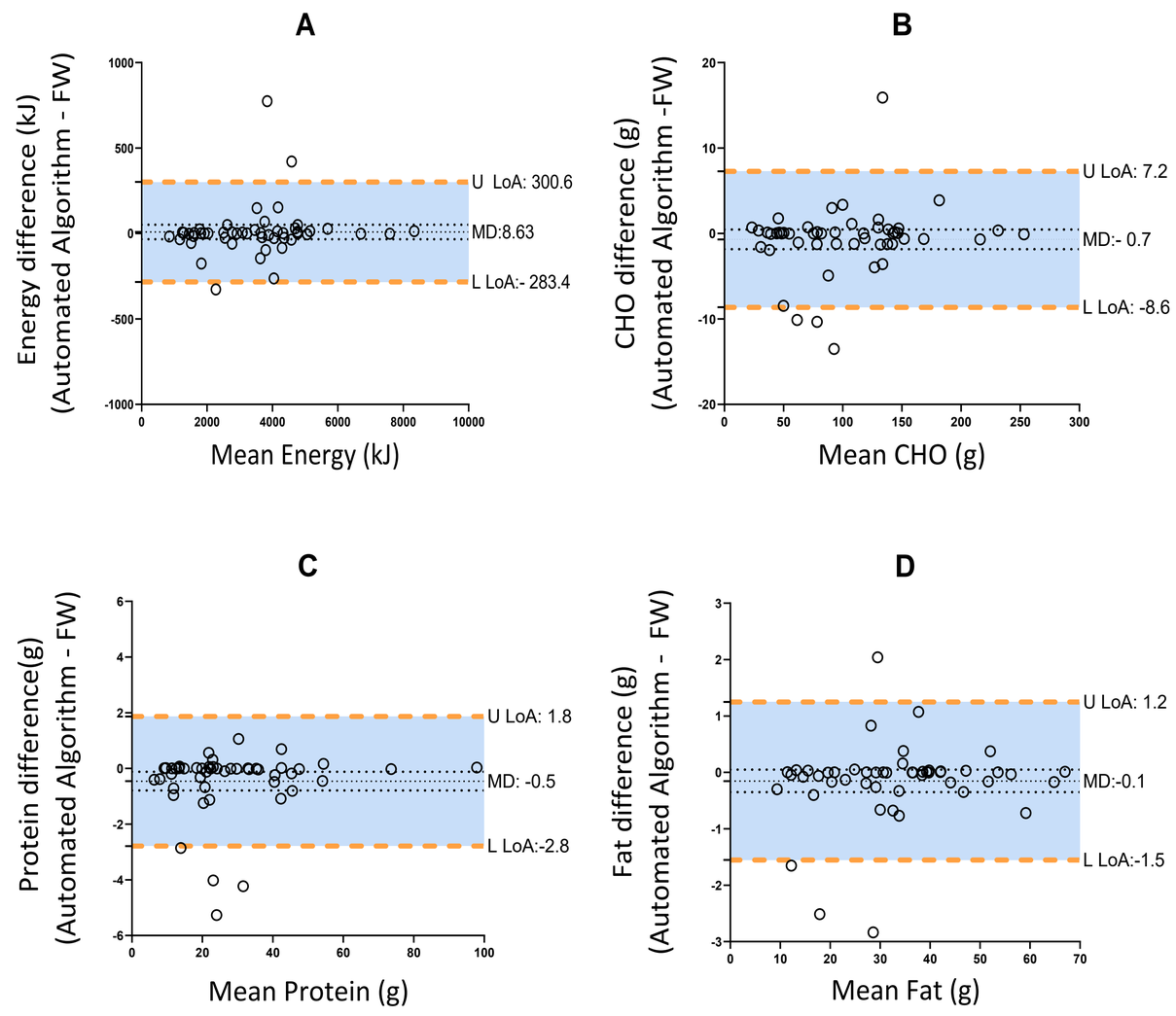

Figure 2: Bland–Altman plots comparing estimates of total energy, carbohydrates (CHO), protein and fat from 50 CFFQ obtained using the Automated Algorithm versus Food Works (FW). A) Total Energy Intake; B) Carbohydrate Intake; C) Protein intake; D) Fat intake; U LoA: upper limits of agreement; L LoA: lower limits of agreement; MD: mean difference (95% CI).

- There was no significant bias in estimates of energy, carbohydrate, and fat obtained by the Automated Algorithm compared to FW analysis.
- The Automated Algorithm slightly underestimated protein by 0.5 g (p=0.009). This appeared to be due to the non-standard items not being included in the Automated Algorithm and variable composition of commercial foods.
- The LOA were relatively narrow (within 5-10% of mean values for energy and all macronutrients).

CONCLUSION

- The Automated Algorithm provides acceptable estimates of energy, carbohydrate and fat from the CFFQ and can be used to derive nutritional intake of infants in large cohort studies or clinical trials.
- The Automated Algorithm produced a small negative bias in estimates of protein, but this is unlikely to be clinically significant. Further adjustment of the protein value used for commercial foods may limit bias.

Reference: [1]Judd, A. L., Beck, K. L., McKinlay, C., Jackson, A., & Conlon, C. A. (2019). Validation of a Complementary Food frequency Questionnaire to assess infant nutrient intake. *Maternal & Child Nutrition, 0*(0), e12879. 10.1111/mcn.12879

GEMS
Gestational Diabetes Mellitus Trial of Detection Thresholds