



Low adherence of Swiss children to national dietary guidelines

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ABSTRACT

Introduction. Dietary guidelines aim to inform people of the types of foods and quantities they should consume each day or week to promote and maintain health. The aim of this study was to describe children's dietary behaviors in terms of adherence to the Swiss Society for Nutrition (SSN) dietary guidelines and possible determinants.

Methods. A cross-sectional study was conducted in September 2010 with 568 children aged 6–12 years old living in Ticino Switzerland. Food intake was collected using 7-day food logs. Adherence with the dietary guidelines from the SSN was assessed according to age group.

Results. With the exception of fish and cereal/potato intake (adherence rates of 68.5% and 47.9%, respectively), adherence to SSN guidelines was low: 26.9% for meat; 22.7% for eggs; 10.4% for fruit; 9.5% for sweets, snacks & soft drinks; 3.5% for milk & dairy, and 0% for vegetables. Multivariate analysis showed no consistent association between the child or their parent's socio-demographic characteristics and adherence to SSN guidelines. Girls had a higher likelihood of adhering with fruit and meat guidelines: multivariate adjusted odds ratio (95% confidence interval) 1.98 (1.10–3.56) and 1.80 (1.08–2.99), respectively. Children aged 10 to 12 had a lower likelihood of adhering with cereals and potatoes 0.48 (0.29–0.78), and a higher likelihood of adhering with the guideline for eggs 1.78 (1.00–3.15).

Conclusion. Dietary intake of Ticinese children shows poor adherence with SSN guidelines. Given the lack of specific socio-demographic factors associated with adherence, population-wide interventions to improve dietary intake are necessary.

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1. Introduction

Unhealthy diets can lead to high blood pressure, increased blood glucose, elevated blood lipids, and obesity; all intermediate risk factors for cardiovascular diseases. Conversely, diets rich in fruits and vegetables reduce the risks of several non-communicable diseases and cancers (McNaughton et al., 2009; Fernandes et al., 2013; World Cancer Research Fund and American Institute for Cancer Research, 2007; Anon.; World Health Organization (WHO), 2011). Moreover, there is some evidence of linkages between cognitive functioning, academic performance and children's food intake: excessive intake of saturated fats and simple carbohydrates is adversely associated with several learning and memory processes (Correa-Burrows et al., 2015; Nyaradi et al., 2014; Northstone et al., 2012).

Despite the evidence on the importance of a healthy diet and the consequences of an unhealthy one, the overall quality of diets has declined. There has been a shift from diets high in grains and vegetables to diets rich in fat and sugar and characterized by increased consumption

of processed foods (Popkin and Ng, 2007; World Health Organization (WHO), 2007). Eating habits are acquired during childhood (Hu, 2008; Krebs et al., 2007; Birch, 1999; Anzman et al., 2010) and generally endure over one's life (World Health Organization (WHO), 2014). Thus, it is critical that children follow a healthy diet.

Both the Food and Agricultural Organization and the World Health Organization have provided recommendations on energy proteins and nutrient requirement since the 1950s (European Food Safety Authority, 2007). On the contrary, food based dietary guidelines aim to inform people of the types of foods and quantities they should consume, daily and weekly, to promote and maintain health. In Switzerland, the Swiss Society for Nutrition (SSN) has issued food based guidelines for adults and children (Walter et al., 2007). Several studies have shown that adherence with the guidelines is low among Swiss adults (de Abreu et al., 2013, 2014; Meier et al., 2010). However, to date, no study has assessed dietary guideline adherence in children.

The aim of this study was to describe children's dietary behaviors in terms of adherence to the SSN 2010 dietary guidelines. Data from a sample of children living in the Italian-speaking canton of Ticino (a heterogeneous state with mountain villages, rural areas and small cities that hosts around 350,000 residents) that were attending public elementary

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school or first two classes of middle school and who enrolled in the project FAN (Famiglia, Attività fisica, Nutrizione) in 2010 (Suggs et al., 2013) were used.

2. Methods

2.1. Sampling

Data come from the project FAN (Famiglia, Attività fisica, Nutrizione) conducted in September 2010. Details of the project FAN have been described previously (Suggs et al., 2013). Briefly, FAN was an 8-week social marketing program offered free of charge to families in Ticino and promoted through schools. It encouraged and advised children and their parents to eat healthy and get regular physical activity. The data used in this study were collected prior to exposure to the intervention.

2.2. Non-dietary data collection

Through a survey administered to parents of participating children, parents were asked to provide their highest educational degree and their child's height and weight. The child's body mass index (BMI) was calculated and the child was categorized as underweight, healthy weight, overweight and obese according to age and gender-specific criteria from the U.S. Centers for Disease Control and Prevention, that have been previously validated with Swiss children aged 6–12 (Zimmermann et al., 2004).

2.3. Dietary data collection and adherence with dietary guidelines

Food intake of the children was collected using a paper based 7-day food log validated for this population (*insert reference after peer-review*). For each day of the week, children were asked to write down the foods and beverages they consumed at the main meals (breakfast, lunch and dinner) and between them (morning, afternoon and after dinner). Information about portion size was not collected because of known difficulties in accurate self-report of portion sizes (Livingstone and Robson, 2000; Foster et al., 2009; Collins et al., 2010; Thiagarajah et al., 2008). The 7-day food log was used for several reasons. First, there is no food frequency questionnaire for children available in Ticino. Second, daily logging of food consumption is more accurate than 3–7 day recall reporting. Finally, the instrument was tested with parents and children independently recording what the child ate each day and a high level agreement between parents and children was found (note: data are available upon request).

Coding procedures of the food log was developed in collaboration with a registered dietician and the foods were categorized into fruit; vegetables; milk, probiotics & dairy; sweets, snacks and soft drinks (SSD); cereal & potatoes; eggs; fish; and meat. An example of the foods included in each category is provided in Supplementary Table 1. As dietary guidelines include daily and weekly consumption recommendations, daily consumptions were averaged throughout the week by summing the frequency of consumption of each of the eight food categories from every meal throughout the week and dividing this count by the number of days the child completed the log), while weekly consumptions were obtained by summing the frequency of consumption of each of the eight food categories from every meal. The 2010 SSN recommendations for children are summarized in Supplementary Table 2.

A child was categorized as adhering to the SSN dietary guidelines if their consumption was within the range proposed by SSN for food consumed daily. For instance, according to the SSN guidelines, a child aged 6 should eat three portions of dairy daily. For this analysis, a 6-year old child was considered as adherent to the dairy recommendations if they ate dairy between 2.8 and 3.2 times per day. Fish and fruit over-consumers (eating fish more than once a week or eating fruits

more than twice a day) were considered to be adherers, as an overconsumption of these foods was not considered harmful.

2.4. Statistical analyses

Statistical analyses were performed using Stata 13.0 (Stata Corp, College Station, TX, USA). Descriptive results were presented as mean \pm standard deviation or as the percent or actual number of participants. Bivariate associations between adherence and several characteristics of the sample were assessed by chi-square or by Fisher's exact test. Multivariable associations were assessed by logistic regression and the results were expressed as odds ratio and (95% confidence interval). Sensitivity analyses were conducted including all data available in the bivariate analysis. All tests were two-sided and statistical significance was assessed for $p < 0.05$.

2.5. Ethics statement

Study procedures were reviewed by the Canton Ticino Ethics Committee and voted "except" from human research ethics approval in accordance with Swiss law. The recommendations in the Helsinki Declaration were followed and all participants, both children and parents, provided informed consent and voluntarily provided their data.

3. Results

3.1. Characteristics of the participants

Out of the 750 children who enrolled in FAN, 607 children completed the food log in September 2010 and 568 of them (93.6%) had complete data for analysis. Comparison between children with and without complete data showed no major differences, except that children with incomplete data were more often from a non-Swiss family (i.e. from parents without Swiss citizenship) than children with complete data (Supplemental Table 3).

Of the 568 children included, 287 (50.5%) were female and mean age was 8.5 ± 1.9 years. The frequencies of underweight, healthy weight, and overweight/obesity were 10.4%, 72.0% and 17.6%, respectively. The reported parent's education was 26.4% high, 15.5% middle and 58.1% low.

3.2. Adherence with dietary guidelines

The overall rates of adherence with the SSN guidelines were, in descending order, 68.5% for fish; 47.9% for cereals & potatoes; 26.9% for meat; 22.7% for eggs; 10.4% for fruit; 9.5% for SSD; 3.5% for milk & dairy and 0% for vegetables (Table 1). For SSD, all non-adherers were over-consumers, a similar trend being for meat, for which 72.7% were over-consumers. Conversely, for eggs and cereals & potatoes, most non-adherers were under-consumers (71.0% and 51.6%, respectively).

3.3. Factors associated with adherence

The bivariate associations between adherence with the SSD guidelines and the characteristics of the children and their parents are summarized in Table 1. Children aged 10 to 12 had a lower adherence to cereal & potato recommendations and a higher adherence to egg consumption; girls had a higher adherence to fruit and meat guidelines. Children whose parents were Swiss and children whose parents were obese or with a healthy weight had a higher adherence to meat guidelines, but the numbers were rather small. Finally, both children who took part in the FAN project with their mothers and children whose parents were non-Swiss had a higher adherence to fruit guidelines (Table 1).

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