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# Predisposing, facilitating and reinforcing factors of healthy and unhealthy food consumption in schoolchildren: a study in Ouagadougou, Burkina Faso

Charles Daboné<sup>1,2</sup>, H  l  ne Delisle<sup>1</sup> and Olivier Receveur<sup>1</sup>

## Abstract:

**Objective:** African schoolchildren's dietary habits are likely changing in the realm of the nutrition transition, particularly in urban areas, but data on their diet and on determinants are scanty. In order to design relevant interventions for this priority target group, the study aimed to assess food habits and their determinants in schoolchildren of Ouagadougou.

**Methods:** In a cross-sectional survey, fifth-grade schoolchildren filled during school hours a questionnaire to assess consumption frequency of 'healthy' foods (fruits, vegetables, meat, fish, legumes) and 'unhealthy' (superfluous) items (cake, cookies, candies, ice, soda) and underlying factors, using Green's PRECEDE model.

**Results:** The study included 769 schoolchildren, mean age  $11.7 \pm 1.4$  years, from eight public and four private schools. Consumption scores of unhealthy items were significantly higher than healthy foods ( $p = 0.001$ ). During the week prior to the survey, 25% of children had eaten no fruit, 20% no meat, 20% no legumes, 17% no fish and 17% no vegetables. While less than 4% ate fruits or vegetables every day, 18.3% ate ice pop every day. Children eating cookies, cakes and candy every day were up to seven-fold those eating fruits, vegetables or legumes. Compared to public-school pupils, those from private schools consumed both healthy and unhealthy items more frequently ( $p = 0.002$  and  $p = 0.007$ , respectively). Urban schoolchildren had significantly higher unhealthy food scores ( $p = 0.027$ ) compared to peri-urban schools. Children's healthy and unhealthy food consumption was primarily explained by perceived decisional power and availability [facilitating factors] for both types of foods, and maternal reinforcement for healthy foods and peers' reinforcement for consumption of unhealthy items. Overall, facilitating factors rated higher for unhealthy than healthy foods.

**Conclusion:** The study showed that city schoolchildren's eating behaviours are far from optimal. Nutrition interventions should be tailored to address the underlying factors in order to impact on behaviours, thereby preventing both dietary inadequacies and excess. (Global Health Promotion, 2013; 20(1): 68–77)

**Keywords:** healthy, unhealthy, food behaviour, schoolchildren, Africa, Burkina Faso

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## Introduction

Available data on schoolchildren of the developing world, particularly in Africa, underline the high prevalence of malnutrition (1,2) along

with the growing problem of overweight/obesity as reported in South Africa (3). Beyond the socio-economic determinants (4), food habits play a

1. TRANSNUT- WHO collaborating Centre on Nutrition Changes and Development, Department of Nutrition, Faculty of Medicine, University of Montreal, Canada.
2. Laboratoire National de Sant   Publique, Burkina Faso.

Correspondence to: Charles Dabon  , TRANSNUT- WHO collaborating Centre on Nutrition Changes and Development, Department of Nutrition, Faculty of Medicine, University of Montreal, 2405 Chemin de la C  te Ste Catherine, Montreal QC, H3T 1A8, Canada. Email: chdabone@yahoo.fr

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central role in schoolchildren's health and nutritional status (5). Schoolchildren's food habits are rapidly changing nowadays (6) with the undergoing nutrition transition in developing countries (7). Poor eating patterns documented in western countries' schoolchildren are now spreading in developing countries (6), with potential negative impact on health (8). To prevent nutritional disorders, lifestyle approaches that promote healthy eating are encouraged (9), with focus on fruit, vegetable, animal foods, cereals and legumes as sources of essential nutrients for health (10). These foods are qualified as 'healthy', while the so-called 'empty-calorie foods', such as biscuits, pastries, sweets and sugar-added beverages are qualified as 'unhealthy' (11). Unhealthy foods are so named because of their high energy density and high content in saturated and trans fats, sodium, cholesterol and sugar (11) while being poor in essential nutrients. Those foods are considered responsible in a large part for the global obesity epidemic in children (12). In low-income countries of Africa, obesity in school-age children may not be a problem yet, as confirmed in Burkina Faso (2,13), but environmental factors, particularly in cities, may be conducive to obesity. For instance, pupils are exposed to street foods (14) that influence their food choices, which may track into adulthood (15). While street foods are convenient in the absence of school feeding programs, they are often criticized for lack of hygiene (16) and their high fat and sugar content (17). Several social, psychosocial and physical factors, such as food availability and accessibility, children's knowledge and attitudes, and the influence of significant others, play a great role in their food behaviours (18,19). However, schoolchildren's diets and underlying factors are poorly documented. Several theoretical models of human behaviour have been proposed (20,21). The PRECEDE framework for health program planning provides for examining predisposing, reinforcing and enabling factors of behaviour (22). This model was deemed relevant to study schoolchildren's food habits and determinants in Ouagadougou, the capital city of Burkina Faso. The purpose of the study was to document 'healthy' and 'unhealthy' food consumption. We hypothesized that unhealthy foods were widely consumed and we intended to identify influential factors.

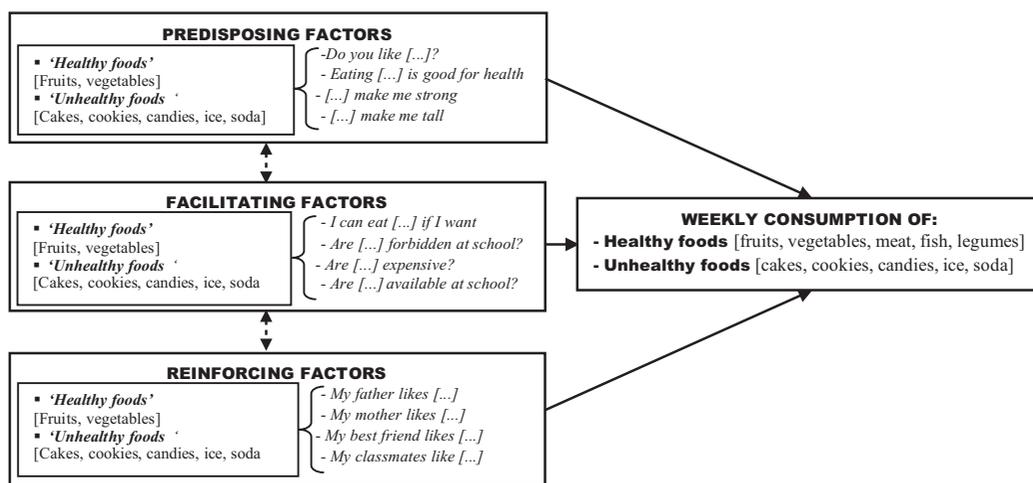
## Material and methods

### *Study design, setting and sample*

The cross-sectional study on eating patterns of healthy/unhealthy foods and underlying factors was conducted in 2009 in eight public (including two located in the peri-urban area) and four private schools of Ouagadougou. These 12 schools were purposively selected in accordance with the ministry of education of Burkina Faso. The ministry chose six *intervention schools* based on specific criteria, namely: school staff commitment, school size, proportion of girls and school location and type. We then matched these *intervention schools* with *control schools* using the same criteria. Minimum sample size ( $n = 770$ ) was calculated with 5% alpha error and 80% power on the basis of anaemia prevalence. All 935 schoolchildren enrolled in the fifth grade of selected schools were invited to participate. The study was to serve as baseline for the implementation and evaluation of an ongoing intervention. More details on sampling procedure is described elsewhere (2).

### *Questionnaire*

The questionnaire was developed on the basis of other studies (23,24) and the Centers for Disease Control and Prevention/World Health Organization (CDC/WHO) self-administered questionnaire used in the Global School-based Student Health Survey (GSHS) project (25). As illustrated in Figure 1, questions addressed predisposing (personal), facilitating (environmental) and reinforcing (social) factors of specific food consumption, according to the PRECEDE model (22). The questionnaire was pre-tested with 53 pupils in the fifth-grade level of a peri-urban school. The objectives were clearly exposed to children and the questionnaire was self-administered as a classroom exercise. The principal investigator (CD) read every question, after which pupils were encouraged to ask for clarification if needed and then wrote their answers. Through the question 'In the last week, on how many days did you eat [...]?' children recorded their weekly consumption (number of days from 0 to 7) of 'healthy foods' (fruits, vegetables, meat, fish, legumes) and 'unhealthy foods' (cakes, cookies, candies, ice pop, soda). A total score (lowest = 0, highest = 35) was generated for the five



**Figure 1.** Factors underlying behaviour and questions asked regarding healthy and unhealthy foods items [Adapted from the PRECEDE model of Green and Kreuter (22)]  
[...] = name of the particular food item (fruits, vegetables, cakes, cookies, candies, ice pop, soda)

healthy foods and five unhealthy foods by summing the individual food scores in each category. Children were then questioned on a series of predisposing, facilitating and reinforcing factors (Figure 1). Two healthy foods (fruits and vegetables) and all unhealthy foods were used for this purpose. A rating of 0 was given to 'No', 1 for 'I don't know' (or 'A little') and 2 for 'Yes'. The total score was computed for the four answers under each factor (lowest = 0, highest = 8).

### Ethical considerations

The study was approved by the ethics committees of the University of Montreal, Canada, and of the Ministry of Health of Burkina Faso. Parental signed consent was obtained for each participating child, who also had to accept personally.

### Statistical analyses

Data were processed with SPSS.17 software (SPSS, Inc., Chicago, IL) using the *t*-test and  $\chi^2$  test for comparisons. Pearson's correlation was used for association between variables, and multiple linear regression was conducted to find independent associations between food behaviour and its determining factors. All analyses were considered significant at  $p < 0.05$ .

## Results

### Socio-demographic characteristics of children

We obtained 806/935 (86.2%) parental consents and report here on 769 pupils (48.1% boys) with complete data. Seventy per cent of pupils were from public schools and one child out of five was from the peri-urban area of the city. The mean age of the sample was  $11.7 \pm 1.4$  years.

### Healthy/unhealthy food consumption

As shown in Table 1, one child out of four (24.8%) had not eaten any fruit during the previous week and less than 1% ate fruit every day. Only 8.6% and 9.0% of children ate fish or meat every day, respectively. Almost 20% had not eaten any meat, 20% no legumes and 17% no vegetable and no fish. In contrast, 6.4–7.7% of pupils ate cakes, cookies and candies every day; 18.3% had eaten ice pop (a snack essentially made of coloured and sweetly flavoured juice, frozen around a stick or in a small plastic bag) every day in the past week. Comparing healthy and unhealthy scores, the former were significantly lower than nearly all the latter, except for soft drinks.

Figure 2 shows that pupils consumed significantly more frequently unhealthy ( $12.1 \pm 7.3$ ) than healthy

**Table 1.** Weekly consumption of healthy and unhealthy foods ( $N = 769$ )

Food items	Weekly consumption (%)					Mean scores $\pm$ SD <sup>‡</sup>
	0 day	1–2 days	3–4 days	5–6 days	7 days	
<b>Healthy foods</b>						
Fruits	24.8	41.1	25.7	7.4	0.9	1.9 $\pm$ 1.7
Legumes	19.6	46.4	23.1	7.8	3.0	2.1 $\pm$ 1.8
Vegetables	17.0	42.9	27.7	8.3	4.0	2.3 $\pm$ 1.8
Fish	17.2	38.8	24.7	10.8	8.6	2.6 $\pm$ 2.1
Meat	19.2	37.6	23.0	11.2	9.0	2.6 $\pm$ 2.2
<b>Unhealthy foods</b>						
Soda	52.8	30.3	10.3	5.7	0.9	1.1 $\pm$ 1.6 <sup>a</sup>
Cookies	27.2	32.5	23.4	10.5	6.4	2.3 $\pm$ 2.1 <sup>b</sup>
Cakes	17.3	36.9	25.1	13.3	7.4	2.6 $\pm$ 2.1 <sup>c</sup>
Candies	13.3	36.5	29.1	13.4	7.7	2.8 $\pm$ 2.0 <sup>d</sup>
Ice pop	14.7	29.3	23.9	13.8	18.3	3.3 $\pm$ 2.4 <sup>d</sup>

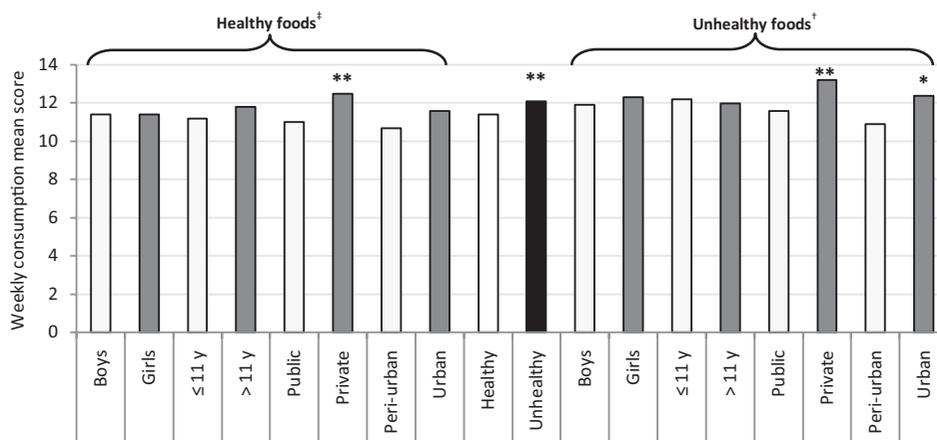
‡lowest = 0, highest = 7

<sup>a</sup>lower than all healthy foods ( $p < 0.001$ )

<sup>b</sup>lower than fish and meat ( $p < 0.01$ ), higher than legumes ( $p < 0.05$ ) and fruits ( $p < 0.001$ )

<sup>c</sup>higher than fruits, legumes and vegetables ( $p < 0.001$ )

<sup>d</sup>higher than all healthy foods ( $p < 0.05$  to  $p < 0.001$ )

**Figure 2.** Weekly food consumption scores according to sex, age, school type and school location.

\* $p < 0.05$ , \*\* $p < 0.01$ ,

<sup>‡</sup> (Fruit score + vegetable score + meat score + fish score + legume score)

<sup>†</sup> (Cake score + cookie score + candy score + Ice pop score + soda score)

foods ( $11.4 \pm 6.3$ ). Those attending private schools consumed both healthy foods ( $12.5 \pm 6.7$  versus  $11.0 \pm 6.1$ ,  $p = 0.002$ ) and unhealthy foods ( $13.2 \pm 7.5$  versus  $11.6 \pm 7.2$ ,  $p = 0.007$ ) more frequently

than their public school peers. Urban pupils consumed unhealthy foods significantly more frequently than their counterparts in the peri-urban schools ( $12.4 \pm 7.3$  versus  $10.9 \pm 7.3$ ).

**Table 2.** Behaviour determinants regarding healthy and unhealthy foods as perceived by schoolchildren

Behaviour Determinants	Mean scores (mean $\pm$ SD)						
	Healthy foods		Unhealthy foods				
	Fruits	Vegetables	Cakes and cookies	Candies	Ice pop	Soda	Ice pop and Soda
<b>Predisposing factors<sup>†</sup></b>							
<i>Well liked</i>	1.9 $\pm$ 0.3	1.6 $\pm$ 0.7	1.9 $\pm$ 0.4	1.8 $\pm$ 0.5	–	–	1.9 $\pm$ 0.4
<i>Good for health</i>	1.3 $\pm$ 0.8	1.2 $\pm$ 0.8	1.1 $\pm$ 0.8	0.7 $\pm$ 0.7	–	–	1.2 $\pm$ 0.8
<i>Makes me strong</i>	1.2 $\pm$ 0.7	1.1 $\pm$ 0.7	0.9 $\pm$ 0.7	0.5 $\pm$ 0.6	–	–	1.0 $\pm$ 0.7
<i>Makes me tall</i>	1.1 $\pm$ 0.7	1.0 $\pm$ 0.7	0.8 $\pm$ 0.7	0.5 $\pm$ 0.6	–	–	0.9 $\pm$ 0.7
<b>Total<sup>‡</sup>¥</b>	<b>5.5 <math>\pm</math> 1.6</b>	<b>4.7 <math>\pm</math> 1.9<sup>a,b</sup></b>	<b>4.7 <math>\pm</math> 1.6<sup>a</sup></b>	<b>3.5 <math>\pm</math> 1.6</b>			<b>4.9 <math>\pm</math> 1.7<sup>b</sup></b>
<b>Facilitating factors<sup>†</sup></b>							
<i>If I want I can eat</i>	0.7 $\pm$ 0.7	0.7 $\pm$ 0.7	0.7 $\pm$ 0.9	0.8 $\pm$ 0.9	0.8 $\pm$ 0.9	0.5 $\pm$ 0.8	–
<i>Not forbidden at school</i>	1.6 $\pm$ 0.8	1.5 $\pm$ 0.8	1.8 $\pm$ 0.6	1.8 $\pm$ 0.6	1.8 $\pm$ 0.6	1.7 $\pm$ 0.7	–
<i>Not expensive</i>	0.8 $\pm$ 0.8	1.0 $\pm$ 0.8	1.6 $\pm$ 0.7	1.8 $\pm$ 0.7	1.7 $\pm$ 0.6	0.4 $\pm$ 0.6	–
<i>Available at school</i>	0.7 $\pm$ 0.8	0.3 $\pm$ 0.6	0.6 $\pm$ 0.8	0.9 $\pm$ 0.9	1.3 $\pm$ 0.9	0.2 $\pm$ 0.4	–
<b>Total<sup>‡</sup>¥</b>	<b>3.8 <math>\pm</math> 1.6</b>	<b>3.5 <math>\pm</math> 1.5</b>	<b>4.6 <math>\pm</math> 1.5</b>	<b>5.2 <math>\pm</math> 1.6</b>	<b>5.6 <math>\pm</math> 1.8</b>	<b>2.6 <math>\pm</math> 1.3</b>	
<b>Reinforcing factors<sup>†</sup></b>							
<i>Father likes</i>	1.5 $\pm$ 0.7	1.2 $\pm$ 0.7	1.0 $\pm$ 0.7	0.8 $\pm$ 0.7	1.1 $\pm$ 0.8	1.6 $\pm$ 0.6	–
<i>Mother likes</i>	1.7 $\pm$ 0.6	1.5 $\pm$ 0.7	1.2 $\pm$ 0.8	0.9 $\pm$ 0.8	1.3 $\pm$ 0.8	1.7 $\pm$ 0.6	–
<i>Best friend likes</i>	1.6 $\pm$ 0.6	1.3 $\pm$ 0.6	1.7 $\pm$ 0.5	1.6 $\pm$ 0.6	1.6 $\pm$ 0.6	1.6 $\pm$ 0.5	–
<i>Classmates like</i>	1.4 $\pm$ 0.54	1.2 $\pm$ 0.5	1.4 $\pm$ 0.5	1.4 $\pm$ 0.5	1.5 $\pm$ 0.5	1.5 $\pm$ 0.5	–
<b>Total<sup>‡</sup>¥</b>	<b>6.1 <math>\pm</math> 1.3</b>	<b>5.1 <math>\pm</math> 1.6</b>	<b>5.3 <math>\pm</math> 1.5<sup>c</sup></b>	<b>4.7 <math>\pm</math> 1.6</b>	<b>5.5 <math>\pm</math> 1.7<sup>c</sup></b>	<b>6.4 <math>\pm</math> 1.4</b>	–

<sup>†</sup>Lowest = 0, highest = 2

<sup>‡</sup>Lowest = 0, highest = 8

<sup>¥</sup>Significant difference between totals of the same line ( $p < 0.001$ ).

For values with same superscript, <sup>a</sup> Not significant, <sup>b</sup>  $p < 0.01$ , <sup>c</sup>  $p < 0.05$ .

### *Behaviour determinants and healthy/unhealthy food consumption*

Table 2 displays scores for factors determining subjects' food behaviours. Predisposing factors revealed that all food items were well liked, particularly fruits which scored the highest for total predisposing factors (5.5) followed by ice pop and soda (4.9). Regarding facilitating factors, ice pop, candies and cakes/cookies scored the highest. Fruits (0.8) and vegetables (1.0) were perceived as expensive and little available at school (0.7 and 0.3, respectively). For reinforcing factors, soda and fruits scored the highest. Mothers' liking was

apparently the most important reinforcing factor for healthy foods, and peers' liking for unhealthy items, in addition to both parents' liking in the case of soda. Correlation between underlying factor scores and consumption frequency was generally weak (Table 3), although stronger for facilitating factors. Ice pop consumption was significantly correlated with all facilitating factors. Regarding reinforcing factors, while mother's liking was significantly correlated only with vegetable consumption frequency ( $p < 0.01$ ), fathers' liking was significantly correlated only with unhealthy foods (cakes and candies,  $p < 0.05$ ). In addition, children's unhealthy food consumption frequency

**Table 3.** Pearson's correlation between determinants and consumption of healthy and unhealthy foods

Behaviour determinants	Weekly consumption scores						
	Healthy foods		Unhealthy foods				
	Fruits	Vegetables	Cookies <sup>†</sup>	Cakes <sup>†</sup>	Candies	Soda <sup>‡</sup>	Ice pop <sup>‡</sup>
<b>Predisposing factors</b>							
Well liked	–	0.072*	–	–	0.092*	–	0.076*
Good for health	–	0.088*	–	–	–	–	–
Makes me strong	–	–	–	0.071*	–	0.089*	0.102**
Makes me tall	–	–	–	–	–	–	–
<b>Facilitating factors</b>							
If I want I can eat	0.156***	0.119**	0.164***	0.188***	0.213***	0.206***	0.293***
Not forbidden at school	–	–	–	–	–	–	0.113**
Not expensive	–	–	–	–	–	–	0.073*
Available at school	–	–	–	–	–	0.132***	0.236***
<b>Reinforcing factors</b>							
Father likes	–	–	–	0.087*	0.080*	–	–
Mother likes	–	0.104**	–	–	–	–	–
Best friend likes	–	–	–	–	0.073*	–	–
Classmates like	–	–	0.097**	–	0.123**	–	0.106**

– Not significant, \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

<sup>†</sup>For all factors, questions were asked as ‘.....cakes and cookies?’

<sup>‡</sup>For predisposing factors, questions were asked as ‘..... Soda and Ice pop?’

was significantly correlated with peers' liking – best friend for candies, classmates for cookies, candies and ice pop.

Regression models (Table 4) included all factors that showed univariate correlation at  $p < 0.20$ . The models explained from 2.9% (vegetables) to 13.4% (ice pop) of the variance of weekly healthy/unhealthy food consumption. Perceived control to eat food items ('If I want I can eat') labelled as a lead question to capture the presence of barriers or not was independently associated with consumption of all food items. Availability at school and no prohibition were independent predictors of unhealthy food scores (ice pop and soda). While mothers' liking was an independent predictor of fruit consumption, fathers' liking tended to independently predict unhealthy food consumption (cakes,  $p = 0.063$ ). Peers' liking was a significant predictor of consumption of cookies and candies.

## Discussion

In the present study in schoolchildren aged 11.5 ± 1.7 years, we examined associations between food habits and underlying factors using Green's PRECEDE conceptual framework (22). Overall, we found that Ouagadougou's schoolchildren consumed unhealthy or superfluous food items more frequently than healthy foods. Of note, less than 1% of pupils had eaten fruit and only 4% had eaten vegetables every day over the week prior to the survey. Such low rates of healthy food consumption have also been reported in a study in Guatemala (26). Daily fruit and vegetable consumption is part of WHO recommendations for the prevention of chronic diseases – 400 g for adults (27). The American Dietetic Association recommends for children aged 4–13 years daily intakes of 1.5 servings of fruits and 1–2.5 servings of vegetables (28). The low rates of fruit and vegetable consumption observed in schoolchildren should raise

Table 4. Linear regression of healthy/unhealthy food consumption on behaviour determinants (N = 769)

Model Components	Food consumption frequency (days/week)													
	Healthy				Unhealthy									
	Fruits		Vegetables		Cookies		Cakes		Candies		Sodas		Ice pop	
	$\beta^*$	P	$\beta^*$	P	$\beta^*$	P	$\beta^*$	P	$\beta^*$	P	$\beta^*$	P	$\beta^*$	P
R <sup>2</sup>	0.037	<0.001	0.029	0.002	0.038	<0.001	0.043	<0.001	0.068	<0.001	0.059	<0.001	0.134	<0.001
Predisposing factors	-	-	0.032	0.400	-	-	-	-	0.046	0.211	-	-	0.065	0.057
Well liked	-0.060	0.095	0.040	0.329	-	-	-	-	0.000	0.999	-	-	-	-
Good for health	-	-	0.004	0.921	0.040	0.259	0.041	0.255	0.022	0.569	0.054	0.132	0.025	0.506
Makes me strong	-	-	0.030	0.417	-	-	-	-	-	-	-	-	0.013	0.715
Makes me tall	-	-	0.100	0.006	0.154	<0.001	0.178	<0.001	0.196	<0.001	0.182	<0.001	0.240	<0.001
Facilitating factors	0.152	<0.001	-	-	-	-	-	-	-	-	-	-	0.082	0.017
If I want I can	-0.060	0.097	-	-	-	-	-	-	-	-	-	-	-	-
Not forbidden at school	-	-	0.051	0.156	-	-	-	-	-	-	-	-	0.020	0.553
Not expensive	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Available at school	-	-	-	-	-	-	-	-	0.045	0.209	0.106	0.003	0.172	<0.001
Reinforcing factors	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Father likes	-	-	-	-	-	-	0.067	0.063	0.044	0.258	0.046	0.193	-	-
Mother likes	0.076	0.034	0.067	0.082	-	-	-	-	0.008	0.828	-	-	0.011	0.750
Best friend likes	-	-	-	-	0.032	0.377	0.028	0.431	0.020	0.593	-	-	-0.031	0.416
Classmates like	-	-	-	-	0.088	0.015	-	-	0.102	0.005	-	-	0.049	0.192

\*Standardized

- Not included in the models

great concern if we consider the importance of fruits and vegetables for the prevention of chronic diseases (10) and micronutrient deficiencies (5). Moreover, a sizeable number of schoolchildren had not once over the week consumed several of the healthy foods included in our study (1/4 of them for fruits, and 1/5 for meat and for legumes). Meat, for instance, has been reported to positively impact African schoolchildren's nutritional status (29). In contrast with low intake of healthy foods, pupils who reported eating cookies, cakes and candies every day represented almost 2–7 fold the number of those eating fruits, legumes or vegetables every day (6.4–7.7% versus 0.9–4%, Table 1). The rate was particularly high for ice pop, with 18.3% eating this item every day. The high rate of unhealthy snack consumption is consistent with results of other studies in schoolchildren of developing (30,31) and developed countries (32). Schoolchildren's preference for these 'empty-calorie foods' may find an explanation in the appealing taste of foods rich in sugar and fat, as reported by Douglas (33).

In this study, using as a conceptual framework Green's PRECEDE model, we found that facilitating factors were more important determinants of intakes than predisposing or reinforcing factors, and that they were more strongly correlated with schoolchildren's unhealthy food than healthy food consumption. All four facilitating factors considered were significantly correlated with ice pop consumption frequency, and three of them ('If I want I can eat'; 'not forbidden in school'; and 'available at school') were independently associated with ice pop consumption, explaining 13.4% of its variance. Facilitating factors were not associated with healthy food consumption, apart from children's perceived control to eat those foods if they want. Fruits and vegetables were perceived as expensive and unavailable, and consumption was low, in spite of a high predisposing score for fruits. This underlines the crucial role of facilitating factors in eliciting food consumption in schoolchildren. Autonomy, food accessibility and food availability have been shown to influence schoolchildren's dietary intakes (18,34). Schoolchildren will eat foods sold by vendors within the school precincts (35) and they will eat more fruits when these are free or cheap (34,36). Similarly, low price acts as incentive for unhealthy food consumption (34).

Schoolchildren's social environment also plays a

great role in their food habits. In this study, we found that mothers' liking was independently associated with healthy eating behaviour, whereas fathers' perceived liking tended to be associated with unhealthy food consumption. Parents are known to greatly influence their children's eating behaviours (37), and particularly the mother whose role in moulding eating habits at an early age is recognized (38). In accordance with our findings, a recent study in 10 primary schools of Hong Kong reported that children's fruit and vegetable consumption was associated with their mothers' knowledge, attitudes and consumption of fruits and vegetables (39). Peers' influence is also highlighted in our study, confirming other studies (38), but exclusively for unhealthy foods. The implication is that both physical and social factors should be taken into account when developing programs for healthy lifestyles in schoolchildren (40).

We also found that public school pupils consumed both healthy and unhealthy foods less frequently than children attending private schools. This may reflect the fact that the latter are from wealthier families compared to the former, with enough pocket money to purchase foods at school. Private schoolchildren may also have more exposure to health concerns, whether in school or at home. In Guatemalan schoolchildren, four times more 'non-consumers' of fruits and vegetables were found in public schools compared to their counterparts in private schools (26). In addition, we observed that only unhealthy food consumption was more frequent in urban than peri-urban schoolchildren, confirming the impact of urbanization on food patterns among urban dwellers (41).

To our knowledge, this is the first study of African schoolchildren's dietary patterns that examines psychosocial and environmental factors underlying healthy and unhealthy food consumption using a theoretical framework. This study yields valuable information not only on food consumption, but also on facilitating and reinforcing factors of food behaviours. However, some limitations should be underlined. In particular, only weekly frequency of a few specific food items was assessed, without estimated quantities, so that full diets are not described. In addition, only Ouagadougou schoolchildren in the fifth grade were included in order for them to understand the questionnaire and as a means of reducing the variance. Caution must be

paid when interpreting these results given the small, albeit significant, magnitude of some differences. The small proportion of the variances explained by the models suggests that several other factors underlie children's food consumption beyond those that were assessed in the study, such as objectively measured availability/accessibility of food items, and the influence of teachers and other family members. In addition, given the low school attendance rate in this country (58%) (42), no extrapolation can be attempted to all school-age children of the same age.

## Conclusion

Findings from the present study confirmed that unhealthy eating behaviours are widespread even in developing countries, particularly in urban schoolchildren. Psychosocial and environmental factors were shown to be important determinants, which should be addressed in school health and nutrition programs, such as the Nutrition Friendly School Initiative (NFSI) being pilot-tested in Burkina Faso. The specific aim of the NFSI (43) is to prevent the double burden of malnutrition, that is, both undernutrition (including micronutrient inadequacies) and overnutrition. Nutrition-related non-communicable diseases are indeed becoming a major concern in developing countries, and prevention should be initiated throughout the lifecycle, including at school age. Tailored nutrition interventions should involve parents and include actions in the school physical and social environment in order to promote healthy food consumption and make such foods available and accessible.

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## Conflict of interest statement

None declared.

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