

# Determinants of Fruit and Vegetables Intake among Secondary School Pupils in the City of Bobo-Dioulasso (Burkina Faso): A Cross-Sectional Study

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## Abstract

According to WHO, eating at least five portions of fruit and vegetables a day at an early age is protective against cancers, cardiovascular diseases and diabetes. The purpose of this study was to determine among secondary school pupils in the city of Bobo-Dioulasso, the level of observation of this recommendation and the associated factors. **Methods:** This was a cross-sectional study conducted from March to April 2016, among secondary school pupils in 1<sup>st</sup> Form, 4<sup>th</sup> Form and 7<sup>th</sup> Form of public and private secondary schools. The diet survey methods were the recalling of the last 24 hours associated with intake frequency questionnaire. An intake of less than one fruit (or a slice of a big fruit) per day and for vegetables, less than one portion of raw or cooked vegetables per day was considered insufficient. **Results:** A total of 1993 pupils were surveyed. The mean age was  $17.5 \pm 3.6$  years and the sex ratio 0.7; 75.4% and 90.0% of pupils had insufficient daily intake of fruit and vegetables respectively. The determinants of this consumption deficiency were: Sex (male, OR = 1.7 (1.3 - 2.2)), secondary school (public, OR = 1.6 (1.3 - 2.0)), class (4<sup>th</sup> Form, OR = 2.5 (1.5 - 4.2)/7<sup>th</sup> Form, OR = 3.7 (2.7 - 5.1)), the mother (thin build, OR = 3.2 (2.0 - 5.3)/overweight/obesity, OR = 2.8 (1.6 - 4.7)) and physical inactivity (OR = 1.5 (1.2 - 2.0)). **Conclusion:** The promotion of a healthy diet among secondary school pupils should take into account the type of school, sex, educational level, physical activity and mothers' influence.

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## Keywords

Fruit and Vegetables Intake, Cardiovascular Prevention, Young Subject

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### 1. Introduction

Unhealthy dietary and physical behaviors are at the root of obesity epidemic and cardiovascular diseases, including even children [1] [2]. In Africa, the number of overweight/obese children has increased from 4 to 9 million between 1990 and 2016 [3]. In Burkina Faso, the prevalence of overweight/obesity with school children was 8.6% in 2010 [4]. Prevention strategies for these diseases, apart from regular physical activity, require a healthy diet; one of the leading recommendations is the daily intake of at least 400 g per day, or at least 5 daily portions of fruit and vegetables [1] [2]. Children and adolescents constitute a prime target. As a matter of fact, fruit and vegetables, rich in vitamins, minerals and fibers, have a favorable effect on health and a protective role against cancers, cardiovascular diseases and diabetes [1] [2] [5]. In Burkina Faso, a study among schoolchildren reports that during the week preceding the study, 25% of children had not eaten fruit [6]. The national STEP survey revealed an insufficient intake of fruit and vegetables for 95% of adults (unpublished data). Should we fear such a level of intake among adolescents? The purpose of our study was to determine the frequency and the individual determinants of insufficient intake of fruit and vegetables among secondary school pupils in urban areas in order to undertake an appropriate promotion of good diet habits in this segment of the population.

### 2. Methods

It was a cross-sectional analytical study, which was conducted from March to April 2016, among pupils in 1<sup>st</sup> Form, 4<sup>th</sup> Form and 7<sup>th</sup> Form of public and private secondary schools in the city of Bobo-Dioulasso in order to determine the prevalence of cardiovascular risk factors. The calculation parameters of the sample were as follows: prevalence 8% (prevalence of overweight/obesity in the schools of Burkina Faso [4], accuracy 3%, alpha error 5% (CI 95%), N = 65,765 pupils, a cluster effect 2. The calculated sample was 1890 pupils, distributed into 630 pupils per class group of 1<sup>st</sup> Form, 4<sup>th</sup> Form and 7<sup>th</sup> Form in order to detect a possible gradient according to the educational level.

The diet survey methods were a recalling of the last 24 hours associated with intake frequency questionnaire.

The informed variables were: food and beverages consumed in the past 24 hours, the weekly intake rate of vegetables (unit = 1 portion) and fruit (unit = 1 fruit or 1 slice of large fruit) available as follows: at least 3 times per day, every day/1 time per day, every day/3 - 4 times per week/1 - 2 times per week/Rarely/ Never.

Given the general context of low intake of fruits and vegetables in Burkina Faso (the national survey STEP in 2013 reported an insufficient intake of fruit and vegetables for 95% of adults, while Daboné noted that a quarter of schoolchildren did not consume any fruit the previous 7 days [6]), we have chosen a minimum intake threshold of 1 fruit or 1 portion of vegetables per day. So, an intake of less than one fruit (or a slice of a big fruit) per day, and for vegetables, less than one portion of raw or cooked vegetables per day, was considered insufficient. The factors associated with this insufficient intake will serve as a basis for developing an intervention strategy by step to ultimately reach the recommendation for 5 fruits and vegetables per day.

The classification criteria of mother and father's build were based on an iconography showing 4 morphotypes: thin, normal, overweight and obese. Pupils had to check the morphotype corresponding to that of their mother and father.

The classification criteria of body mass index (BMI) are those of the International Obesity Task Force (IOTF) which defines for each sex and at each age a threshold value of overweight and obesity [7] [8].

Through logistic regression method, individual socio-demographic and clinical factors, significantly associated with insufficient fruit and vegetable intake at 5% of significance level, were identified.

The overall project of this study was approved by Burkina Faso's National Ethics Committee. Authorizations from the Regional Director of Secondary Education and from Secondary School Administrations were obtained for the survey. An informed consent form attached to an information leaflet was sent to parents before the survey. Only pupils whose parents gave their consent by signing the consent form were interviewed. The data were also processed in respect of the anonymity of the respondents.

### 3. Results

A total of 1993 pupils were surveyed: 649 in 1<sup>st</sup> Form, 673 in 4<sup>th</sup> Form and 671 in 7<sup>th</sup> Form.

#### 3.1. General Characteristics of Pupils

The mean age was  $17.5 \pm 3.6$  years. The mean age per class group was  $13.6 \pm 1.5$  years in 1<sup>st</sup> Form,  $17.5 \pm 1.8$  years in 4<sup>th</sup> Form, and  $21.3 \pm 2.0$  years in 7<sup>th</sup> Form.

More than half of the pupils were female, 56.6% ( $n = 1128$ ), that means a sex ratio of 0.8.

#### 3.2. Characteristics of Fruit Intake

Only 24.6% of pupils consumed at least 1 fruit per day (corresponding to those who consumed fruit at least 3 times per day, every day and once per day, every day).

The frequency of insufficient fruit intake was 75.4% ( $n = 1503$ ).

In multivariate analysis, sex (male), type of secondary school (public), educa-

tional level (4<sup>th</sup> Form or 7<sup>th</sup> Form) and non-practice of a regular physical activity were factors independently associated with this insufficient intake (**Table 1**). We notice that this intake deficiency worsened over the course of classes (years).

### 3.3. Characteristics of Vegetable Intake

Only 10.0% of pupils consumed at least 1 portion of vegetables per day.

The frequency of insufficient vegetable intake was 90.0% (n = 1793).

Multivariate analysis showed that educational level (4<sup>th</sup> Form and 7<sup>th</sup> Form) and mother's build (thin or overweight/obesity) were factors independently associated with insufficient intake (**Table 2**).

## 4. Discussion

From 7 to 9/10 pupils had an insufficient intake of fruit and vegetables. These results, although lower than the results of STEPS survey among adults in Burkina, are nonetheless alarming. They are in the order of previous data for secondary school pupils in other countries of our sub region [9] [10]. In France in 2010, 63.7% of adolescents declared that they did not consume fruit every day, 62.9% for vegetables.

The main modifiable factors of these diet habits included educational level and mothers' influence.

Many studies have shown that mothers' influence is associated with healthy diet behaviors of their children [11] [12] [13]. In Burkina, like everywhere in the world, they are a landmark for their children; their food choices, their methods of preparation, their encouragement to consume them are all factors that affect the food choices of their family members.

Many individual determinants influence diet behavior [13] [14] [15]. Among other things, there is the physiological state, especially age and gender.

In our study, 4<sup>th</sup> Form and 7<sup>th</sup> Form pupils consumed fruit and vegetables less often than those who were significantly younger (mean age = 13.6 ± 1.5 years in 1<sup>st</sup> Form against 17.5 ± 1.8 years in 4<sup>th</sup> Form and 21.3 ± 2.0 years in 7<sup>th</sup> Form). It was the same for boys compared to girls. 1<sup>st</sup> Form pupils in pre-adolescence are still influenced by their mothers. The educational level is a determinant reported by Peltzer, who associated higher education with insufficient intake of fruit and vegetables [16]. We also found a decline in this intake related to the level of education, with lower intake in upper classes; pupils are bigger, with an affirmation of their food choices.

Food preferences are also reported as determinant of diet habits [13] [14] [15]. For example, "not liking vegetables" is one of the main predictive factors of fruit and vegetables intake among children [17]. Cultural factors are not left behind in food choices [18] [19] [20]. Food choices inspired by native cultural values do not always correspond to the "western" perception of the nutritional value of foods. In our region, the traditional composition of set meals does not specify vegetables or fruit in the form of starter and/or dessert.

**Table 1.** Determinants of insufficient daily intake of fruit among pupils in 1<sup>st</sup> Form, 4<sup>th</sup> Form and 7<sup>th</sup> Form of public and private secondary schools in the city of Bobo-Dioulasso (Burkina Faso).

Factor	Insufficient daily intake of fruit				
	n (%)	OR brut (CI 95%)	P	Adjusted OR (CI 95%)	P
Sex					
Female	813 (72.1)	1	10 <sup>-3</sup>	1	10 <sup>-3</sup>
Male	690 (79.8)	1.5 (1.2 - 1.9)		1.7 (1.3 - 2.2)	
Secondary school			10 <sup>-3</sup>		
Private	788 (71.7)	1		1	10 <sup>-3</sup>
Public	715 (80.0)	1.6 (1.3 - 1.9)		1.6 (1.3 - 2.0)	
Class			10 <sup>-4</sup>		
1 <sup>st</sup> Form	392 (60.4)	1		1	10 <sup>-4</sup>
4 <sup>th</sup> Form	533 (79.2)	2.5 (1.9 - 3.2)		2.4 (1.9 - 3.2)	
7 <sup>th</sup> Form	578 (86.1)	4.1 (3.1 - 5.3)		3.7 (2.7 - 5.1)	
BMI			0.011		
Normal	988 (77.4)	1		1	0.919
Thin	421 (71.0)	0.7 (0.6 - 0.9)		1.0 (0.8 - 1.3)	
Overweight/obesity	94 (76.4)	0.9 (0.6 - 1.5)		1.0 (0.6 - 1.6)	
Sedentarity			0.445		
No	1193 (75.7)	1			
Yes	310 (74.0)	1.1 (0.9 - 1.4)			
Physical activity			10 <sup>-3</sup>		
Yes	736 (72.4)	1		1	10 <sup>-3</sup>
No	767 (78.6)	1.4 (1.1 - 1.7)		1.5 (1.2 - 2.0)	
Obesity knowledge			0.612		
Bad	517 (77.6)	1			
Good	465 (78.8)	1.1 (0.8 - 1.4)			
Desire of weight gain			0.355		
No	1335 (75.7)	1			
Yes	167 (72.9)	0.9 (0.6 - 1.2)			
Mother's build			5 × 10 <sup>-5</sup>		
Normal	197 (67.2)	1		1	0.160
Thin	677 (75.5)	1.5 (1.1 - 2.0)		1.3 (1.0 - 1.8)	
Overweight/obesity	611 (78.7)	1.8 (1.3 - 2.4)		1.3 (0.9 - 1.8)	
Father's build			5 × 10 <sup>-3</sup>		
Normal	147 (68.7)	1		1	0.972
Thin	540 (73.1)	1.2 (0.9 - 1.7)		1.0 (0.7 - 1.4)	
Overweight/obesity	777 (77.9)	1.6 (1.2 - 2.2)		1.0 (0.7 - 1.4)	
Self-image vs Weight status			0.016		
No concordance	789 (73.3)	1		1	0.772
Concordance	714 (78.0)	1.3 (1.1 - 1.6)		1.0 (0.8 - 1.2)	
Breakfast intake			0.083		
No	568 (77.6)	1		1	0.180
Yes	934 (74.1)	0.8 (0.7 - 1.0)		0.8 (0.7 - 1.1)	

**Table 2.** Determinants of insufficient daily intake of vegetables among pupils in 1<sup>st</sup> Form, 4<sup>th</sup> Form and 7<sup>th</sup> Form of public and private secondary schools in the city of Bobo-Dioulasso (Burkina Faso).

Factor	Insufficient daily intake of vegetables				
	n (%)	OR brut (CI 95%)	P	Ajusted OR (CI 95%)	P
Sex					
Female	1004 (89.0)	1	0.105		
Male	789 (91.2)	1.3 (0.9 - 1.7)			
Secondary school					
Private	806 (90.2)	1	0.797		
Public	987 (89.8)	0.96 (0.7 - 1.3)			
Class					
1 <sup>st</sup> Form	544 (83.8)	1	10 <sup>-4</sup>	1	9 × 10 <sup>-4</sup>
4 <sup>th</sup> Form	615 (91.4)	2.0 (1.4 - 2.9)		2.5 (1.5 - 4.2)	
7 <sup>th</sup> Form	634 (94.5)	3.3 (2.2 - 4.9)		2.6 (1.3 - 5.2)	
BMI					
Normal	1162 (91.0)	1	0.123		
Thin	522 (88.0)	0.7 (0.5 - 1.0)			
Overweight/obesity	109 (88.6)	0.8 (0.4 - 1.4)			
Sedentarity					
No	1414 (89.8)	1	0.708		
Yes	379 (90.5)	0.9 (0.6 - 1.3)			
Physical activity					
No	885 (90.7)	1	0.301		
Yes	908 (89.3)	0.9 (0.6 - 1.1)			
Obesity knowledge					
Bad	590 (88.6)	1	0.067		
Good	541 (91.7)	1.4 (1.0 - 2.1)			
Desire of weight gain					
No	1587 (90.0)	1	0.814		
Yes	205 (89.5)	0.9 (0.6 - 1.5)			
Mother's build					
Normal	242 (82.6)	1	10 <sup>-4</sup>	1	10 <sup>-4</sup>
Thin	817 (91.1)	0.46 (0.3 - 0.7)		3.2 (2.0 - 5.3)	
Overweight/obesity	709 (91.4)			2.8 (1.6 - 4.7)	
Father's build					
Normal	179 (83.6)	1	4 × 10 <sup>-3</sup>	1	0.875
Thin	669 (90.5)	1.9 (1.2 - 2.9)		1.0 (0.5 - 1.9)	
Overweight/obesity	909 (91.2)	2.0 (1.3 - 3.1)		0.9 (0.5 - 1.7)	
Self-image vs weight status					
No concordance	967 (89.8)	1	0.774		
Concordance	826 (90.2)	1.0 (0.8 - 1.4)			
Breakfast intake					
No	669 (91.4)	1	0.117		
Yes	1124 (89.2)	0.8 (0.6 - 1.1)			

Vegetables are usually incorporated, in small or large quantities, in the cooking of the main meal; fruit are consumed outside the meals in the form of a snack. In the area of Bobo-Dioulasso, fruit and vegetables are relatively available and cheap according to their season. However, their affordability is variable within the population [6]. Thus, diet behaviors considered unfavorable were associated with unfavorable socio-economic characteristics [6] [9] [21] [22]. In our study, we have noticed that pupils enrolled in public secondary schools had a lower fruit intake compared to their mates in private secondary schools.

Suggestions based on the findings of this study could be, as a priority, the sensitization of mothers on the nutritional and preventive values of fruit and vegetables, the introduction of a teaching module on nutritional and preventive values of fruit and vegetables from 1<sup>st</sup> Form classes and then rehearsal of the module in 3<sup>rd</sup> Form and 6<sup>th</sup> Form classes, the selling of fruits at subsidized prices in secondary schools and in public schools in particular.

The purpose of this study was to throw light on the individual behaviors of pupils in order to draw lessons for cardiovascular prevention. Thus, the collective determinants of diet behavior (environmental, social, and economic) that go beyond the scope of our study have not been studied, limiting this study. However, their place is essential in a comprehensive prevention program. Another limit could be the inclusion of pupils in examination classes (4<sup>th</sup> and 7<sup>th</sup> Forms) in the study.

## 5. Conclusion

This study showed that 7 to 9 pupils out of 10 had a highly inadequate daily intake of fruit and vegetables in the city of Bobo-Dioulasso. The main determinants of these diet habits were the type of school, sex, educational level, and mothers' influence. Activities promoting healthy diet among secondary school pupils should take this into account.

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