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Social Inequalities in Fruit and Vegetable Consumption among Algerian Households

Mahmoud Brahim[*1], Sidali Ramdane [2] Amine Tlemcani [3]

[1]Université Ziane ACHOUR de DJELFA, Faculté d'économie, Algérie

[2]Université de Blida 1, Faculté des sciences de la nature et de la vie, Algérie

[3]Université de Blida 1, Faculté des sciences de la nature et de la vie, Algérie

Corresponding author*[1] : E-mail : mahmout12@yahoo.fr

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Abstract

The consumption of fruits and vegetables is considered a public health priority by numerous organizations and is subject to global nutritional recommendations from the FAO and WHO. Their program's well-known recommendation to "eat 5 servings of fruits and vegetables daily" is often cited but rarely followed by consumers.

Three key arguments support the health benefits of fruits and vegetables: their contribution to micronutrient intake necessary for proper bodily function, their protective effect against major chronic diseases such as cardiovascular, neurodegenerative, and metabolic diseases (including diabetes), as well as certain cancers, and their low energy content, which is increasingly critical given the rapid rise of overweight and obesity.

In Algeria, the debate surrounding the population's dietary and nutritional issues has long been open but remains unresolved, even for the foreseeable future. Given the country's inherent predisposition to dietary imbalances, significant disparities persist. This context motivated us to select social class as a parameter for analyzing a year-long survey (from March to February) conducted among Algerian households across four regions (Central, Eastern, Western, and Southern Algeria).

This study seeks to answer the following question: *What role do fruits and vegetables play in Algerian households' diets according to social class?*

The survey revealed that the average fruit and vegetable consumption is below the 400 grams per day recommended by the WHO. Distribution analysis indicates that approximately 60% of surveyed individuals fall below this benchmark. In terms of consumption frequency, adherence to the "at least 5 servings of fruits and vegetables daily" guideline is observed in only a small fraction of the sample (less than 5% according to the survey).

Keywords: Fruits and vegetables, consumption, survey, social classes, Algeria.

Introduction

The consumption of food products is a fundamental aspect of individual consumption, addressing physiological, psychological, and social needs. Failure to meet these needs poses nutritional challenges that significantly impact both the current and future economic landscape of a country [1].

Consequently, food security is not only a political, economic, and social issue but also a crucial component of any development strategy. Evaluating the dietary and nutritional status of populations and understanding the disparities among different consumer groups are therefore essential [2].

Assessing the dietary and nutritional status of a society or a group of individuals is inherently complex, especially when analyzing both quantitative and qualitative aspects. Eating behaviors are influenced by a wide range of complex and diverse factors [3]. While it is challenging to understand food consumption patterns in developed countries, it is even more difficult in developing nations [4].

According to the latest comprehensive survey conducted by Algeria's National Statistics Office (ONS) in 2022, Algerians allocate a significant portion of their budget to food [5]. Approximately 42% of household expenditures in Algeria are dedicated to food needs. Moreover, the ONS survey indicates that food products dominate Algerian household consumption, representing the largest share of their budgets.

Within this category, food products account for 17.5% of expenditures, followed by fresh vegetables at 13.4%, while meat and dairy products occupy a smaller share. This imbalance between caloric and protein intake, often favoring the former, reflects several contributing factors. These include the high cost of animal proteins (red meat, poultry, and fish), frequent supply chain disruptions [7], and the insufficient production of certain staples like milk and dairy products. Such challenges lead to a significant reduction in protein intake, which must then be compensated for by other sources [8].

In this context, this article seeks to analyze the dietary and nutritional situation of Algerian households by focusing on the variable of social class (socio-professional category of the household head). This parameter is defined based on several criteria, with the most significant being the occupational classification developed by the ONS, which uses a three-digit coding system adapted to the Algerian context. The social class of the household head is considered, as social groups tend to exhibit analogous behaviors [9].

This leads to the following research questions:

- What is the role of fruits and vegetables in the diets of Algerians?
- How does their consumption vary according to social class?
- Which social classes are at greater risk?
- How do fruits and vegetables contribute to the energy and nutritional intake of essential nutrients?

Methodological Approach

Food consumption surveys aim to provide valuable data for studies and analyses designed to develop socio-economic and political strategies. Such surveys address the needs of planners, researchers, and decision-makers at all levels. As highlighted, *"Understanding living conditions, and especially the nutritional status of households, is imperative for achieving political objectives and fostering development that addresses disparities among social categories"* [10].

In this regard, we conducted a year-long survey (from March to February) involving 2,580 households across Algeria, accounting for the seasonality of consumption.

This survey provides extensive information on the dietary habits of the Algerian population. However, using social class as the sole criterion (Table 01) [11][12] is problematic and warrants further examination. Access to employment and income is not the only explanatory factor; a deeper investigation into each social class is necessary. Each socio-professional category has distinct dietary behaviors [13].

Households in the upper-middle or upper-income brackets are more likely to enjoy excellent diets compared to those with lower incomes, even though significant income disparities can exist within the same social class [14].

Table 01: Social classes considered in the survey [15].

Code	Nomenclature	Abréviation
C.S.P. 1	Employers	1 EMR
C.S.P. 2	Self-employed	2 IND
C.S.P. 3	Senior managers and liberal professions	3 CS.PL
C.S.P. 4	Middle managers	4 CM
C.S.P. 5	Workers	5 OUV
C.S.P. 6	Employees	6 EMPLY

C.S.P. 7	Laborers and seasonal workers	7 MO.SAI
C.S.P. 8	Staff in transition	8 P.TRA
C.S.P. 9	Inactive, unemployed	9 INAC
C.S.P. 10	Undeclared	10N.DEC

Data Processing and Analysis

It is important to highlight the difficulty of working with raw survey data and analyzing its content according to a specific criterion. This often requires in-depth research, complex calculations, and labor-intensive transformations, often involving disciplines for which prior knowledge may be limited or necessitating further learning.

The data collected by our surveyors was raw and detailed, requiring substantial effort. First, the data was entered into Excel, then all consumed foods were grouped into corresponding categories (meat, dairy and derivatives, legumes, etc.). Finally, the focus was narrowed to our analysis group: cereals and derivatives.

Comparisons were made between the quantities consumed and theoretical dietary rations (*Rations Alimentaires Types Souhaitables* - RATS) to calculate satisfaction rates. Additionally, an analysis of food subgroups was conducted to highlight the importance of each in total consumption.

For the caloric and nutritional analysis, the quantities consumed were converted into energy and nutrient contributions using conversion tables to adjust the data from "as purchased" (T.A.) to "edible portion" (P.C.). Nutritional composition tables were then employed by multiplying the previously calculated quantities by the corresponding values in the table. Since the tables provide data per 100 grams, the resulting figures were multiplied by 10. This process allowed the creation of tables detailing total metabolite and caloric contributions, recommended norms, and the percentage of coverage relative to theoretical standards.

A statistical study was conducted to identify homogenous groups of cereal and derivative consumption across social classes (CS). The calculated averages were compared using the Student's t-test ($\alpha = 5\%$), with pairwise comparisons [16].

Results and Discussion

Consumption of Fresh Vegetables by Socio-Professional Categories (SPC)

The consumption of fresh vegetables varies significantly across SPCs, ranging from 69.85 kg/person/year for laborers and seasonal workers to 76.39 kg/person/year for manual workers—a difference of 8 kg/person/year. Consumption peaks at 93.22 kg/person/year for senior executives and liberal professions, almost double the RATS benchmark of 50 kg/person/year.

Nearly a quarter of the fresh vegetables consumed consist of tomatoes, followed by onions. Tomato consumption varies between 12.78 kg/person/year (for employers) and 16.97 kg/person/year (for undeclared workers). Onion consumption ranges from 10.89 kg/person/year (undeclared workers) to 13.96 kg/person/year (employers). Notably, the difference in consumption between extreme categories (employers and employees for tomatoes; independent workers and those in transition for onions) reaches 4 kg.

Salad consumption averages 8 kg/person/year, with the highest intake among senior executives and liberal professions at 12.61 kg/person/year and the lowest among manual and seasonal workers (MO.SAI) at 5.88 kg/person/year. Salad, often served as a side or main dish, is predominantly consumed by wealthier categories, particularly senior executives and liberal professions.

Peppers are consumed at an average of 6 kg/person/year. Some categories, such as mid-level managers, consume more peppers than onions, with the highest intake at 6.55 kg/person/year. The lowest intake of peppers is observed among laborers and seasonal workers at 4.68 kg/person/year.

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Carrots, zucchini, and green beans show similar consumption patterns across SPCs, except for carrots. Individuals in transition consume the highest quantity of carrots at 10.50 kg/person/year, a 5 kg difference from the lowest intake among manual workers at 5.73 kg/person/year.

Finally, chili peppers are less popular across SPCs, with consumption not exceeding 1.96 kg/person/year among independent workers. The lowest intake of chili peppers, at 1.10 kg/person/year, is observed among individuals in transition.

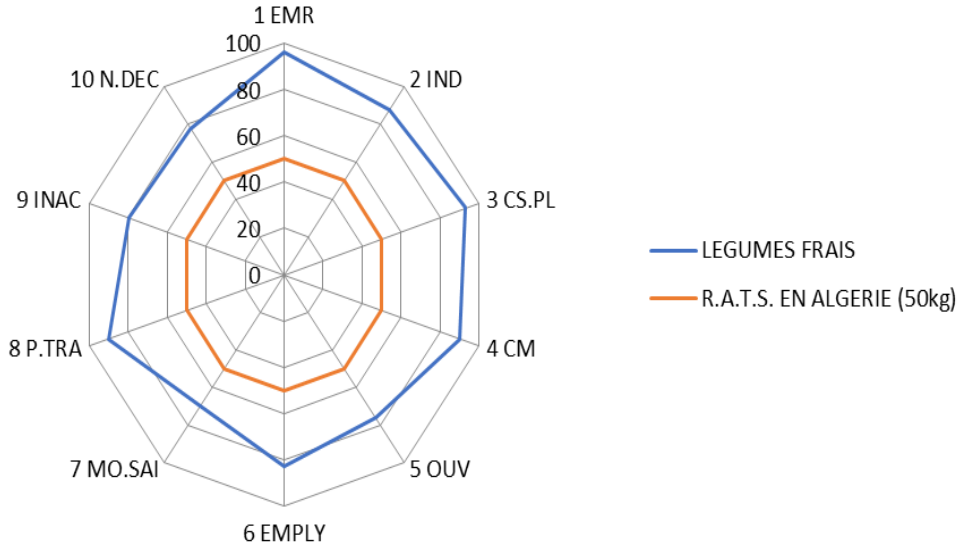
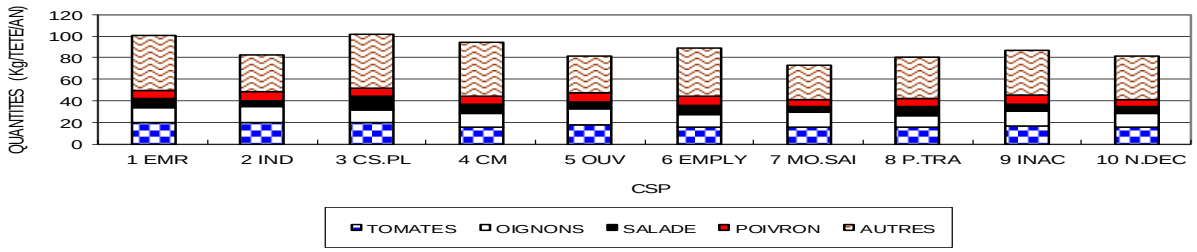


Figure 1:



Consumption of fresh vegetables according to CSP compared to the Desirable Standard Food Ration.

Figure 2: Level of consumption of fresh vegetables according to CSP.

Table 2: Quantity of fresh vegetables consumed in CSP (In kg/head/year)

	1 EMR	2 IND	3 CS.PL	4 CM	5 OUV	6 EMPLY	7 MO.SAI	8 P.TRA	9 INAC	10 N.DEC
J/ FRESH VEGETABLES	95,60	87,74	93,22	90,08	76,39	82,88	69,85	90,09	79,84	77,62
R,A,T,S, IN ALGERIA	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
SATISFACTION RATE	191,19	175,48	186,45	180,15	152,77	165,77	139,70	180,18	159,68	155,24
DON'T a-TOMATOES	16,97	15,76	15,63	14,12	14,51	13,34	12,99	14,20	13,66	12,78
a/ J (%)	17,75	17,96	16,76	15,68	19,00	16,10	18,60	15,76	17,11	16,46
b-ONIONS	13,96	11,27	10,90	11,70	12,66	11,27	12,31	12,10	12,29	10,89

b/ J (%)	14,61	12,85	11,69	12,99	16,57	13,60	17,62	13,43	15,39	14,03
c-SALAD	8,71	8,89	12,61	8,42	6,90	9,11	5,88	8,42	6,75	7,56
c/ J (%)	9,11	10,13	13,52	9,35	9,03	11,00	8,42	9,34	8,46	9,74
d- PEPPER	5,64	5,96	6,39	6,55	6,34	5,99	4,68	4,85	5,87	5,39
d/ J (%)	5,90	6,79	6,86	7,27	8,30	7,23	6,69	5,39	7,35	6,94
e- CARROTS	7,70	6,04	7,26	7,74	5,73	6,15	5,82	10,50	6,85	6,44
e/ J (%)	8,05	6,89	7,78	8,59	7,50	7,43	8,33	11,65	8,57	8,29
f-ZUCCHINI	3,66	4,35	4,80	4,27	3,65	3,87	2,97	2,56	3,78	3,67
f/ J (%)	3,83	4,95	5,15	4,74	4,78	4,67	4,25	2,84	4,73	4,72
g-GREEN BEANS	4,58	3,56	2,31	2,60	2,57	2,65	2,69	1,46	2,57	2,65
g/ J (%)	4,79	4,05	2,48	2,89	3,36	3,20	3,85	1,62	3,21	3,41
h-PEPPERS	2,49	2,55	2,34	2,29	3,09	2,64	2,67	3,10	3,09	2,57
h/ J (%)	2,60	2,91	2,52	2,54	4,05	3,19	3,82	3,44	3,88	3,31

Fruit Consumption by Socio-Professional Categories (SPC)

The *Ration Alimentaire Type Souhaitable* (RATS) for fruit is estimated at 45 kg per person per year. Only two categories meet this target: mid-level managers, with a consumption of just 45.15 kg per person per year, and senior executives and liberal professions, who consume 53.77 kg per person per year. This is more than double the lowest consumption recorded, which is 28.80 kg per person per year among laborers and seasonal workers. Other categories meet between four-fifths and three-quarters of the RATS.

Orange Consumption

Oranges rank first among fruits, with an average consumption of 10 kg per person per year. The lowest consumption is observed among laborers and seasonal workers at 7.07 kg per person per year, while the highest is seen among senior executives and liberal professions at 21.44 kg per person per year—nearly three times more. A significant gap of 5 kg separates this group from mid-level managers, who rank second in orange consumption. It is noteworthy that even for oranges, consumption varies greatly across categories, reflecting the perception of fruit as a luxury product for some groups.

Mandarin Consumption

Mandarin consumption follows a similar pattern. The difference between the highest and lowest consuming categories—senior executives and liberal professions (5.01 kg per person per year) and laborers (2.08 kg per person per year)—reaches 4 kg per person per year. Laborers are closely followed by laborers and seasonal workers, who consume 2.11 kg per person per year.

Watermelon Consumption

Watermelon ranks second among fruits, with an average consumption of 6.74 kg per person per year. Interestingly, individuals in the transition category, considered at-risk, consume the highest quantity (6.88 kg per person per year). This is likely due to watermelon's affordability, a trend also observed for melon consumption.

Grape Consumption

Grapes hold the third position, with an average consumption of 4 kg per person per year. The lowest consumption is recorded among laborers and seasonal workers (3.52 kg per person per year), while individuals in the transition category

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consume the highest amount (5.66 kg per person per year), creating a gap of 2 kg per person per year between the extremes.

Date Consumption

Date consumption fluctuates significantly across SPCs. Some categories consume far more dates than melons, likely due to their affordability. For example, the undeclared category records the highest date consumption at 5.21 kg per person per year, contributing 14.57% to their total fruit intake, while melon contributes only 2.14%. A similar trend is seen among senior executives and liberal professions and laborers and seasonal workers, where dates contribute 7.34% and 15.49% of total fruit intake, respectively.

Figure 3: Fruit consumption according to CSP in Algeria compared to the Desirable Standard Food Ration (R.A.T.S = 45kg/head/year)

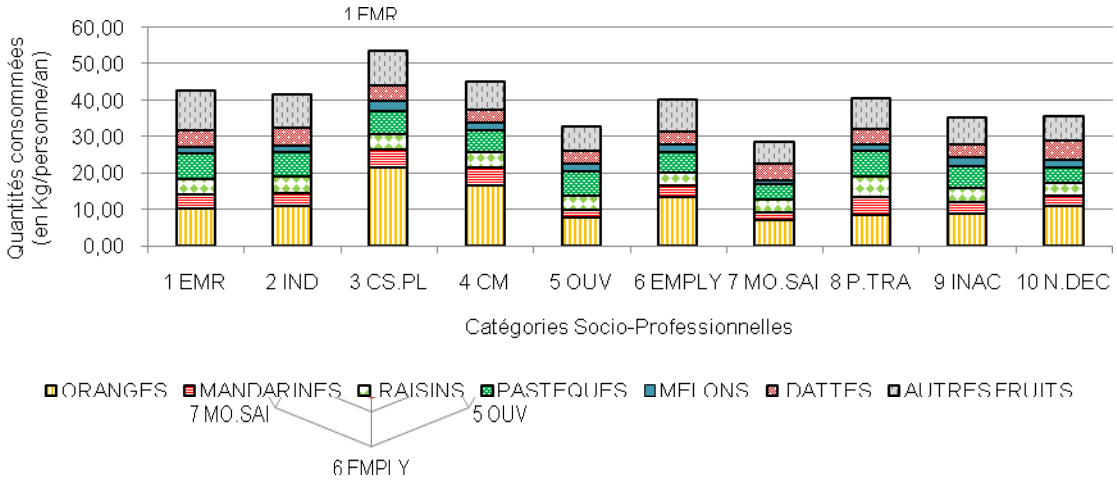

Figure 4: Level of fruit consumption according to CSP

Table 3: Quantity of fruits consumed according to CSP (In kg/head/year)

	1 EMR	2 IND	3 CS.PL	4 CM	5 OUV	6 EMPLY	7 MO.SAI	8 P.TRA	9 INAC	10 N.DEC
I/ FRUITS	42,88	41,84	53,77	45,15	32,82	40,22	28,80	40,65	35,25	35,75
R,A,T,S, IN ALGERIA	45,00	45,00	45,00	45,00	45,00	45,00	45,00	45,00	45,00	45,00
SATISFACTION RATE	95,29	92,97	119,49	100,33	72,94	89,38	63,99	90,34	78,32	79,45
DON'T a-ORANGES	10,16	10,86	21,44	16,74	7,88	13,50	7,07	8,63	9,01	10,97
a/I (%)	23,71	25,96	39,87	37,08	24,00	33,57	24,55	21,23	25,57	30,68
b-MANDARINS	3,98	3,58	5,01	4,82	2,08	3,02	2,11	4,84	3,16	2,80
b/I (%)	9,28	8,56	9,32	10,68	6,35	7,50	7,32	11,91	8,98	7,84
c-GRAPES	4,42	4,61	4,34	4,41	3,97	3,75	3,52	5,66	3,71	3,59
c/I (%)	10,31	11,01	8,07	9,77	12,10	9,33	12,23	13,91	10,53	10,05
d- WATERMELONS	6,79	6,72	6,44	5,69	6,46	5,43	4,33	6,88	6,12	4,32
d/I (%)	15,83	16,06	11,97	12,60	19,68	13,50	15,05	16,92	17,36	12,09
e- MELONS	2,03	1,88	2,82	2,37	2,39	2,22	1,10	1,78	2,42	2,14

e/I (%)	4,74	4,48	5,24	5,25	7,27	5,51	3,82	4,39	6,87	5,98
f-DATES	4,34	4,74	3,95	3,59	3,50	3,37	4,46	4,25	3,60	5,21
f/I (%)	10,13	11,33	7,34	7,96	10,68	8,38	15,49	10,44	10,21	14,57

Conclusion

The dynamics of food consumption patterns have shifted significantly in recent years, primarily driven by the socio-economic changes within Algeria.

Our survey, which encompassed 163 food products and included 2830 households from across Algeria over four seasons (one week per season) between 2010 and 2015, highlights these trends.

The combination of factors, such as economic conditions (income, prices, purchasing power), social aspects (habits, traditions, customs), and socio-economic category affiliation, play a crucial role. Among these, economic factors—income and expenditures—along with socio-professional categories, are the most influential.

While the Recommended Allowance for Fresh Vegetables (R.A.T.S.) is generally met across most socio-professional categories (SPCs) in the sample, fruit consumption falls short of the R.A.T.S. for a significant portion of surveyed households. Only two of the wealthiest SPCs exceed this standard. This shortfall is primarily due to the high cost of fruits, which limits consumption and redirects spending toward more affordable alternatives, such as juices and beverages. Citrus fruits, particularly oranges, are the most consumed, followed by grapes and watermelons.

For some SPCs, access to a diet that meets nutritional standards is concerning, as individuals struggle to obtain essential reference foods (such as meat, fish, and fruits) necessary for their dietary and nutritional well-being. The root causes include low or non-existent income levels, which compromise their ability to meet dietary needs.

Recommendations

It is imperative for Algerian researchers in food and nutrition sciences to:

1. Update and adapt food conversion and composition tables for locally consumed items.
2. Establish new nutritional standards, including revised R.A.T.S. tailored to the Algerian context.

Future Directions

Our study primarily focused on the variable of socio-professional categories. However, future research should delve deeper into other parameters, such as household size, educational levels of household heads, and regional disparities. A more granular analysis at the regional level, considering variables examined nationally, would offer valuable insights.

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