

Epidemiological Profile of Obesity among Adults Aged 21 to 65 Years Living in Yopougon, Cocody and Abobo (District of Abidjan, Côte d'Ivoire)

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Abstract

Objective: The study aims to establish the epidemiological profile of obesity in Abidjan. **Methods:** It was a cross-sectional study carried out in Côte d'Ivoire with 349 volunteers aged 21 to 65 years old and living in 330 households located in Yopougon, Cocody and Abobo, three Municipalities in the city of Abidjan. **Results:** Out of 349 participants, 90 or 25.8% were declared obese according to BMI. Based on IMG, 62.8% of people had abnormally high body fat. Abdominal obesity was more common in Yopougon and Cocody than in Abobo. Relative to BMI, 36.1% of women were obese compared to 12.9% of men. The same observation was made with regard to the umbilical perimeter. Indeed, abdominal obesity was more observed in women with a rate of 52.6% compared to 11.6% in men. 35.6% of obese people have no level of education. According to the respondents, a very high proportion of weight gain occurred after the age of 10. It was between 10 and 21 years old in Yopougon and Cocody and between 18 and 21 years old in Abobo. More than 70% of obese people living in Yopougon, Cocody and Abobo would not consider obesity as a disease while 40.7% have said they were very little informed about obesity. **Conclusion:** Two major points have emerged from the examination of the data collected: 1) The prevalence of overweight and obesity remains very high in the three Communes of Abidjan. 2) The occurrence of obesity would be influenced by the sociodemographic characteristics of the populations. Also, updating these sociodemographic characteristics is essential to better adapt national strategies for obesity and overweight combating.

Keywords

Epidemiological Profile, Obesity, Adult, Abidjan, Côte d'Ivoire

1. Introduction

Obesity is a multifactorial disease resulting from multiple genetic factors associated with environmental factors such as dietary change and lack of physical activity [1]. It gradually sets on a person following an imbalance in the energy balance. Energy balance represents the difference between total energy expenditure and total caloric intake [2]. The overall estimate has shown that the proportion of obese adults has increased from 28.8% in 1980 to 36.9% in 2013 among men and from 29.8% to 38% among women. These increases were observed in both developed and developing countries [3]. In sub-Saharan Africa, specifically in all West African countries, the prevalence of adult overweight and obesity has rapidly increased [4]. About 35% of adult women in this region of Africa are overweight or obese [5]. Obesity affects 7% of women aged 20 to 49 in West Africa. Surprisingly, the burden is more concentrated among educated women living in the largest cities in the sub-region such as Abidjan, Accra and Lagos [6]. The reasons justifying this trend are the improvement of standard living conditions of populations which is associated to accelerated urbanization. These main reasons are leading to changes in population food supply systems, diets, gut microbiome and reduced levels of physical activity [7].

Overweight and obesity represent the fifth global risk factor for mortality, causing 2.8 million deaths every single year [2]. Obesity deteriorates lifestyle, leads to appearance of psychological problems, disruption of menstrual cycles and complications during pregnancy. It is a key element of metabolic syndrome which causes many diseases such as cardiovascular disease, type 2 diabetes, high blood pressure, sleep apnea, dyslipidemia and certain cancers [8].

The management of obesity has four (4) objectives of decreasing importance. These include prevention of weight gain, weight stabilization, treatment of comorbidities and finally weight loss [9]. This is why the fight against overweight and obesity must also be focused on changes in eating behaviors [10]. In general, the treatment of obesity is considered difficult and its medium-term results are disappointing [11]. This is why prevention remains the ideal way to fight obesity pandemic throughout the world.

To fight non-communicable diseases including obesity, West African countries have developed joint prevention programs. In 2020, Mali, Gambia and Nigeria implemented almost all of WHO's essential nutrition actions. As for Guinea, Senegal, Burkina Faso and Ivory Coast, they are committed to implementing numerous programs to combat obesity and non-communicable diseases [12].

Thus, Côte d'Ivoire is committed through its policy and strategy documents to

reinforce its strategy against non-communicable diseases including overweight and obesity. Among these documents are the “*integrated strategic plan for the prevention and management of non-communicable diseases in Côte d’Ivoire*”, the “*National Nutrition Guidelines*” and the “*local foods recipes guide for nutritional care of adolescents and adults*” [13]. In order to have updated data in the field of nutrition, the National Council for Nutrition, Food and Early Childhood Development (CONNAPE) in collaboration with its partners, has undertaken studies on several themes which have been carried out across the entire national territory. Indeed, from 2016 to 2020, five studies were carried out by CONNAPE. These are the “*study on the evaluation of nutritional status*”, the “*basic survey on the table of nutritional values*”, the “*monitoring of the agricultural season and food vulnerability*”, “*the Harmonized Survey on Household Living Conditions*” and “*tracing expenditure on specific and nutrition-sensitive interventions in Côte d’Ivoire in 2017 and 2018*”.

Despite all the efforts made by the State of Côte d’Ivoire, there is a persistence of the prevalence of overweight and obesity throughout the Ivorian territory, especially in large cities like Abidjan. Indeed, WHO has estimated in 2010, that in Côte d’Ivoire, obesity affected 7.9% of the population, including 3.9% men and 11.9% of women [14]. The 2011-2012 Demographic and Health Survey (EDS) carried out in Côte d’Ivoire has reported a prevalence of overweight of 19% and 6.6% for obesity among women of childbearing age [15]. In 2017, 21.60% of men and 27.19% of women were declared overweight. As for obesity, it was more common at 20.36% among women compared to 8.15% among men [16]. One of the regions most affected by overweight and obesity in Côte d’Ivoire is the Lagunes Region (Abidjan). Indeed, the WHO STEPS survey (measurements of chronic disease risk factors) has revealed a prevalence of overweight and obesity at 32.2% in the adult population of the Lagunes region [17]. Hauhouot-Attoungbré *et al.* [18] have shown that in 2013, 28.8% and 13.8% of breastfeeding women in the Lagunes Region were overweight and obese, respectively.

Face to the persistence of high prevalence of overweight and obesity, the structures responsible for the fight against non-communicable diseases are questioning the reasons for the ineffectiveness of the strategies already undertaken and the new appropriate strategies to be implemented to achieve the expected results. That is in response to this problem that the present work was carried out in order to establish the epidemiological profile of obese people living in the city of Abidjan. The aim was specifically to determine the sociodemographic characteristics of obese people and to identify the predominant type of obesity in three Municipalities of Abidjan: Yopougon, Cocody and Abobo.

2. Material and Methods

2.1. Ethic Approval and Consent to Participate

This study realized from 1st August to 31st August 2023. It was approved by the Ministry of Health and Public Hygiene in the Republic of Côte d’Ivoire. And

the Ethical approval for this study was obtained from the Life Sciences and Health Ethics Committee of Côte d'Ivoire (CNESVS, reference: N/Réf: 161-23/MSHPCMU/CNESVS-kp). Individual verbal consent was required from all the volunteers before starting the investigation. The objectives of the study were explained to each participant. They were assured that their information was anonymous and only accepted for research purposes. Only consenting volunteers were allowed to take part at the study.

2.2. Technical Material

The technical equipment was composed of anthropometric equipment, survey sheets and computer tools. The scale was used to measure the weight in kilograms (Kg). To measure the size in meters, the standing measuring rod was used. The data was collected on 3 survey forms: "Informed consent form", "Household questionnaire" and "Individual questionnaire". A computer equipped with software for collecting (Excel) and statistical data processing (SPSS) was used for this study.

2.3. Type and Choice of Study Sites

This was a cross-sectional study carried out in Côte d'Ivoire among 330 households located in three Municipalities that are Yopougon, Cocody and Abobo. Indeed, Côte d'Ivoire is a West Africa country, bordered to the North by Mali and Burkina Faso, to the South by the Atlantic Ocean, to the West by Guinea and Liberia, and to the East by Ghana. The population of Abidjan is estimated around 6,321,017 citizens. It represents approximately 21.5% of the Ivorian population. Abidjan is one of the most populous cities in French-speaking West Africa countries [19]. Abidjan units all the factors necessary for the spread of the overweight and obesity pandemic [6]. The selection of Yopougon, Cocody and Abobo was based on a reasoned choice oriented by the lifestyle of the populations living in these Municipalities. The Wealthy people live in Cocody and the families with modest incomes generally reside in Yopougon. Most of the time, people with limited financial means live in Abobo [19].

2.4. Sampling Method

The target population of the study was all households residing in the Municipalities of Yopougon, Abobo and Cocody. The type of survey proposed was a simple random survey that was applied to each of the three Communes. The sample size in the three municipalities was calculated based on the Cochran formula [20].

$$n = t^2 \times p \times \frac{(1-p)}{m^2}$$

With:

n : Minimum sample size to obtain significant results for an event and a fixed level of risk.

t^2 : Confidence level. In this study, the typical value of the 95% confidence level was 1.96.

m : Margin of error. In this study the margin of error was set at 5%.

p : estimated proportion of the population that presents the characteristic.

In 2017, obesity has affected 20.36% of women and 8.15% of men [16]. Based on this information, it is considered that three households out of 10 have obese people. Thus, with $p = 30\%$, the study sample was as follows:

$$n = 1.96^2 \times 0.30 \times \frac{(1-0.30)}{0.05^2}$$

$n = 322.69$ rounded to 330 households.

2.5. Selection of Households and Study Participants

The selection of households was made using the itinerary method. For this purpose, a path has been determined in each Commune. The selection of households was done randomly. Thus, a starting point was chosen and a number of sampling steps between the previous and the following household was also respected. This number of steps was two. The number of steps thus guaranteed the random aspect of data collection. The selection of respondents to the questionnaire in each household was based on the consent of people.

2.6. Inclusion and Exclusion Criteria for Study Participants

Participants should be men or women who were at least 21 years old and no older than 65 years old on the day the survey was conducted. They should all reside in one of the Municipality of Cocody, Yopougon and Abobo and live in one of the households selected for the study. However, people who did not obey to inclusion criteria were excluded from the study for various other considerations, that could constitute bias. This is why pregnant and breastfeeding women as well as men and women who did not give their consent were excluded from the survey. Based on these criteria, 349 people aged 21 to 65 living in 330 households and having given their verbal consents, have constituted the survey population (Table 1).

2.7. Nutritional Assessment Methods

The nutritional assessment has consisted of taking the weight, height and umbilical circumference of the participants in order to classify the population studied according to the Body Mass Index, the Fat Mass Index and the Umbilical Perimeter.

2.7.1. Body Mass Index

Body Mass Index (BMI), also known as the Quetelet Index, is an indicator for estimating corpulence. Defined in 1997 by the WHO, BMI makes it possible to evaluate the nutritional status in adults aged 18 to 65, according to a grid which defines different states of malnutrition evolving from undernutrition (starvation) to

Table 1. Number of households visited per municipality.

Neighborhoods	Yopougon	Cocody	Abobo	Entire population
2 plateaux	0	30	0	30
Abobo Banco	0	0	45	45
Abobo Celeste	0	0	26	26
Akouédo	0	30	0	30
Anonkoi Kouté	0	0	39	39
Anono	0	13	0	13
Batim	10	0	0	10
Blaukoss	0	9	0	9
Cité Mami Adjoua	4	0	0	4
Cocody centre	0	9	0	9
Cocody Danga	0	19	0	19
Sicogi	86	0	0	86
Sogéfia	10	0	0	10
Total	110	110	110	330

morbid obesity or massive. The calculation formula is given below:

$$\text{BMI}(\text{kg}/\text{m}^2) = \frac{\text{Weight}(\text{Kg})}{\text{height}^2(\text{m})}$$

2.7.2. Fat Mass Index

Fat mass index is an index expressed as a percentage which makes it possible to judge the proportion of adipose tissue in an adult person. It allows to calculate the proportion between adipose mass (fat mass) and dry mass (muscle mass). The IMG allows to assess whether an adult person is too thin or too fat. Fat mass index is calculated by considering 3 factors: BMI, age and sex. The formula for calculating the Fat mass index is as follows:

$$\text{Fat mass index}(\%) = (1.2 \times \text{BMI}) + (0.23 \times \text{Age}) - (10.8 \times S) - 5.4$$

In this study, S = 1 is assigned to men and S = 0 to women. So,

- For men:

$$\text{Fat mass index}(\%) = (1.2 \times \text{BMI}) + (0.23 \times \text{Age}) - (10.8 \times S) - 5.4$$

- For women:

$$\text{Fat mass index}(\%) = (1.2 \times \text{BMI}) + (0.23 \times \text{Age}) - (10.8 \times S) - 5.4$$

According to WHO, the interpretation of Fat mass index varies depending on sex. Indeed, for men the latter must be between 15% and 20% and for women between 25% and 30%.

2.7.3. Waist Size

Waist circumference is a simple indicator of excess abdominal fat in adults. Excess abdominal fat is associated, independently to BMI, the development of metabolic and to vascular complications of obesity [21]. Abdominal obesity is defined with specific waist circumference values depending on ethnic groups. In Caucasians, abdominal obesity is defined by a waist circumference ≥ 80 cm in women and ≥ 94 cm in men. In the United States, higher values of waist circumference are currently used for the clinical diagnosis of abdominal obesity (≥ 88 cm in women and ≥ 102 cm in men) [22].

2.8. Statistical Analyses

Statistical processing Data analysis was carried out on SPSS 20.0. Descriptive statistics were used to illustrate the sociodemographic characteristics and other descriptive elements of households and respondents in relation to the obesity status of participants in the Communes visited. Obesity status was determined through the calculation of the Body Mass Index (BMI), waist circumference and Fat Mass Index in each Commune and in the entire population studied.

3. Results

3.1. Characteristics of Household Heads

In Yopougon, Cocody and Abobo, households were mainly maintained by women. Indeed, of the 330 households visited, 197 or 59.7% of households were headed by women. The heads of households in the Municipality of Yopougon were the oldest compared to the others Municipalities with an average age of 46 years old. The youngest heads of household had an average age of 40 years old and reside in the Commune of Cocody. Overall, 77% of household heads have reached primary school. Among them, 37.9% are student in secondary school. However, it was observed that the Municipalities of Cocody and Abobo have respectively recorded up 26.4% and 38.2% of heads of households who had no level of education. The majority of household heads (66.4%) were in a relationship and did not have a stable job (67.3%). However, 54.5% of household heads in the Municipality of Yopougon have declared that they regularly held a stable job. For the preparation of family meals, the overall trend observed in the three Municipalities was the same. Indeed, the majority of household heads has said they had no difficulty to feed daily their families. Also, in 60.9% of cases, heads of household in the three Municipalities have admitted to do not regularly give instructions for preparing meals (Table 2).

3.2. Characteristics of Respondents

175 over 349 people who have responded to the questions, or 53% of the respondents were heads of household. They have an average age of 36 years old and were predominantly men in 55.6% of cases (Table 3).

Table 2. Characteristics of household heads.

		Yopougon		Cocody		Abobo		Entire population	
		Size	%	Size	%	Size	%	Size	%
Sex	Men	35	31.8	46	41.8	52	47.3	133	40.3
	Women	75	68.2	64	58.2	58	52.7	197	59.7
Age (Years)	21 - 35	27	24.5	49	44.5	33	30	109	33
	36 - 45	22	20	26	23.6	42	38.2	90	27.3
	46 - 55	40	36.4	24	21.8	22	20	86	26.1
	56 - 65	15	13.6	11	10	13	11.8	39	11.8
	≥66	6	5.5	0	0	0	0	6	1.8
Average age	(Years)	46		40		42		42	
Level of education	None	5	4.5	29	26.4	42	38.2	76	23
	Primary	15	13.6	12	10.9	31	28.2	58	17.6
	Secondary	59	53.6	37	33.6	29	26.4	125	37.9
	Higher	31	28.2	32	29.1	8	7.3	71	21.5
Employment Status	Steady job	60	54.5	28	25.5	20	18.2	108	32.7
	Jobless	50	45.5	82	74.5	90	81.8	222	67.3
Living in couple	Yes	68	61.8	70	63.6	81	73.6	219	66.4
	No	42	38.2	40	36.4	29	26.4	111	33.6
Meals pay	Avec difficulty	31	28.2	46	41.8	51	46.4	128	38.8
	Without any difficulty	79	71.8	64	58.2	59	53.6	202	61.2
Giving instruction for meal cooking	Yes	48	43.6	54	49.1	27	24.5	129	39.1
	No	62	56.4	56	50.9	83	75.5	201	60.9

Table 3. Demographic characteristics of respondents.

		Yopougon		Cocody		Abobo		Entire population	
		Size	%	Size	%	Size	%	Size	%
Sex	Men	66	53.7	65	56.5	63	56.8	194	55.6
	Women	57	46.3	50	43.5	48	43.2	155	44.4
Age (years)	21 - 35	69	56.1	82	71.3	47	42.3	198	56.7
	36 - 45	25	20.3	14	12.2	36	32.4	75	21.5
	46 - 55	22	17.9	12	10.4	18	16.2	52	14.9
	56 - 65	7	5.7	7	6.1	10	9	24	6.9
Average age	(Années)	36		33		39		36	
Relationship to the head of household	Others links	13	11.8	2	1.8	1	0.9	16	4.8
	Household head	49	44.5	35	31.8	91	82.7	175	53
	Partner	23	20.9	33	30	16	14.5	72	21.8
	No link	25	22.7	39	35.5	2	1.8	66	20

3.3. Predominant Type of Obesity among the Three Communes

Out of 349 respondents, 90 or 25.8% of participants were declared obese according to BMI measurements. A 95% confidence interval has shown that overall the prevalence of obesity was between 21.3% and 30.7%. Relative to BMI, the three Municipalities have recorded almost the same prevalence of obesity. Indeed, the prevalence in Yopougon, Cocody and Abobo were 30.1%, 21.7% and 25.2% respectively. Determination of weight status based on IMG has shown that 62.8% of the 349 respondents have had Too Much Fat (TMF). The distribution of obese people according to the Municipalities, has shown that the three Municipalities have had approximately the same prevalences which were 62.6% in Yopougon, 59.1% in Cocody and 66.7% in Abobo. The waist circumference analysis has revealed that compared to the Municipality of Cocody, the Municipalities of Yopougon and Abobo have had higher proportions of people with abdominal obesity. The Municipality of Cocody has recorded 26.1% of people with abdominal obesity compared to 38.2% for Yopougon and 38.7% for Abobo (Table 4).

Table 4. Predominant type of obesity by Commune.

		Yopougon		Cocody		Abobo		Entire population	
		Size	%	Size	%	Size	%	Size	%
BMI (Kg/m ²)	Non-obese	86	69.9	90	78.3	83	74.8	259	74.2
	Obese	37	30.1	25	21.7	28	25.2	90	25.8
	Total	123	100	115	100	111	100	349	100
Nutritional status according to BMI	Undernutrition < 16.5	0	0	1	0.9	1	0.9	2	0.6
	Thinness (16.5 - 18.5)	6	4.9	5	4.3	7	6.3	18	5.2
	Normal build (18.5 - 24.9)	49	39.8	50	43.5	49	44.1	148	42.4
	Overweight (25 - 30.0)	31	25.2	34	29.6	26	23.4	91	26.1
	Moderate obesity (30 - 34.9)	20	16.3	14	12.2	17	15.3	51	14.6
	Severe obesity (35 - 39.9)	11	8.9	6	5.2	5	4.5	22	6.3
	Morbid obesity > 40	6	4.9	5	4.3	6	5.4	17	4.9
	Total	123	100	115	100	111	100	349	100
Fat Mass Index	Person with too much fat	77	62.6	68	59.1	74	66.7	219	62.8
	Normal person	29	23.6	24	20.9	24	21.6	77	22.1
	Person too thin	17	13.8	23	20	13	11.7	53	15.2
	Total	123	100	115	100	111	100	349	100
Waist size (cm)	Abdominal obesity	47	38.2	30	26.1	43	38.7	120	34.4
	No abdominal obesity	76	61.8	85	73.9	68	61.3	229	65.6
	Total	123	100	115	100	111	100	349	100

3.4. Sex, Age Groups and Educational Level of Obese People among the Three Communes

Relative to BMI, 36.1% of women were obese compared to 12.9% of men (**Table 5**). The same observation was made with regard to the umbilical perimeter. Indeed, abdominal obesity affects more women at 52.6% than men at 11.6% of cases. The age distribution of obese people has shown that 37.3% of obese people were in the age group of 36 to 45 years old, while 40.4% of them were aged between 46 and 55 years old (**Table 6**). The population of obese people was made of 35.6% of people who do not have any level of education. Among non-obese people, 78.4% have approximately got to primary school compared to 64.4% among obese people (**Table 7**).

3.5. Age of Onset of Weight Gain, Perception of Obesity and Level of Information of Obese people among the Three Communes

In Yopougon as in Cocody, weight gain mainly occurred after the age of 10 years

Table 5. Gender of obese people living in Yopougon, Cocody and Abobo.

Obesity Status	Sex				Entire population		
	Women		Men		Size	%	
	Size	%	Size	%			
BMI	No obese people	124	63.9	135	87.1	259	74.2
	Obese people	70	36.1	20	12.9	90	25.8
	Total	194	100	155	100	349	100
Waist size (cm)	No abdominal obesity	92	47.4	137	88.4	229	65.6
	Abdominal obesity	102	52.6	18	11.6	120	34.4
	Total	194	100	155	100,0	349	100

Table 6. Age groups of obese people living in Yopougon, Cocody and Abobo.

	[21 - 35 years]		[36 - 45 years]		[46 - 55 Years]		[56 - 65 Years]		Entire population	
	Size	%	Size	%	Size	%	Size	%	Size	%
Non-obese people	164	82.8	47	62.7	31	59.6	17	70.8	259	74.2
Obese people	34	17.2	28	37.3	21	40.4	7	29.2	90	25.8
Total	198	100	75	100	52	100	24	100	349	100

Table 7. Level of education of obese people living in Yopougon, Cocody and Abobo.

	None		Primary school		Secondary school		Higher		Total	
	Size	%	Size	%	Size	%	Size	%	Size	%
Non-obese people	56	21.6	44	17	89	34.4	70	27	259	100
Obese people	32	35.6	22	24.4	22	24.4	14	15.6	90	100
Entire population	88	25.2	66	18.9	111	31.8	84	24.1	349	100

old. Specifically, most obese people have said they noticed an abnormal intake when they were between 10 and 21 years old. As for obese people in Abobo, their weight gain began on average at the age of between 18 and 21 years old (**Table 8**). More than 70% of obese people living in Yopougon, Cocody and Abobo would not consider obesity as a disease. Among obese people, 40.7% have said they had never received information about obesity. The majority, 80.2%, did not regularly monitor their weight and most of them (78.9%) wanted to lose weight (**Table 8**). Almost half (44%) of the obese people had already tried to lose weight. But this attempt ended in failure for 83% of them.

Measuring the level of motivation for weight loss showed that more than three-quarters of obese people were motivated to engage in an obesity management

Table 8. Age of starting weight gain, perception of obesity and level of information about obesity.

		Yopougon		Cocody		Abobo		Entire population	
		Size	%	Size	%	Size	%	Size	%
Age of onset of weight gain (in years)	<2 years	3	8	0	0	3	11	6	7
	>50 years	1	3	0	0	0	0	1	1
	10 - 18	10	27	5	20	2	7	17	19
	18 - 21	9	24	13	52	18	64	40	44
	2 - 5	0	0	1	4	0	0	1	1
	21 - 35	7	19	0	12	3	11	13	14
	35 - 50	2	5	0	0	0	0	2	2
	5 - 10	3	8	1	4	2	7	6	7
	Unspecified	2	5	2	8	0	0	4	4
	Total	37	100	25	100	28	100	90	100
Perception of obesity	Obesity is not a sickness	95	77.2	77	67	73	65.8	245	70.2
	Obesity is a sickness	28	22.8	38	33	38	34.2	104	29.8
	Total	123	100	115	100	111	100	349	100
Receiving information about obesity	No	48	39	42	36.5	52	46.8	142	40.7
	Yes	75	61	73	63.5	59	53.2	207	59.3
	Total	123	100	115	100	111	100	349	100
Willingness about weight losing	No	6	16.2	2	8	7	25	15	16.7
	Unspecified	2	5.4	2	8	0	0	4	4.4
	Yes	29	78.4	21	84	21	75	71	78.9
	Total	37	100	25	100	28	100	90	100
Regular weight monitoring	No	83	67.5	95	82.6	102	91.9	280	80.2
	Yes	40	32.5	20	17.4	9	8.1	69	19.8
	Total	123	100	115	100	111	100	349	100

program (**Table 9**). Also, more than three quarters of obese people have declared that they had never received instructions at the hospital for weight loss, and had a total lack of knowledge of the National Nutrition Program (PNN) as well as the National Institute of Public Health (INSP).

3.6. Family History, Eating Behavior and Spending Time before a Screen

An obese person had 38.9% chance to have an obese mother (**Table 10**). In general, 51.1% of obese people had access to three meals per day. Among obese people, 64.4% of them did not eat their meals at more or less fixed times, 68.9% snacked between meals and 59% spent more than 4 hours daily in front of a

Table 9. Attitudes of obese people living Yopougon, Cocody and Abobo.

		Yopougon		Cocody		Abobo		Entire population	
		Size	%	Size	%	Size	%	Size	%
Attempting to lose weight	No	16	43	8	32	22	79	46	51
	Unspecified	2	5	2	8	0	0	4	4
	Yes	19	51	15	60	6	21	40	44
	Total	37	100	25	100	28	100	90	100
Success if any attempt to lose weight	No	14	74	13	87	6	100	33	83
	Yes	5	26	2	13	0	0	7	18
	Total	19	100	15	100	6	100	40	100
Level of motivation to be engaged in an obesity management program	Not motivated	4	10.8	2	8	3	10.7	9	10
	Slightly motivated	14	37.8	4	16	18	64.3	36	40
	Motivated	12	32.4	16	64	3	10.7	31	34.4
	Very motivated	5	13.5	1	4	4	14.3	10	11.1
	Unspecified	2	5.4	2	8	0	0	4	4.4
	Total	37	100	25	100	28	100	90	100
Instructions received at the hospital for weight loss	No	27	73	12	48	25	89	64	71
	Unspecified	2	5	2	8	0	0	4	4
	Yes	8	22	11	44	3	11	22	24
	Total	37	100	25	100	28	100	90	100
Knowledge about PNN	No	116	94.3	110	95.7	109	98.2	335	96.0
	Yes	7	5.7	5	4.3	2	1.8	14	4.0
	Total	123	100	115	100	111	100	349	100
Knowledge about INSP	Non	115	93.5	111	96.5	110	99.1	336	96.3
	Oui	8	6.5	4	3.5	1	0.9	13	3.7
	Total	123	100	115	100	111	100	349	100

Table 10. Families history, eating behavior and time spending before a screen of obese people living in Yopougon, Cocody and Abobo.

		Non-obese		Obese		Entire population	
		Size	%	Size	%	Size	%
Family history (Obesity and chronic diseases)	Father	15	5.8	14	15.6	29	8.3
	Mother	42	16.2	35	38.9	77	22.1
	Partner	4	1.5	1	1.1	5	1.4
	Children	3	1.2	3	3.3	6	1.7
	Non-obese people	200	77.2	42	46.7	242	69.3
Number of meals per day	1	4	1.5	0	0	4	1.1
	2	37	14.3	15	16.7	52	14.9
	3	159	61.4	46	51.1	205	58.7
	4	53	20.5	25	27.8	78	22.3
	5	4	1.5	3	3.3	7	2.0
	More than 6	2	0.8	1	1.1	3	0.9
	Total	259	100	90	100	349	100
Eating at more or less fixed times	No	168	64.9	58	64.4	226	64.8
	Yes	91	35.1	32	35.6	123	35.2
	Total	259	100	90	100	349	100
Snacking	No	98	37.8	28	31.1	126	36.1
	Yes	161	62.2	62	68.9	223	63.9
	Total	259	100	90	100	349	100
Time spent daily in front of a screen	Less than 1 h	0	0	1	1	1	0
	1 - 3 h	115	44	36	40	151	43
	4 - 6 h	88	34	28	31	116	33
	7 - 9 h	26	10	15	17	41	12
	10 - 12 h	30	12	10	11	40	11
	Total	259	100	90	100	349	100

screen. Regarding the daily duration of sleep, almost half of obese people (47.8%) had a sleep time of less than 7 hours. In addition, 73.3% of obese people did not practice any physical activity outside of household activities (Table 11). Regarding the daily duration of sleep, almost half of obese people (47.8%) had a sleep time of less than 7 hours. In addition, 73.3% of obese people did not practice any physical activity outside of household activities (Table 11).

4. Discussion

Côte d'Ivoire that is facing to the double burden of malnutrition, must find

Table 11. Sleep duration and physical activities of obese people living in Yopougon, Cocody and Abobo.

	Non-obese people		Obese people		Entire population		
	Size	%	Size	%	Size	%	
Daily sleep duration	1 - 3 h	4	1.5	1	1.1	5	1.4
	4 - 6 h	94	36.3	42	46.7	136	39
	7 h	117	45.2	38	42.2	155	44.4
	8 - 12 h	44	17.0	9	10.0	53	15.2
	Total	259	100	90	100	349	100
Physical activities outside of household activities	No	156	60.2	66	73.3	222	63.6
	Yes	103	39.8	24	26.7	127	36.4
	Total	259	100	90	100	349	100

solutions to resolve both problems of undernutrition and control the emergence of problems of obesity and metabolic diseases. To deal with this, the interventions focus on prevention activities for the reduction of malnutrition in all its forms [23]. In order to address the key factors that affect the nutritional status of individuals, it is important to establish the links between the sociodemographic characteristics of populations and the occurrence of overweight and obesity [24]. The study of the determinants of obesity in people aged 21 to 65 years carried out in August 2023 in Abidjan made it possible to provide information on obese adults. The results of this study have shown that in Yopougon, Cocody and Abobo, the heads of households were predominantly women and had an average age of 42 years old. This result is consistent with current household realities on the African continent. Indeed, the proportions of female heads of household vary in Africa between two extremes, 6.5% in Burkina Faso and 45.9% in Botswana. Women heads of households are most represented in Eastern and Southern Africa countries (Kenya, Zimbabwe, Botswana, Namibia). In the rest of the continent, values are almost everywhere below 20%, except in Congo (21.1%), Togo (26.4%) and Ghana (32.2%). On the other hand, this result is contrary to that of Tiembré *et al.* (2008) who have revealed that in 2008, heads of households were relatively young with an average age of 35 years and were largely represented by men in Abobo [25]. This reversal of household characteristics could be explained by the shift in current family structures towards another model of family organization. The evolution of marital behavior (rising female celibacy especially in the city and marital mobility), the accentuation of work migrations (male but also female, rather individual than family), the growing practice of non-cohabitation of spouses in cities, but also a general process of female emancipation constitute factors which contribute to increasing feminization of heads of household [26]. The household is a group of people, related or not, living together under the same roof, sharing meals together and recognizing the authority of a head of household [27]. A household contained on average

20% adults without stable income in Abidjan in 2008 [28]. This figure almost triples in 2023 [29]. In addition, Abidjan is one of the cities in the West African Economic and Monetary Union (UEMOA) zone which contains the most households made up of nuclear and extended families [28]. Faced with men's difficulties, women now participate in the economic support of the household, partially or totally, voluntarily or not [30]. Generally, mothers undertake small activities around the households which sometimes bring in more than those of their spouses. This income is generally used for current household expenses. This last argument constitutes one of the main reasons why the majority of household heads do not give instructions for preparing meals. Indeed, the daily life of households is the fruit of the combined efforts of both spouses. The functioning principle of households is based on the solidarity of parents which is based on the principle of "who wins offers" that is to say in practice sometimes it is the mother who offers the meal and sometimes it is the father. This solidarity means that the majority of heads of households have, comforts them for daily meals paying.

Noting the difficulties faced by household heads, the majority of young people are hesitant to create new households at the risk of being responsible for the current expenses of a large number of people. Moreover, the analysis of the labor supply of young people has revealed that in Côte d'Ivoire, most of the time young people are victim of unemployment compared to adults [29]. This would explain the reluctance of young people to create new households, hence the increase in the average age of heads of household which was from 35 years in 2008 to 42 years in this study. The majority (66.4%) of household heads were in a relationship and did not have a stable job (67.3%). However, 54.5% of household heads living in Yopougon have had regularly stable employment. The exception made by household heads in Yopougon regarding the failure to obtain stable jobs is due in part to the existence of an industrial zone in Yopougon which provides jobs. Regarding the respondents to the questionnaires, 53% of the total number of respondents were heads of household. This information has the advantage of guaranteeing the reality of the daily experience of households at the end of this study given that the head of the household is in principle the one who has all decision-making rights over the members of the household [31].

Out of 349 people who have responded to the questionnaires, 90 or 25.8% of participants were declared obese according to BMI measurements. Moderate obesity was the most widespread form in the communes of Yopougon, Cocody and Abobo. The overall prevalence of obesity in these three municipalities is close to that obtained by Goetjes *et al.* (2021), who claimed that 26.72% of people in a study in South Africa were obese [32]. However, it must be emphasized that abdominal obesity, which is the worst form of obesity, was the most prevalent in Yopougon. According to Malik *et al.* (2019), 50.8% of respondents to the questionnaire of a study in Anonkoi 3 in Abidjan have had abdominal obesity [33]. The prevalence of overweight and obesity still remains high, especially

in urban areas because the risk is approximately three times higher in large cities [34]. In the general population, the rate of people diagnosed as obese based on BMI was 25.8%, that of people with abdominal obesity is 34.4% and of people with too much fat is 62.8%. Thus, some apparently non-obese people either have too much fat or are suffering from abdominal obesity. Body mass index (BMI) is widely used to monitor the prevalence of obesity because it helps assess the risk of coronary heart disease and ischemic stroke [35]. As for the Fat Mass Index, it assesses obesity and its complications according to age and sex while distinguishing between excess body fat and high muscle mass [36]. Normal weight individuals with abdominal obesity may have metabolic risk factors, and therefore be candidates for elevated risk of metabolic syndrome and cardiovascular disease [37]. Waist circumference measurements are closely linked to metabolic risk factors such as the adiposity index [38]. Thus, waist circumference as a marker of obesity is a better predictor of coronary artery calcification than BMI [36]. Abdominal obesity is very often associated with an increased risk of cardiovascular diseases, diabetes and cancer [39].

In this study, obesity was more common in women than in men. According to Kanter and Caballero (2012), the prevalence of overweight and obesity varies considerably depending on sex and overall, more women are obese than men [40]. In women, the biological factor of menopause affects fat distribution and increases the risk of obesity [41]. In addition, many socio-cultural factors make it difficult to practice physical activities after childbirth and therefore contribute to increasing the risk of obesity in women [42] [43].

This study has indicated that people aged 36 to 55 were most affected by obesity. According to Chigbu *et al.* (2018), the risk of obesity increases in Nigeria with age, which approaches forty years and over [44]. In most of the obese people in this study, weight gain began when they were on average between 10 and 21 years old. This information could challenge policies and lead to the intensification of the promotion of good nutritional practices among children, adolescents and young people. This idea is also supported by certain results of this study which stipulate that the majority of obese people would not consider obesity as a disease, snacked between meals, did not practice any physical activity and were unaware of national prevention and support structures. This could be the cause of the high rate of failure of weight loss attempts among obese people.

5. Conclusion

In the population of the study of the determinants of obesity in Abidjan, the rate of people diagnosed as obese based on BMI was 25.8%, that of people with abdominal obesity was 34.4%, and 62.8% for people with too much fat. Thus, some apparently non-obese people either had too much fat or had abdominal obesity. The majority of obese people do not consider obesity to be a disease, snack between meals, do not practice any physical activity and are unaware of national

structures for the prevention and management of obesity. This situation would be at the origin of the persistence of the problem of obesity and its consequences in Côte d'Ivoire. Thus, the present conclusions of this study provide recent and complementary information to policies in order to enable them to adapt and better guide national strategies to combat obesity.

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Authors Contribution

Ahoussi Attouo Josiane Koffi conducted the study, collected data and wrote the manuscript. Koffi Bruno Koko did statistical analyses and helped with interpretation. Adjoumani Placide Ehoué helped with data collection. Brou André Konan supervised the study. All authors read and approved the manuscript.

Ethics Statement

The study was approved by the Ministry of Health and Public Hygiene of Côte d'Ivoire and the Life Sciences and Health Ethics Committee of Côte d'Ivoire.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Drewnoski, A. (2003) The Role of Energy Density. *Lipids*, **38**, 109-115. <https://doi.org/10.1007/s11745-003-1039-3>
- [2] WHO: World Health Organization (2009) Global Health Risks: Mortality and Burden of Disease Attributable to Selected Major Risks. Geneva. https://reliefweb.int/attachments/ef6f94a1-3f4a-3d8b-b18d-3bbe7d98ed9f/4F47C550473045B6492576A2000D675E-WHO_healthrisks_Dec09.pdf
- [3] Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., *et al.* (2014) Global, Regional, and National Prevalence of Overweight and Obesity in Children and Adults during 1980-2013: A Systematic Analysis for the Global Burden of Disease Study 2013. *The Lancet*, **384**, 766-781. [https://doi.org/10.1016/S0140-6736\(14\)60460-8](https://doi.org/10.1016/S0140-6736(14)60460-8)
- [4] Van Wesenbeeck, C. (2018) Distinguer Sécurité alimentaire urbaine et rurale en Afrique de l'Ouest. OCDE, Paris.
- [5] Beck, E.J., Shields, J.M., Tanna, G., Henning, G., de Vega, I., Andrews, G., *et al.* (2018) Developing and Implementing National Health Identifiers in Resource Limited Countries: Why, What, Who, When and How? *Global Health Action*, **11**, Article ID: 1440782. <https://doi.org/10.1080/16549716.2018.1440782>
- [6] ECOWAS (2020) Ne laisser aucune femme ni aucun enfant en rade: Inégalités dans la couverture et l'état nutritionnels des femmes, des enfants et des adolescents en

- Afrique de l'Ouest.
<https://countdown2030.org/wp-content/uploads/2020/10/CD2030-Initiative-ouest-africaine-sur-la-nutrition-rapport-Summary-FRE.pdf>
- [7] Chowdhury, M.A.B., Adnan, M.M. and Hassan, M.Z. (2018) Trends, Prevalence and Risk Factors of Overweight and Obesity among Women of Reproductive Age in Bangladesh: A Pooled Analysis of Five National Cross-Sectional Surveys. *BMJ Open*, **8**, e18468. <https://doi.org/10.1136/bmjopen-2017-018468>
- [8] Olshansky, S.J., Passaro, D.J., Hershow, R.C., Layden, J., Carnes, B.A., Brody, J., *et al.* (2005) A Potential Decline in Life Expectancy in the United States in the 21st Century. *The New England Journal of Medicine*, **352**, 1138-1145. <https://doi.org/10.1056/NEJMs043743>
- [9] Wharton, S., Lau, D.C.W., Vallis, M., Sharma, A.M., Biertho, L., Campbell-Scherer, D., *et al.* (2020) L'obésité chez l'adulte: Ligne directrice de pratique clinique. *Canadian Medical Association Journal*, **192**, E1757-E1775. <https://doi.org/10.1503/cmaj.191707-f>
- [10] Powell, L.H., Calvin, J.E. and Calvin Jr., J.E. (2007) Effective Obesity Treatments. *American Psychologist*, **62**, 234-246. <https://doi.org/10.1037/0003-066X.62.3.234>
- [11] Sable, S.P., Yan, K., Yapi, A., Kpebo, D.D., Ekou, K.F., Ake-Tano, P.O.S., *et al.* (2020) Epidemiologic Profile of Overweight and Obesity in Abidjan, Ivory Coast: A Cross-Sectional Study. *Annals of Global Health*, **86**, 46. <https://doi.org/10.5334/aogh.2755>
- [12] Ministère de la Santé et de la lutte contre le SIDA (2014) Plan stratégique intégré de prévention et de prise en charge des maladies non transmissibles en Côte d'Ivoire 2015-2019. https://www.iccp-portal.org/system/files/plans/CIV_B3_PLAN-STRATEGIQUE-In-tegré-2015-2019-MNT-CIV-final.pdf
- [13] PNN (2017) Plan National Multisectoriel de Nutrition 2016-2020. http://www.pnmin.gouv.ci/fichier/doc/PNMN_2016_2020_15_08_16.pdf
- [14] WHO: World Health Organization (2011) Non Communicable Diseases Country Profiles 2011. Geneva. https://iris.who.int/bitstream/handle/10665/44704/9789241502283_eng.pdf?sequence=1
- [15] MSLS, INS, MEMPD and ICF International (2013) Enquête Démographique et de Santé et à Indicateurs Multiples de Côte d'Ivoire 2011-2012. <https://dhsprogram.com/pubs/pdf/fr272/fr272.pdf>
- [16] PNLMM (2019) Enquête sur la prévalence et caractéristiques du diabète en Côte d'Ivoire.
- [17] MSHP and Direction de Coordination du Programme STEPS/MNT (2005) Enquête sur les facteurs de risque des maladies non transmissibles. https://cdn.who.int/media/docs/default-source/ncds/ncd-surveillance/data-reporting/c%C3%B4te-d-ivoire/steps/steps-report-cotedivoire-2005.pdf?sfvrsn=6a50d0de_2&download=true%20consulted%20on%2024/09/23
- [18] Hauhouot-Attoungbré, M.L., Yayo, E.S., Konan, J.L., Koné, F., Siara, E. and Monnet, G. (2013) Régime d'engraissement et syndrome métabolique en Côte d'Ivoire. *Annales de Biologie Clinique*, **71**, 207-210. <https://www.jle.com/10.1684/abc.2013.0808>
<https://doi.org/10.1684/abc.2013.0808>
- [19] MPD and INS (2022) Recensement Général de la Population et de l'Habitat (RGPH 2021). <https://www.ins.ci/RGPH2021/RESULTATS%20DEFINITIFS%2021.pdf>

- [20] Cochran, W.G. (1977) Sampling Techniques. 3rd Edition, John Wiley & Sons, New York.
- [21] Tsigos, C., Hainer, V., Basdevant, A., Finer, N., Fried, M., Mathus-Vliegen, E., *et al.* (2008) Management of Obesity in Adults: European Clinical Practice Guidelines. *Obesity Facts*, **1**, 106-116. <https://doi.org/10.1159/000126822>
- [22] Alberti, K.G., Zimmet, P. and Shaw, J. (2006) Metabolic Syndrome: A New World-Wide Definition. A Consensus Statement from the International Diabetes Federation. *Diabetic Medicine*, **23**, 469-480. <https://doi.org/10.1111/j.1464-5491.2006.01858.x>
- [23] Côte d'Ivoire (2016) Plan National Multisectoriel de Nutrition 2016-2020. http://www.pnmin.gouv.ci/fichier/doc/PNMN_2016_2020_15_08_16.pdf
- [24] Ohlsson, B. and Manjer, J. (2020) Sociodemographic and Lifestyle Factors in Relation to Overweight Defined by BMI and "Normal-Weight Obesity". *Journal of Obesity*, **2020**, Article ID: 2070297. <https://doi.org/10.1155/2020/2070297>
- [25] Tiembré, I., Vroh, J.B.B., Kouassi, D.P., Attoh-Touré, H., Ekra, K.D., Diane, A., *et al.* (2014) Connaissances, attitudes et pratiques des chefs de ménage de la commune d'Abobo (Abidjan, Côte d'Ivoire) en matière de rage, en 2008. *Santé Publique*, **26**, 547-553. <https://doi.org/10.3917/spub.144.0547>
- [26] Pilon, M., Seidou, M. and Tichit, C. (1997) Les femmes chefs de ménage: Aperçu général et études de cas. In: Pilon, M., Locoh, T., Vignikin, E. and Vimard, P., Eds., *Ménages et familles en Afrique. Approches des dynamiques contemporaines*, CEPED, Paris, 167-191.
- [27] Randall, S., Coast, E., Antoine, P., Compaore, N., Dial, F.B., Fanghanel, A., *et al.* (2015) UN Census Households and Local Interpretations in Africa since Independence. *SAGE Open*, **5**, 1-18. <https://doi.org/10.1177/2158244015589353>
- [28] Larmarange, J., Coulibaly, S., Koriko, O. and Fall, M. (2014) Appréhender la structure écodémographique des ménages à partir d'enquêtes économiques: L'exemple des Enquêtes sur les Dépenses des Ménages 2008. <https://www.afristat.org/wp-content/uploads/2022/02/stec108e.pdf>
- [29] OIM (2023) Étude nationale du marché du travail en Côte d'Ivoire. Genève. <https://publications.iom.int/system/files/pdf/PUB2023-001-L-%C3%89tude-nationale-du-march%C3%A9-C%C3%B4te-d%E2%80%99Ivoire.pdf>
- [30] Bisilliat, J. (1996) Femmes du sud, chefs de famille. Karthala, Paris.
- [31] Appleton, S. (1996) Women-Headed Households and Household Welfare: An Empirical Deconstruction for Uganda. *World Development*, **24**, 1811-1827. [https://doi.org/10.1016/S0305-750X\(96\)00089-7](https://doi.org/10.1016/S0305-750X(96)00089-7)
- [32] Goetjes, E., Pavlova, M., Hongoro, C. and Groot, W. (2021) Socioeconomic Inequalities and Obesity in South Africa—A Decomposition Analysis. *International Journal of Environmental Research and Public Health*, **18**, Article 9181. <https://doi.org/10.3390/ijerph18179181>
- [33] Malik, S.K., Kouame, J., Gbane, M., Coulibaly, M., Ake, M.D. and Ake, O. (2019) Prevalence of Abdominal Obesity and Its Correlates among Adults in a Peri-Urban Population of West Africa. *AIMS Public Health*, **6**, 334-344. <https://doi.org/10.3934/publichealth.2019.3.334>
- [34] Abubakari, A.R., Lauder, W., Agyemang, C., Jones, M., Kirk, A. and Bhopal, R.S. (2008) Prevalence and Time Trends in Obesity among Adult West African Populations: A Meta-Analysis. *Obesity Reviews*, **9**, 297-311. <https://doi.org/10.1111/j.1467-789X.2007.00462.x>
- [35] WHO: World Health Organization (2008) Waist Circumference and Waist-Hip Ra-

tio. Report of a WHO Consultation. Geneva.

http://apps.who.int/iris/bitstream/10665/44583/1/9789241501491_eng.pdf

- [36] Park, J., Lee, E.S., Lee, D.Y., Kim, J., Park, S.E., Park, C.Y., *et al.* (2016) Waist Circumference as a Marker of Obesity Is More Predictive of Coronary Artery Calcification Than Body Mass Index in Apparently Healthy Korean Adults: The Kangbuk Samsung Health Study. *Endocrinology and Metabolism*, **31**, 559-566. <https://doi.org/10.3803/EnM.2016.31.4.559>
- [37] Lee, S.C., Hairi, N.N. and Moy, F.M. (2017) Metabolic Syndrome among Non-Obese Adults in the Teaching Profession in Melaka, Malaysia. *Journal of Epidemiology*, **27**, 130-134. <https://doi.org/10.1016/j.je.2016.10.006>
- [38] Czernichow, S., Kengne, A.P., Stamatakis, E., Hamer, M. and Batty, G.D. (2011) Body Mass Index, Waist Circumference and Waist-Hip Ratio: Which Is the Better Discriminator of Cardiovascular Disease Mortality Risk? Evidence from an Individual-Participant Meta-Analysis of 82 864 Participants from Nine Cohort Studies. *Obesity Reviews*, **12**, 680-687. <https://doi.org/10.1111/j.1467-789X.2011.00879.x>
- [39] Fruh, S.M. (2017) Obesity: Risk Factors, Complications, and Strategies for Sustainable Long-Term Weight Management. *Journal of the American Association of Nurse Practitioners*, **29**, S3-S14. <https://doi.org/10.1002/2327-6924.12510>
- [40] Kanter, R. and Caballero, B. (2012) Global Gender Disparities in Obesity: A Review. *Advances in Nutrition*, **3**, 491-498. <https://doi.org/10.3945/an.112.002063>
- [41] Morita, Y., Iwamoto, I., Mizuma, N., Kuwahata, T., Matsuo, T., Yoshinaga, M., *et al.* (2006) Precedence of the Shift of Body-Fat Distribution over the Change in Body Composition after Menopause. *Journal of Obstetrics and Gynaecology Research*, **32**, 513-516. <https://doi.org/10.1111/j.1447-0756.2006.00437.x>
- [42] McLaren, L. (2007) Socioeconomic Status and Obesity. *Epidemiologic Reviews*, **29**, 29-48. <https://doi.org/10.1093/epirev/mxm001>
- [43] Farpour-Lambert, N.J., Ells, L.J., Martinez de Tejada, B. and Scott, C. (2018) Obesity and Weight Gain in Pregnancy and Postpartum: An Evidence Review of Lifestyle Interventions to Inform Maternal and Child Health Policies. *Frontiers in Endocrinology*, **9**, Article 546. <https://doi.org/10.3389/fendo.2018.00546>
- [44] Chigbu, C.O., Parhofer, K.G., Aniebue, U.U. and Berger, U. (2018) Prevalence and Sociodemographic Determinants of Adult Obesity: A Large Representative Household Survey in a Resource-Constrained African Setting with Double Burden of Undernutrition and Overnutrition. *Journal of Epidemiology & Community Health*, **72**, 702-707. <https://doi.org/10.1136/jech-2018-210573>

Abbreviations

BMI: Body Mass Index

CONNAPE: Council for Nutrition, Food and Early Childhood Development

INS: National Institute of Statistics

PNN: National Nutrition Program

PNLMM: National Program for the Fight against Metabolic Diseases

MEMPD: State Ministry, Ministry of Planning and Development

MSLS: Ministry of Health and the Fight against AIDS

WHO: World Health Organisation

Survey Questionnaire

Date: /_/_/ /_/_/ /_/_/___/

Start time: /___/

End time: /___/

Investigator name:

Investigator phone contact: /_/_/_/_/_/_/_/_/_/_/_/_/

Municipality: 1. Abobo 2. Cocody 3. Yopougon

Neighborhood: 1..... 2..... 3.....
4..... 5..... 6.....

I-HOUSEHOLD

Household order number by municipality: Household Number

Respondent Name:

Respondent phone Contact: /_/_/_/_/_/_/_/_/_/_/_/_/

Information about the head of household		
Quality of the respondent: Head of household <input type="checkbox"/> Husband/Wife <input type="checkbox"/> Son/Daughter <input type="checkbox"/> Other parents <input type="checkbox"/> Unrelated <input type="checkbox"/>	Age of the head of household (in Years) : /___/	
	Woman (W) <input type="checkbox"/>	Man (M) <input type="checkbox"/>
	Stable Job (Monthly wage is available) <input type="checkbox"/>	Unstable job (absence of wage) <input type="checkbox"/>
	No level of education <input type="checkbox"/>	Educated Primary <input type="checkbox"/> Secondary <input type="checkbox"/> University <input type="checkbox"/>
	In Relationship with <input type="checkbox"/>	Not in a Relationship <input type="checkbox"/>
	Apparently obese (big by the look) <input type="checkbox"/>	Apparently not obese (not big by the look) <input type="checkbox"/>
	Ensures meals without difficulty <input type="checkbox"/>	Ensures meals with difficulties <input type="checkbox"/>
	Gives instructions for family meals making <input type="checkbox"/>	Do not give any instruction for family meals making <input type="checkbox"/>
	Practices a regular physical activity <input type="checkbox"/>	Do not Practice any regular physical activity <input type="checkbox"/>

II-RESPONDENTS TO THE INDIVIDUAL QUESTIONNARY

Participant's order number: Number/Household Number

Participant Name:

Participant phone Contact: /_/_/_/_/_/_/_/_/_/_/_/_/

Participant Relationship with the head of household

Head of household

Husband/Wife

Son/Daughter

Other parents Unrelated **WHAT TYPE OF PREDOMINANT OBESITY?**

1-Weight: / _____/Kg

Height: / _____/meters

BMI: / _____/kg/m²**2-Body Mass Index Interpretation:**Undernutrition < 16.5 Thinness 16.5 - 18.5 Normal build 18.5 - 24.9 Overweigh 25-30.0 Moderate obesity 30.0 - 34.9 Severe obesity 35.0 - 39.9 Morbid obesity > 40 **3-Umbilical perimeter (in cm):** / _____ /**Umbilical perimeter Interpretation**Man abdominal obesity: waist circumference > 102 cm Woman abdominal obesity: waist circumference > 88 cm **4-Fat Mass Index (%):** / _____ /**Men Umbilical Perimeter Interpretation**Fat Mass Index less than 15 %: Very thin person Fat Mass Index between 15 and 20 %: Normal size person Fat Mass Index greater than 20 %: Person with too much fat Fat Mass Index less than 25 %: Thin Person **Women Interpretation of the Umbilical perimeter**Fat Mass Index less than 25%: Person too thin Fat Mass Index between 25 and 30 %: Normal size person Fat Mass Index greater than 30%: Person with too much fat **5-Do you frequently feel pain?** NO YES • **Psychic Suffering:** NO YES - Anxiety - Sadness - Dissatisfaction - Self-shame - Lost of self-esteem - Feeling guilt - Misunderstanding - Others (specify) • **Physical Suffering:** NO YES - Migraines - Cramps - Joint pain - Muscle aches - Abdominal pain - Tiredness - Vertigo - Tingling - Other (Specify)

WHY PEOPLE ARE OBESITY?

6-Respondent Age: / ____ / Years old

7-Sex: Woman Man

8-If woman (specify): Pregnant or breastfeeding Neither pregnant nor breastfeeding

9-Educational level: None Primary Secondary University

10-Marital status: Legally married In a relationship with Not in a relationship

11-Familial obesity (Who is fat in your family?):

Father Mother Partner Children Others (specify)

12-Age (in age unit) of the starting weight gain (In case of obesity)*:

<2 years old 2 - 5 years old 5 - 10 years old 10 - 18 years old

18 - 21 years old 21 - 35 years old 35 - 50 Years old >50 years

13-What the occurrence and persistence of your weight gain could be explain by (In the case of obesity)*?

• **Stress situation (In case of obesity):** Yes No

- In the couple
- In the families
- At work
- Other situation (Specify)

• **Marital Status Change (In case of obesity):** Yes No

- From single one situation to be getting married
- From a person who is single to a person who is in a relationship with anyone else
- From a married person to a divorce

• **Presence of illness (In case of obesity):** Yes No

Specify (In case of illness).....

• **Taking medication over a long period (In case of obesity)** Yes No

Specify the reasons that any medication has been taken:

• **Have you got a promotion that has impacted your socioeconomic condition (In case of obesity)?**

Yes No

• **Sedentary time**

- Less than 7 hours sitting or lying awake
- More than 7 hours sitting or lying awake

• **Eating habits**

- **How do you eat?**

In front of a screen (television, computer, smartphone): Yes No

In the company of family members or other people: Yes No

Sitting down: Yes No

Serve oneself only once: Yes No

• **Average duration of a meal:**

Less than 10 mn 10 - 15 mn 15 - 20 mn 20 - 30 mn More than 30 mn

• **Eating outside home:** No Yes

• **Snacking (food intake in small quantities outside of meals)** Yes No

• **Number of meals per day (including snacks)**

1 2 3 4 5 6 More than 6

Eating at more or less fixed times: Yes No

Average time between first and last meal of the dayLess than 1 h 1 - 2 h 3 - 5 h 6 - 8 h 9 - 12 h 13 - 16 h >16 h **Average time between meals during the day**Less than 1 h 1 - 2 h 3 - 5 h 6 - 8 h 9 - 12 h 13 - 16 h >16 h

Do you frequently eat ultra-processed foods from the food industry (crisps, sausages, biscuits, breakfast cereals, energy bars, soft drinks, candy, etc.)? Yes No

Do you do household activities (sweeping, laundry, dishes, etc.)? Yes No

Explain your choice?.....

If Yes, how often?1 day/week 2 - 3 day/week 4 - 5 day/week 6 - 7 day/week

Do you engage in physical activity outside of household activities? Yes No

Why?.....

If Yes, how often (number of times per week)Once Twice 3 times 4 times 5 times 6 times 7 times a week **If Yes, what physical activities do you practice outside of household activities?**- Walking - Dancing - Jumping rope - Jogging - Swimming - Football - Other (Specify)

• **How much time do you spend in front of a screen (TV, computer, smartphone, etc.) per day? /___/ hours**

• **In your area, do you have access to:**- A Gym center Yes No - Restaurants Yes No - Collective sport's activities Yes No • **How do you get your work?**- by your own car - by your own motorbike - by your own bike - Public transport - Walk - Elevators - Stairs - Other (Specify) • **Average sleep duration per day**1 - 3 h 4 - 6 h 7 h 8 - 12 h More than 12 h

• **Do you monitor your weight regularly (weight gain):** Yes No

Rarely At least once a year At least once a month

• **Do you know National Nutrition Program (PNN) that develops strategies to combat all forms of malnu-**

trition: Yes No

• Do you know National Institute of Public Health (INSP) that treats obesity? Yes No

14-Do you know that:

-That there is a National Nutrition Program (PNN) which develops strategies to combat all forms of malnutrition

Yes No How

-Have you been monitored in the INSP* nutrition service? Yes No

-If Yes, was the program a success*? Yes No

-If Yes, did you succeed? Yes No

Why?.....

III-WHAT IS THE PERCEPTION OF OBESITY BY PEOPLE AFFECTED BY THIS DISEASE?

15-In your viewpoint, is being fat a situation of illness?

-It is an illness

-It is not an illness

16-Is being obese a choice? Yes No

17-According to you, what does being fat mean?

- Being rich
- Suffer from a form of malnutrition that is obesity
- Sign of elegance
- Sign of incapacity to work
- To not care about his one's own health

18-How do you think you are?:

Skinny Normal build size Overweight Obese

19-Is it necessary to go to hospital for obesity treatment? Yes No

Why?.....

20-Does anyone told you about obesity? Yes No

If yes, where?

- At hospital
- In Mass media (television, radio, etc) productions
- In the couple (marriage or free relationship)
- In the families At work
- Somewhere else specify.....

21-At the hospital, have you ever been encouraged to take care of your obesity? (In case of obesity)*

Yes No

22-How do you want plan to be physically?

Lose weight Intact (No change) Get more weight

23-Do you want to lose weight (In case of obesity)? Yes No

Why?.....

24-What is your level of motivation to be engaged in an obesity management program (In case of obesity)*?

0 No motivation 1 Little motivated 2 Motivated 3 Very motivated

Why?.....

25-Have you ever tried to lose weight (In case of obesity)?: Yes No

26-If Yes, have you lost weight in the long term (In case of obesity)? Yes No

Why?.....