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ENDOGENOUS FOOD BASKET FOR CABA

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Abstract

The official body of the Autonomous City of Buenos Aires (CABA) considers as poor any person who cannot have access to a basket of goods and services elaborated based on the uses and customs. The food basket that is taken as reference, however, exceeds the nutrients necessary to survive and prevent basic diseases, hence not really providing an idea of poverty or extreme poverty. This paper suggests an alternative method to measure this. We estimate the food component of the basic basket for the city for the last 5 months of 2020, following the linear programming proposed by Stigler (1945) *and later used by Allen (2017) to measure basic needs. We estimate that the resulting basic diet costs 20% of what the official one does, if we incorporate the nutritional requirements suggested by the official method. We also estimate the basic diet with the more basic requirements suggested by Allen; this basket costs 12% of what the official one does and it is so basic that it is composed of 70% wheat flour. These baskets would imply that very few people would be considered extremely poor in CABA.*

Introduction

What does it mean to be poor? The existing literature about poverty provides divergent definitions about this phenomenon and one of the main debates that arises is whether this concept should follow an absolute or a relative connotation. For instance, while the dollar-a-day line, created by Ravallion et al. (1991) adopts an absolute approach, the Townsend Centre for International Poverty Research defines poverty as the lack of resources needed to have access to common living patterns, customs and activities determined by the average individual[1]. Is the definition of poverty related to the possibility of meeting some basic requirements for survival? Or is it associated with the ability of resembling the average-type consumer in a determined society?

Absolute lines make sense because they have a fixed real value over time and space (Ravallion, 2020), that is to say, they are independent of the society and the historical moment studied. In 1976, the International Labour Organization (ILO) defined the poverty line in terms of the minimum requirements of clothing, shelter, food and other essential services such as transportation, education and health; in 2015, the World Bank defined as "extremely poor" people of the world who are currently living on less than $1.90 dollars a day. These are examples of the absolute approach, given that the non-poor status is related to the ability of avoiding deprivation of basic requirements for survival. The absolute line aims to define poverty, and in particular extreme poverty, in terms of access to certain goods that imply a universal minimum of well-being.

Alternatively, if we come to the conviction that an individual´s economic well-being depends on that of the rest of the society in which he lives in (and not to a universal minimum standard), then we are referring to a poverty line that uses the relative concept. Relative measures assume people perceive their well-being based on the situation of the society in which they live. In this vein, Galbraith (1958) defines the non-poor status not only in relation to how much income an individual has, but also on how much income others in society have. Put simply and in the words of Hagenaars and de Vos (1988): "Poverty is having less than

[1] To see the online version of these article, visit https://www.bristol.ac.uk/poverty/definingandmeasuringpoverty.html

others in society" (p.212). Therefore, following the relative line, as the well-being of a society increases, the needs that a person must cover so as not to be considered poor also augment and the poverty line varies in real terms.

Certainly, the choice of the poverty definition results in different estimations of the percentage of poor people (and consequently imply dissimilar approaches for public policy implementation). While the relative concept considers as poor any individual who lacks a certain amount of income derived from the median or mean income in a given society, the absolute concept performs a headcount ratio of people who do not possess the minimum income to cover for some basic requirements to survive. Additionally, even the establishment of these minimum requirements to survive imply defining what survival means. Wagle (2002) states: "Defining what the basic means of survival includes involves arbitrary standards because the issue of survival is immediately related to the quality of survival" (p.156). Thus, a debate about which are the basic requirements that should be considered for the absolute poverty line arises. A clear example of the disagreements as to what the essential components of survival include is that of food. If certain universally valid nutritional requirements are set, the minimum threshold is determined by the possibility of access to a certain quantity of goods that allow satisfying these nutrients. However, economists and health researchers have not yet been able to come to an agreement about which is the minimum nutritional threshold for survival. Particularly, should the minimum nutritional requirements be just enough to avoid starving or should they be set in order to grant the individual a healthy vigorous life? If so, which diseases should be covered for?

Yet, apart from the relative and absolute approaches, a third "hybrid" one is also possible. This combines both previous ideas since it strives to reflect both subsistence and social inclusion. A person is considered poor if she is either below the common global standard or if she is living below the poverty line that one would expect given the average income in the country of residence (Ravallion, 2016). In particular, when studying the official measurement of poverty of the Autonomous City of Buenos Aires (CABA) carried out by the General Directorate of Statistics and Census (*Dirección General de Estadística y Censos*)

(DGEC), we note that it adopts this approach. What still remains to be developed is a measure of the city's poverty that solely follows the absolute approach, that is, there is no existing estimate of the percentage of people who do not have access to an established basic food basket that allows them to survive anywhere in the world. In the absence of this kind of measure for CABA, we propose to carry out the estimation with the method proposed by Allen (2017).

The official method understands poverty as "the situation of deprivation due to the dearth of resources necessary to access the typical conditions of existence of a historically determined society" (DGEC 2010, p.17). The need to include the concept of tastes and habits in the method is evident. This approach assumes, on the one hand, the existence of a set of universal basic needs that should be satisfied to avoid being in a situation of extreme poverty. But on the other hand, it accepts certain variability of the needs that should be covered in order not to be poor between societies and over time. The official organism seeks to measure the percentage of people who, due to insufficient resources, persistently fail to access a group of basic goods that the rest of society does. Alternatively, Allen (2017) states that the poverty lines should have "a clear meaning related to survival" (p.4). According to his view, the fact that a country has a taste for more expensive food should not imply a higher percentage of poverty. The author proposes an international poverty measurement comparable (or, according to him, superior) to World Bank's $1-a-day line[2]. Since the United Nations' new Sustainable Development goal is to eradicate extreme poverty for all people everywhere by 2030, the author claims that a robust tool for measuring extreme poverty on a global basis should satisfy five conditions. "First, the line should have a clear meaning related to survival. Second, it should represent a constant standard across time and space. Third, it should respond to local prices and climate. Fourth, the poverty line should avoid intractable index number problems. Fifth, it should require only readily available information" (Allen 2017, p.4). None of these conditions are related to the social aspect of welfare.

[2] In fact, the World Bank's $1-a-day line implies much less poverty than the linear programming method in the countries analyzed in Allen's paper.

In this paper, we study the food component of the basic basket of CABA. We present the official food basket, which is estimated based on the recommended intake of calories and on the eating habits of the population, and we analyze why this basket would exceed in size, diversity and consequently in price the basket necessary to survive. First, the minimal nutritional requirements might be considered as high in comparison to those necessary to be alive. Second, and most importantly, it is not the least-cost diet for the required nutrients it establishes. Instead, if the focus was not on complying with local food habits and tastes, it would be possible to find a less expensive combination of foods that meets the basic nutritional requirements.

In order to estimate a basic food basket following the concept of absolute poverty related to survival, we estimate two alternative monthly basic diets from August to December of 2020. We used the linear programming method carried out by Allen as part of his procedure to measure international poverty. This method takes into account a list of foods and from it derives the diet that meets a set of specific nutritional requirements at the lowest possible cost. We scrapped the monthly prices of all the supermarkets of the district of Villa Crespo (since we assume that it represents the average prices of the city based on INDEC's study of the pricing of rents and housing of the city) and proceeded to carry out the linear programming. The resulting diet is endogenous, since its composition varies according to changes in relative food prices.

The first linear programming we perform takes as nutritional requirements those proposed by the official method. The resulting basket, which we call LP (linear programming) basket, has an eighth of the diversity of the official one and it weighs and costs 46% and 20% of what the official one does, respectively. The second linear programming uses Allen's more limited nutrients requirements and, therefore, the resulting basket (which we call LP Basic basket) is even more austere and cheaper. It has 83% of the diversity of the LP basket and it weighs and costs 81% and 60% of what the LP basket does, respectively.

Although the least-cost method has been rejected by authors who claim that the implied diets are unlikely to be socially acceptable (Ravallion, 2020), we understand that the linear programming method does not seek to replace the

measurement of poverty thought of as the impossibility of accessing certain regional habits. Instead, it seeks to measure extreme poverty. It is true that in a city that is not poor on average, such as CABA, the risk of starvation is not frequent. To get an image of this, we see that, during the months studied, the LP Basic basket represents less than 6% of the minimum wage. This implies that no one with a registered job would have to resort to these extremely basic diets. They would be consumed almost exclusively by unemployed or underemployed people without access to social programs.

Overall, this paper proposes a method to generate a basic food basket with which it would be possible to measure poverty, understood as an absolute phenomenon directly related to survival. Additionally, it is discussed that the fact that this basket is dynamic could be beneficial. Food substitutions were only observed in one of the five months, but in a country as inflationary as Argentina, in longer periods of time the basket could be expected to change frequently and this kind of analysis could be useful to have an updated reference.

Official Method

The DGEC monthly publishes the estimation of poverty for CABA. In addition to the food component, the basic basket includes expenses for goods and services that are considered essential such as rent, expenses, electricity, gas, water services, education (education services, textbooks and school materials), public transport, communications (landline in single-person homes, cell phone and internet), cleaning supplies, entertainment, clothing, health (medicines and health services) and household equipment (DGEC, 2010). In this paper we are going to focus on the food component, and because of that it is relevant to understand the procedure followed to build the food basket. The basic basket is composed of foods that match the consumption cultural patterns of the Argentine population - according to the National Household Expenditure Survey (ENGH-INDEC) of

2004/2005- in quantities that satisfy the energetic requirements recommended by FAO (2001).

The official method first sets a caloric requirement (2,720 kcal) and then observes which twentile of the population is able to purchase a diet that meets this requirement. Given that the consumption patterns of the fifth twentile suit this condition, the consumption preferences of this twentile are chosen in order to derive the composition of the basic food basket. Once this basket is obtained, the next step is to check that different groups of food follow a caloric structure (i.e. the percentage contribution of each food to the total calories of the basket) recommended by the Dietary Guidelines for the Argentine Population (ADDYND) (2003). Therefore, changes to the relative quantities of each group of foods are made so as to ensure that each group contributes the correct percentage of calories, yet the empirical observed consumption structure of the population chosen has to be respected. Additional necessary adjustments[3] are made in the quantities and types of foods to approach a correct diet considering professional nutritional recommendations made by WHO (2004) and economic aspects (based on the prices from the IPC -consumer price index-). Once the foods composing the basket are chosen, the total cost is calculated. The resulting composition of the official basic food basket and the evolution of its price[4] are

[3] It could be argued that the official's methodology and calculations report lacks transparency. In particular, at this stage there does not seem to be a clear criterion for the sake of achieving several -sometimes contradicting- goals. The goal explained by the text is to "achieve the highest possible yield per unit of nutrient, while respecting the observed caloric structure as much as possible at the lowest possible cost". It is not clear up to which point they are willing to adjust the basket components while compromising its fidelity to the observed consumption pattern. For instance, while the lemon fruit was excluded for its condition of "condiment", salt and vinegar (also condiments) were included. Also, protein is not considered in the nutrient requirements, yet they decided to choose a certain type of meat based on the amount of protein and iron they contribute.

[4] This information was obtained from a document published in 2021 by Dirección General de Estadística y Censos (Ministerio de Hacienda y Finanzas GCBA) . Go to https://www.estadisticaciudad.gob.ar/eyc/?p=24646 to view the file. As a reference, the evolution of the price of the food basket of a single-person (a 25-year-old male adult) household is taken.

shown in Tables 1 and the top rows of Table 2, respectively. The latter shows a cumulative price growth rate in Argentine pesos of 16.4%.[5]

Table 1 - Official Model Diet (kg per person per month)

Facturas and *churros*	0.43	Potatoes	6.47	Cheese (*gratinado*)	0.16
Water crackers	0.47	Tomato	2.00	Plain or flavored yoghurt	0.49
Cookies	0.61	Carrot	0.99	Oil	1.00
Bread	5.81	Canned tomatoes	1.55	Butter	0.10
White rice	1.22	*Asado* (meat)	1.11	*Dulce de leche*	0.21
Wheat flour	1.04	Minced meat	1.28	Sugar	1.10
Pasta	1.22	*Nalga* (beef cut)	0.56	Jams, other sweets and jellies	0.30
Tapas de empanadas/pastelitos	0.23	*Paleta* (beef cut)	0.56	Sodas	1.23
Tapas de tarta	0.15	Whole chicken	1.88	Juices and powdered soft drinks	0.10
Lentils	0.30	*Fiambres*	0.69	Wine	1.07
Banana	4.05	Hake	1.06	*Yerba mate*	0.43
Apple	2.92	Tuna	0.22	Tea bags	0.03
Orange	3.75	Eggs	0.76	Ground coffee or beans	0.06
Red chili	0.40	Sandwiches	0.11	Fine salt	0.06
Onion	2.32	Whole milk	7.33	Coarse salt	0.03
Lettuce	1.07	Cheese (*cremoso*)	1.16	Vinegar	0.06

Source: Dirección General de Estadística y Censos (2010)

[5] Not surprisingly, this result is very close to the estimated price growth for CABA from the INDEC, which estimates a price growth of 17.4% for foods and non-alcoholic beverages, and a growth of 16.9% for all goods in general in the CPI basket.This information was obtained from a document published in 2021 by Instituto Nacional de Estadísticas y Censos (INDEC). Go to https://www.indec.gob.ar/indec/web/Nivel4-Tema-3-5-31 to view the file.

Table 2 - Monthly Expenditure (per person)

	August	September	October	November	December
Official Model					
In Argentine pesos	8,121.38	8,464.46	8,972.40	9,153.73	9,449.79
Growth		4.22%	6.00%	2.02%	3.23%
In Dollars	109.49	111.29	114.73	112.60	112.62
Growth		1.65%	3.08%	-1.86%	0.03%
LP Model					
In Argentine pesos	1,593.7	1,633.3	1,820.0	1,848.4	2,023.3
Growth		2.48%	11.44%	1.56%	9.46%
In dollars	21.5	21.5	23.3	22.7	24.1
Growth		-0.05%	8.37%	-2.30%	6.06%
LP Basic Model					
In Argentine pesos	996.8	1,020.2	1,095.5	1,104.1	1,162.3
Growth		2.35%	7.38%	0.79%	5.27%
In dollars	13.4	13.4	14.0	13.6	13.9
Growth		-0.18%	4.42%	-3.04%	2.00%

Sources: the monthly expenditure according to the Official Model was obtained from a document published in 2021 by Dirección General de Estadística y Censos (Ministerio de Hacienda y Finanzas GCBA) (https://www.estadisticaciudad.gob.ar/eyc/?p=24646). The monthly expenditure from the LP Model and the LP Basic Model are authors' calculations obtained using linear programming.

Note: the data on the exchange rate used to calculate the price of the monthly expenditure in dollars was obtained from the Central Bank of the Argentine Republic's (*Banco Central de la República Argentina)* official website. It is the reference price of "Communication A3500".

Analysis of the Official Basket

If we want to estimate a basket that includes the essential foods to survive at the lowest price, the basket should only include the minimum foods that allow meeting the basic requirements. When studying the composition of the official basket, we note that it includes processed and varied foods, which makes us think that there could be a less complex basket that still meets the conditions. A clear example of the variety is the inclusion of four different types of bovine meat, instead of including the one that provides nutrients in the cheapest way. Regarding the inclusion of processed foods such as *facturas*, *churros*, cookies, pasta and bread, the basket could be simplified if the raw materials were purchased. Therefore, if we consider a definition of poverty related to survival,

the quantity and diversity of foods included in the official basic food basket call our attention for being possibly excessive. We therefore proceed to study whether in fact the official basket is not limited to representing the food necessary to survive but rather includes additional foods typical of the local culture.

First, the required 2,720 calories on which the method is based[6] exceed the 2,100[7] calories that, according to Allen (2017), are necessary to survive. Second, the composition of the diet does not cover the minimum requirements at the lowest cost, but it is rather based on the actual composition reported in the survey. We proceed to study this second matter by calculating the total nutrients provided by the official basket (namely, the effective nutrients), and comparing them with the nutritional recommendations which are taken as reference by the official organism (i.e., the required nutrients). Note that there are no nutritional requirements for fats and proteins since the official method report does not mention any precise number to account for a minimum intake of these nutrients. Table 3 shows the required and the effective nutrients, as well as the percentage of overshooting, that is, the percentage by which the nutrients provided by the estimated basket exceed those suggested as minimums.

[6] The amount of calories required are those recommended by FAO (2001) and the Dietary Guidelines for the Argentine Population (AADYN). It specifies 2,720 calories per day, based on the 1996 average daily calories.

[7] Allen (2017) follows the USDA energetic recommendations by Shapouri et al (2010), who base their calculations in FAO's (2001) energetic requirements recommendations. They take an energetic minimum requirement that covers for a lower physical activity level (PAL).

Table 3 - Official Model: Nutritional Requirements and Overshooting (daily kg per person)

	Required nutrients	Effective nutrients	Overshooting
Calorie	2,720 kcal	2,835 kcal	4%
Protein		0.12	
Fat		0.09	
Iron	1.14E-05	1.31E-05	15%
B12	2.40E-09	5.06E-09	111%
Folate	4.00E-07	1.32E-06	229%
B1 (thiamin)	1.20E-06	7.38E-06	515%
Niacin	1.60E-05	3.17E-05	98%
C	4.50E-05	2.34E-04	421%
Riboflavin	1.30E-06	2.01E-06	55%
Vitamin A	6.00E-07	7.65E-07	28%
Calcium	1.00E-03	1.30E-03	30%
Zinc	7.00E-06	1.90E-05	171%

Source: Authors' calculations.

Due to the existence of overshooting, the possibility of estimating a more austere (and, therefore, probably less expensive) basket that better meets the minimum nutritional requirements remains open.

Additionally, the fact that this basket is fixed could represent a problem. While it is not clear if indeed habits have not changed since the 2004 survey on which the estimate is based, the basket's dearth of flexibility could be a bigger problem when representing what people who are on the brink of starvation eat. In an inflationary country like Argentina, the change in relative prices becomes important (Tomassi, 1992). People maximize their welfare subject to their budget constraints by constantly substituting goods. A dynamic basket may therefore represent more accurately the purchasing decision faced by the extreme poor. In the next section, we discuss the estimation of a basket that adapts to the changes in relative prices.

Linear Programming Method

When estimating the basic basket, it is necessary to incorporate not only food but also other elements. Indeed, Allen (2017) also includes a nonfood component (made up of fuel, lightning and clothing) and rented housing. However, we focus exclusively on the food component of this basket, for which the author uses linear programming to determine the least-cost diet for 20 countries. Stigler (1945) was the first to ever use this method (without even having the simplex method in Excel). The objective of this procedure is to construct a diet from a list of foods[8] that minimizes the cost of attaining predetermined nutritional requirements.

Technically, the problem to be solved by each agent is:

$$\min \left\{ Cost = \sum p_i F_i \right\} \quad subject\ to \quad \sum \eta_{ij} F_i \geq R_j \, ; F_i \geq 0$$

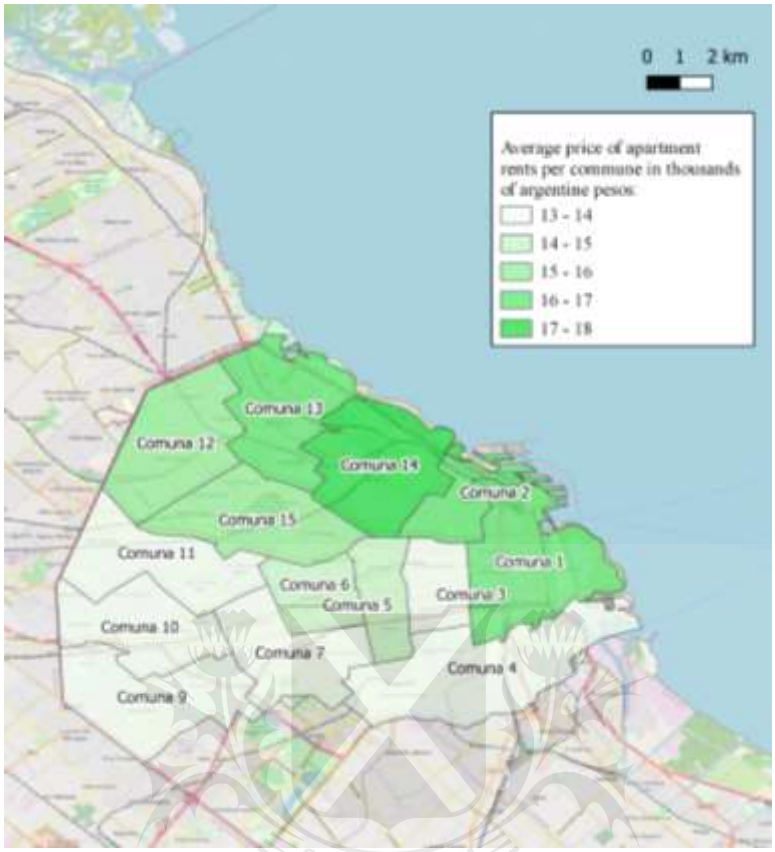
Where p_i represents the price for each food i and F_i represents its amount (measured in kilograms). R_j is the required amount of nutrient j and η_{ij} the quantity of nutrient j per unit of food F_i (Allen 2017). Note that the resulting number of foods F_i that minimize the least cost diet will be equal or less than the amount of nutritional requirement restrictions that we impose in the model.

In order to apply this procedure to estimate CABA's basket, prices of all foods of all supermarkets and retails in Villa Crespo were scrapped[9] every Sunday from August 2020 to December 2020. CABA is organized in 15 different communes (*comunas*) or jurisdictions, and Villa Crespo is a district that belongs to the 15th commune. According to a study carried out by the INDEC[10], the pricing of rents and housing in Villa Crespo represents a fair estimate for the average housing price in the whole region of CABA. Therefore, we presume that prices of foods in Villa Crespo are an average and fair representation of prices for the city of CABA as a whole. Figure 1 shows a map of CABA and the average prices of apartment rents in 2019 for each commune. Villa Crespo is part of the 15th commune which has medium-cost apartment rent pricing.

[8] See Appendix I for details of the foods included.

[9] See appendix II for details on the programming and code.

[10] This information was obtained from a document published in 2016 by Dirección General de Estadística y Censos (Ministerio de Hacienda y Finanzas GCBA). Go to https://www.estadisticaciudad.gob.ar/eyc/?p=109632 to view the file.



Note: Own elaboration. Map representing the region of CABA, Argentina divided into 15 *comunas* (communes) and showing the average price of apartment rents.
Source: document published in 2016 by Dirección General de Estadística y Censos (Ministerio de Hacienda y Finanzas GCBA) (https://www.estadisticaciudad.gob.ar/eyc/?p=109632)

The website from which the prices were scrapped is called *Precios Claros*[11]. This platform was launched in 2016 as an initiative of the National Department of Consumer Defense for citizens to have access to information about market prices in specific areas. Since then, whoever enters the website can compare the prices of the 30 shops closest to the selected location. There are more than 300 categories and more than 70,000 products. The database, known as the Electronic Argentine Price Advertising System (SEPA), is supplied daily by large retail and wholesale businesses that sell mass consumer products, household appliances, electronics and construction materials.

[11] To visit the website, go to www.preciosclaros.gob.ar

From the large database, we decided to keep the prices of the last Sunday of each month to match the prices with the estimated salary payment date and to be able to make the comparisons. In Argentina the inflationary process is persistent, so comparing prices with income from a different moment can lead to erroneous conclusions. In this way, the prices at the end of the month match with the salaries that are paid on the last days of the month or the first days of the next month. We then solved the linear programming with the simplex algorithm in Excel to estimate the monthly optimal solution, that is, the composition of the basic food basket. Finally, we proceed to calculate the cost of each basket.

Is the official basket a least-cost basket?

With the objective of estimating a basic diet whose nutrients do not exceed those required, we perform the linear programming adopting as restrictions the nutritional requirements used by the official method (i.e. the required nutrients from Table 3). The amount of nutrients provided by perishable foods were obtained from the USDA (United State Department of Agriculture) Agricultural Research Service[12], while the nutrients of non-perishable foods were obtained from their respective nutritional labels. The resulting composition of the individual diets is shown in Table 4.

[12] In general, the values of each nutrient used in the linear programming were obtained from the US Department of Agriculture National Nutrition Database website. It is important to note that some of the most traditional Argentinian foods were not available on this database, and therefore we had to either: look it up on an alternative database or pick a food that was available on the USDA database and had very similar components. To access the USDA database, go to: https://fdc.nal.usda.gov/

Table 4 - LP Model Diet (kg per person per month)

	August to November	December
Wheat flour	5.0	4.6
Milk		5.8
Beef	4.2	2.4
Oil	2.2	3.3
Soy	11.5	8.7
Orange	2.1	2.1
Carrots	2.1	1.9
Total	27.22	28.99

Source: Authors' calculations.

We observe that the diversity of the LP basket is much more limited than the official. While the official basket includes 48 foods, the LP contains 6 or 7 (out of a maximum of 11 foods given the limit imposed by the number of requirements). While none of the foods in the official basket exceeds 12% of the total composition, some foods represent a high percentage in the LP basket. For example, soy and wheat flour comprise 42 and 18% of the basket respectively the first four months, and 30 and 16% respectively the last month.

As mentioned above, several foods from the official basket are processed. As we see in the estimation of the LP basket, it is possible to estimate a basket that provides nutrients in a less expensive way if unprocessed foods are selected. Nevertheless, it could be argued that a limitation of the Allen method is that it does not include the necessary processing cost of the food, thus underestimating the real cost of the basket.

Another difference between the official and the LP baskets is in the total amount of food: the LP basket is made up of 27 kg monthly, which accounts for 46% of the official basket's weight. This has a clear implication on the price: on average, the LP basket costs 20% of the official price. The monthly prices of the LP basket are shown in the middle rows of Table 2. The cumulative price growth rate of this basket in Argentine pesos over the 5 months is 27%. This increase is significantly higher than the 16% growth in the price of the official basket. Since the months

that cause this difference are October and December, we turn to analyze the reason for the increase in the price of the LP basket for these two periods.

The increase in the price from September to October of the LP basket was 11.44%. The composition of the basket did not change, and the prices that increased the most were those of soy (which increased by 13%), carrots (which increased by 32%) and oranges (which increased by 24%). The increase in soy is particularly important since it makes up 42% of the basket, a percentage that does not change since it is a food very rich in nutrients[13] relative to its price. The increase in the price of carrots and oranges is also relevant since each food contributes 8% of the basket (percentages that do not change from September to October due to the nutritional quality of these foods relative to their prices[14]). The impact of the price of these foods on the total price of the official basket is not as relevant since oranges and carrots contribute 6% and 2% respectively to the total food basket, while soy is not even included in the official basket (because it is not commonly consumed).

The explanation for the 9.46% increase in December is similar. Soy increased its price by 12% (although its contribution to the basket decreased to 32%), carrots by 21% and beef by 26% (although its contribution to the basket fell from 16% to 9%).

Additionally, the use of linear programming allows the overshooting of nutrients to be minimized as much as possible. By definition, the method returns a result that meets the nutritional requirements at the lowest possible cost. The required and the effective nutrients are shown in Table 5.

[13] In particular, the nutritional properties of soy relative to their price lead to the contribution of 93% of the calcium in the basket, 87% of the iron, 79% of the proteins, 69% of the folate, 64% of the zinc, 63% of the riboflavin, 47% of the calories and 44% of the niacin.

[14] Carrots provide 97% of vitamin A, while oranges provide 91% of vitamin C.

Table 5 - LP Model: Nutritional Requirements and Overshooting (daily kg per person)

	Required nutrients	Effective nutrients	Overshooting
Calorie	2,720 kcal	2,720 kcal	0%
Protein		0.24	
Fat		0.09	
Iron	1.14E-05	6.00E-05	426%
B12	2.40E-09	2.40E-09	0%
Folate	4.00E-07	1.67E-06	317%
B1 (thiamin)	1.20E-06	1.20E-06	0%
Niacin	1.60E-05	2.25E-05	41%
C	4.50E-05	4.50E-05	0%
Riboflavin	1.30E-06	1.52E-06	17%
Vitamin A	6.00E-07	6.00E-07	0%
Calcium	1.00E-03	1.00E-03	0%
Zinc	7.00E-06	3.00E-05	329%

Source: Authors' calculations.

Finally, it is not clear if the fact that the basket is built endogenously every month based on rising prices has great implications on its composition. The basket remains constant for the first 4 months. Although its cost increases by 10% in that period, the relative changes do not appear to have been large enough to cause the consumer to "perfectly maximize" by substituting (instead, the best option is to consume the exact same basket). We do see a change in the last month. The amount of wheat flour, beef, soy and carrots decrease by 7%, 43%, 24% and 10%, respectively. The amount of oil and oranges increase by 50% and 1%, respectively. Milk is incorporated into the basket, making up 20% of it.

This change suggests that if the basket were to be measured for longer periods perhaps it would be beneficial if it was dynamic. Static baskets in high-inflation economies is an issue that has been repeatedly addressed through literature. For instance, Glaeser, Ditella and Llanch (2017) outline the importance of adjusting consumption patterns when an economy undergoes major changes, otherwise the tendency of consumers to substitute expensive products for cheap products will produce biases on the price index. Therefore, in a country with a history of high inflation and significantly changing relative prices like Argentina (Tomassi, 1992), a constant basket could be suboptimal since it would underestimate and overestimate the price required to meet the minimum requirements.

Is that the cheapest basket to keep you alive?

Allen (2017) disagrees with the "aura of scientific objectivity" (p.7) with which some authors like Stigler (1945) and Smith (1959) determine nutritional requirements. In this sense, he believes that "the linear programming approach takes on the character of an estimation exercise rather than a purely objective determination of the optimal diet" (Allen 2017, p.7).

The author presents four models, each containing an increasing amount of nutritional requirements according to different criteria about what the key nutrients for survival are. He concludes that the Basic model is the best candidate to describe the behavior since it ensures defense against the main deficiency diseases (i.e. anemia, beri-beri, pellagra and scurvy) by requiring 2,100 calories per day[15], 50 g of protein, 34 g of fat[16] and the Indian recommended daily allowances[17] (RDA) of iron, folate, thiamine, niacin, and vitamins C and B12.

We compare the Basic model nutritional requirements with those required by the official method. Some of the vitamins and minerals required by the official method were deliberately excluded by Allen when calculating his least-cost diet. These are: riboflavin, vitamin A, calcium and zinc. Surely, the dearth of these nutrients might cause certain health issues. For instance, a deficiency of Vitamin A leads to night blindness. Therefore, it is debatable whether this nutrient is essential for survival matters. Allen excludes it since que claims that most people are unconcerned about this mineral because night blindness does not appear a costly disability.

In this section, we estimate the basket based on the requirements imposed by Allen in his Basic model[18], which we will call the LP Basic model. If we agree

[15] As recommended by US Department of Agriculture (Shapouri et al. 2010)
[16] As recommended by FAO (2008c)
[17] The requirements were computed by Allen by computing the weighted average of the RDAs for the various age and sex groups.
[18] See Appendix III to see the results of measuring the least-cost diet for CABA with the 1,700 calorie and the CPF approaches.

with the author's criteria, the official basket's requirements would be excessive. Therefore, we carry out the linear programming taking as nutritional requirements those proposed by Allen. The resulting composition of the diets and its prices are shown in Tables 6 and the bottom rows of Table 2, respectively. The cumulative price growth rate of the LP basic basket in Argentine pesos over the 5 months is 17%. This increase is similar to the 16% increase in the price of the official basket. Yet, it significantly less than the 27% increase in the price of the LP basket since the basic LP basket is made up of 70% flour, a food that only increased its price by 9% in total throughout the period studied.

Measured in relation to the exchange rate, the evolution of the price of the official and the LP basic basket are similar. While the exchange rate, measured by the Central Bank reference price of "Communication A3500", increased 13.12%, the price of the official model basket in Argentine pesos increased 16.4% and the LP Basic Model increased 16.6%. As a consequence, the price of the baskets in dollars increased by 2.86% and 3.08% respectively. The correlation between a crawling peg exchange rate and accumulated increase of the price of the basket is not verified on a monthly basis, so we could consider that there could be an accumulated correlation between food baskets and the official exchange rate, which is not necessarily verified month by month.

Table 6 - LP Basic Model Diet (kg per person per month)

	August to November	December
Wheat flour	15.3	14.4
Potatoes		6.3
Beef	3.4	2.7
Oil	0.7	0.7
Soy	0.4	0.4
Orange	2.1	
Total	21.83	24.47

Source: Authors' calculations.

Analogously to the results obtained in Allen's paper, the predicted diet is high on grains: it is made up of 70% flour in the first 5 months (percentage that drops to 59% in December). The diversity of foods is even more limited than that of the LP diet: the LP Basic diet is composed of 5 foods. The average total amount of food is 19% smaller than the LP diet, that is to say, 63% smaller than the official diet. Subsequently, the average price of the LP Basic diet is 40% lower than the LP diet, that is to say, it is 88% cheaper than the official diet. These numbers suggest that, if we base the linear programming on Allen's nutritional requirements, it is possible to live with an even more austere and cheaper basket.

As in the previous model, overshooting is minimized as we can see in Table 7.

Table 7 - LP Basic Model: Nutritional Requirements and Overshooting (daily kg per person)

	Required nutrients	Effective nutrients	Overshooting
Calorie	2,100 kcal	2,100 kcal	0%
Protein	5.00E-02	8.23E-02	65%
Fat	3.40E-02	3.40E-02	0%
Iron	1.91E-05	1.91E-05	0%
B12	8.77E-10	1.90E-09	117%
Folate	1.80E-07	1.53E-06	750%
B1 (thiamin)	1.13E-06	3.28E-06	191%
Niacin	1.48E-05	1.48E-05	0%
C	4.10E-05	4.10E-05	0%

Source: Authors' calculations.

Likewise, as in the previous linear programming, the composition of the basket only changes in December. We confirm that it was the month with the greatest amount of changes in the relative prices of foods.

To what degree does linear programming make sense?

Regardless of the nutritional requirements that are considered in each method, the common view amongst economists is that linear programming fails to represent a realistic diet (Allen 2017; Ravallion, 2020). Stigler (1945) himself considers that the diets resulting from his linear programming are not representative for poor Americans in the 1930s and 1940s. It is his belief that "it would be the height

of absurdity to practice extreme economy at the dinner table in order to have an excess of housing or recreation or leisure" (pp. 312–313). Smith (1959) also concludes that in Michigan in the mid-1950s very few people consumed what was predicted by Stigler's linear programming. He states that the diet is "a dramatic illustration of how little purely nutritional needs have to do with the level of actual food expenditures". He continues to say: "If we want diets that someone might be willing to eat, we need models that take account of tastes and habits." (p. 272).

In line with this idea, empirical evidence has demonstrated that the poor spend a significant amount of their budget on alcohol, sugar and other foods from traditional festivals (Banerjee and Duflo 2007). These are expensive sources of calories yet presumably better tasting than wheat flour, oil or soy. Hence, the linear programming method fails to capture these types of preferences and habits among the poor.

Ravallion (2020) also criticizes Allen's (2017) approach since he claims that welfare not only depends on nutritional status, but also on social inclusion. He states: "Credible measures require that we allow for the functioning of social inclusion, as both a factor influencing the food consumption bundle relevant to attaining nutritional requirements in a specific social context and as an independent determinant of welfare" (p.179). According to this view, the official method, whose minimum satisfaction threshold is related to the standard of living of the city, would be more closely aligned with modern methods which "identify a food bundle consistent with prevailing tastes in each setting, respecting the influence of local food habits as well as recommended nutritional intakes" (p.178).

Allen (2017) acknowledges that linear programming utterly fails to explain the diets in rich countries, but he claims that its predictions are more realistic when survival is the issue and, therefore, when "necessity displaces desire". Hence, if CABA was in average a poor city, the consumption habits should not be very different from subsistence behavior. While this could be the debate for very specific places in Argentina which are poor, it definitely does not represent the country: the World Bank classified Argentina as an upper-middle income country

in 2020.[19] Furthermore, while the percentage of the national population living in CABA in the first semester of 2020 was 6.8%, the contribution to GDP was 18.6%, according to IERAL[20]. Therefore, we can conclude that the region analyzed in this paper is far from being poor.

Reference Incomes

As we have mentioned, in this paper we do not estimate the total basic basket and, therefore, we cannot estimate the percentage of extreme poor people in CABA. However, we can compare the basic diet estimated with each method with the minimum wage and minimum retirement pension from the last five months of 2020 to give us an idea of what percentage of the income would be designated to the food component of the basket. The results are shown in Table 8.

Table 8 - Minimum Legal Income Spending on Basic Food Baskets

	August	September	October	November	December
Minimum wage (in Argentine pesos)	16,875.0	16,875.0	18,900.0	18,900.0	20,588.0
% allocated to the official diet	48.1%	50.2%	47.5%	48.4%	45.9%
% allocated to the LP diet	9.4%	9.7%	9.6%	9.8%	9.8%
% allocated to the LP Basic diet	5.9%	6.0%	5.8%	5.8%	5.6%
Minimum retirement pension (in Argentine pesos)	18,128.9	18,128.9	18,128.9	18,128.9	19,035.3
% allocated to the official diet	44.8%	46.7%	49.5%	50.5%	49.6%
% allocated to the LP diet	8.8%	9.0%	10.0%	10.2%	10.6%
% allocated to the LP Basic diet	5%	6%	6%	6%	6%

Source: National Public Administration of the Argentine Republic's website (http://www.trabajo.gob.ar/estadisticas/bel/ingresos.asp)

[19] Visit https://blogs.worldbank.org/opendata/new-country-classifications-income-level-2019-2020 to see the online article.

[20] Ieral is an Argentinian non-profit civil association founded by 34 enterprises in Cordoba, Argentina that investigates and contributes to the economic issues in Argentina. To see the online version of this document visit: https://www.ieral.org/images_db/noticias_archivos/4205-Monitor%20Fiscal.pdf

Another possible reference is to compare the basic diets with basic salaries negotiated by each union. Table 9 shows examples of different basic jobs for December, 2020[21].

Table 9 - Minimum Legal Salary Spending on Food per Job (December 2020)

	Minimum Salary	% allocated to the official diet	% allocated to the LP diet	% allocated to the LP basic diet
Domestic worker	19,777.0	47.8%	10.2%	5.9%
Salesperson	43,485.2	21.7%	4.7%	2.7%
Doorman	47,797.4	19.8%	4.2%	2.4%
Nurse	41,125.5	23.0%	4.9%	2.8%
Short and medium distance driver	44,766.7	21.1%	4.5%	2.6%

Source: National Public Administration of the Argentine Republic's website (http://www.trabajo.gob.ar/estadisticas/bel/ingresos.asp)

By way of comparison, Allen states that in the developing countries, about two-thirds of spending is on food and that the share is one quarter in developed countries like the United States, United Kingdom, and France. Additionally, the official poverty line for the United States assumes a food share of one third, and is therefore set at three times the cost of a 1962 Economy Food Plan (Orshansky 1965).

Another possible comparison is with the breakdown of poverty line spending by broad category made by the DGEC. The food component represents 42% of the total food basket[22], on average. However, it should be noted that, for the period studied, the estimated official basket price exceeds the minimum wage by 15% on average. This implies that basic needs would remain uncovered. Leaving the rest of the expenses constant, a person who earns the basic wage would not be able to buy the food basket proposed by the government. He should worsen the quality of your diet by reducing the quantity or diversity of foods.

[21] The information of this section was obtained from a document published in 2021 by the National Public Administration of the Argentine Republic. Go to http://www.trabajo.gob.ar/estadisticas/bel/ingresos.asp to view the files.
[22] See Appendix IV for additional information about the expenditure per category.

What does seem to be clear is that the LP Basic basket represents a too small share of the legal basic salaries and pensions. Someone with one of these incomes is likely to choose to make their diet more complex (at least someone who does not have to feed third parties). If all the citizens of CABA earned at least the minimum wage, this seems to imply that the percentage of people in CABA that are in the margin of survival and whose behavior is therefore governed by linear programming is zero.

However, it should be noted that this study, when comparing general and food baskets with registered income, excludes specific situations that could be relevant when measuring poverty. First, the existence of unregistered workers, whose wages are generally lower than registered workers'. Second, the presence of the unemployed population. According to the DGEC, the unemployment rate in CABA for the third and fourth quarters of 2020 was 13.4 and 10.1% respectively[23]. Third, and in the opposite direction, the existence is a population that receives some type of economic assistance from the government. This includes the Universal Child Allowance, Emergency Family Income, Alimentar Card, among other programs.

To make a correct estimate of the number of people who cannot survive it would be of utmost importance to take these facts into account. Although these issues are not studied in this paper, what is clear is that the percentage of poverty and indigence that would arise if the basic food basket of linear programming were taken as a reference would be substantially lower than the official values: in the second semester of 2020, poverty in CABA reached 16.5%, while poverty reached 5.3% (INDEC, 2021). This is due to the different definition of poverty on which the method is based.

Conclusions

What the pertinent methodological strategy to measure poverty is depends on the conceptualization that is made of the phenomenon. The official measurement of

[23] This information was obtained from a document published in 2021 by Dirección General de Estadística y Censos (Ministerio de Hacienda y Finanzas GCBA). Go to https://www.estadisticaciudad.gob.ar/eyc/?p=27380 to view the file.

poverty in the Autonomous City of Buenos Aires considers any person who cannot access the usual goods of this society as poor. Alternatively, Allen (2017) considers that "the poverty line represents the cost of meeting basic needs, not a level of satisfaction, and should be set accordingly" (p.17).

When analyzing the official basic food basket, we observe that it does indeed include a wide diversity of foods that greatly exceed the nutrients required to survive. This paper uses the method proposed by Allen (2017) to determine the diet that effectively allows survival and prevents common diseases at the lowest cost. That is, an absolute basic food basket is estimated using linear programming. The procedure is also repeated with less nutritional requirements, following those used by Allen (2017), to obtain an even more austere and cheaper basket. This costs only 12% of what the official basket costs, and it is made up of 70% flour.

Although some economists disagree with this way of estimating the basket because they argue that it does not reflect reality, we consider it relevant to know the minimum cost at which a person survives. Furthermore, the fact that the basket is endogenous may be especially beneficial in an inflationary country like Argentina. Since relative prices constantly change, consumers (especially those with greater budget constraints) substitute the purchased foods.

Bibliography

Allen, Robert C. 2017. "Absolute Poverty: When Necessity Displaces Desire." *American Economic Review*, 107 (12): 3690-3721.

Asociación Argentina de Dietistas y Nutricionistas-Dietistas (AADyND). 2003. "Guías Alimentarias para la Población Argentina: Manual de Multiplicadores" Buenos Aires: AADyND

Banerjee, Abhijit V., and Esther Duflo. 2007. "The Economic Lives of the Poor." The Journal of Economic Perspectives, 21 (1): 141–168.

Beccaria, Luis A. y Alberto Minujin. 1991. *Sobre la medición de la pobreza: enseñanzas a partir de la experiencia argentina*. Documento de trabajo N°8 Buenos Aires: UNICEF Argentina

Broda, Christian, and David E. Weinstein. 2006. "Globalization and the Gains from Variety." *The Quarterly Journal of Economics*, 121 (2): 541–585

Dirección General de Estadística y Censos (DGEC). 2010. *Canastas de consumo de la Ciudad de Buenos Aires: metodología y cálculos iniciales*. Buenos Aires: Ministerio de Hacienda Available from: https://www.estadisticaciudad.gob.ar/eyc/?p=39236.

Dirección General de Estadística y Censos (DGEC). 2016. *Construcción de las líneas de indigencia (LI) y pobreza (LP) para la Ciudad de Buenos Aires. Síntesis metodológica.* Buenos Aires: Ministerio de Hacienda Available from: https://www.estadisticaciudad.gob.ar/eyc/wp-content/uploads/2016/06/lineas_pobreza_indigencia_sintesis_metodologica_2016_06.pdf

Food and Agricultural Organization of the United Nations (FAO). 2001. "Human Energy Requirements: Report of a Joint FAO/WHO/UNU Expert Consultation." Food and Nutrition Technical Report Series N° 1.

Food and Agricultural Organization of the United Nations (FAO). 2008c. "Fats and Fatty Acids in Human Nutrition: Report of an Expert Consultation." FAO Food and Nutrition Paper 91.

Fundación Mediterránea (IREAL). 2020. “Autonomía fiscal de las provincias argentinas: ¿Cómo mejorar para lograr un mayor crecimiento económico?” Monitor Fiscal. Vol.13 nº13.

Galbraith, John K. 1998. *The affluent society*. Boston: Houghton Mifflin Harcourt

Glaeser, Edward L., Rafael Di Tella, and Lucas Llach. 2018 “Introduction to Argentine exceptionalism”. *Latin American Economic Review* 27 (1).

Hagenaars, Aldi and Klaas de Vos. 1988. “The Definition and Measurement of Poverty”. *The Journal of Human Resources,* 23(2): 211-221

International Labour Organization (ILO). 1976. *Meeting Basic Needs: Strategies for Eradicating Mass Poverty and Unemployment.* Geneva: ILO

Instituto Nacional de Estadística y Censos (INDEC). 2021. “Incidencia de la pobreza y la indigencia en 31 aglomerados urbanos. Segundo semestre de 2020” Condiciones de vida. Vol. 5, nº 4. Buenos Aires: INDEC. Available from: https://www.indec.gob.ar/uploads/informesdeprensa/eph_pobreza_02_2082FA92E916.pdf

Orshansky, Mollie. 1965. "Counting the Poor: Another Look at the Poverty Profile". *Social Security Bulletin,* 28 (1) : 3-29.

Ravallion, Martin. 2016. *The Economics of Poverty: History, Measurement, and Policy*. Oxford: Oxford University Pres.

Ravallion, Martin. 2020. "On Measuring Global Poverty," *Annual Review of Economics,* 12(1): 167-188.

Shapouri, Shahla, Stacey Rosen, May Peters, Felix Baquedano, and Summer Allen. 2010. “Food Security Assessment, 2010–2020.” US Department of Agriculture Economic Research Service Report.

Smith, Victor E. 1959. “Linear Programming Models for the Determination of Palatable Human Diets.” *Journal of Farm Economics* 41 (2): 272–83.

Stigler, George J. 1945. “The Cost of Subsistence.” *Journal of Farm Economics* 27 (2): 303–14.

Tommasi, Mariano. 1992. *Inflation and relative prices: evidence from Argentina*. Los Angeles: Department of Economics, University of California

Wagle, Udaya. 2002. “Rethinking poverty: definition and measurement”. *International Social Science Journal*, 54(171): 155-165.

World Health Organization (WHO). 2004. “Vitamin and mineral requirements in human nutrition, second edition”. Available from: http://whqlibdoc.who.int/publications/2004/9241546123.pdf

Appendix

Appendix I: Foods included by Allen

The following foods were included by Allen (2017) in the objective function: wheat flour, wheat bread, rice, maize flour, beans, eggs, cheese, chicken, milk, meat, fish, butter, margarine, vegetable oil, white sugar, potatoes, tomatoes, cabbage, sweet potatoes, carrots, onions, cauliflower, spinach, roasted peanuts, cassava, alcohol, yellow maize grains, white maize grains.

Appendix II: Programming

The code used for scrapping foods in Villa Crespo uses R as the programming language. Here is a copy of the script that we ran every Sunday of every week of every month during the last five months of 2020.

This code was provided by Julian Redatky, whom we sincerely thank for his kindness.

Code used:

```
rm(list = ls())

if(!require('pacman')) install.packages('pacman')

pacman::p_load('dplyr','jsonlite','readxl')

setwd('C:/Users/carol/Documents/Udesa/Thesis/Programacion/scraper_frescos/Archivos')

categorias <- read_excel('Frescos_etiquetas.xlsx', na = 'NA') %>%

  mutate(id = paste0('0',id)) %>%

  na.omit()

sucursales <<- c('10-3-645','15-1-431','15-1-12','24-1-241','10-3-528','15-1-666','15-1-362','10-3-265','10-3-619','15-1-511','15-1-416','12-1-82','9-3-5231','10-3-604','15-1-538','15-1-396','10-3-731','15-1-482','10-3-321','15-1-627','10-2-384','10-3-608','15-1-7','15-1-699','15-1-652','10-3-563','15-1-540','10-3-561','12-1-168','15-1-380')

download_data <- function(id_categoria) {

  i <- 0; total <- 0; ret <- data.frame()
```

```
  while(i <= total) {
    url <-
paste0('https://d3e6htiiul5ek9.cloudfront.net/prod/productos?&id_categoria=',id_categoria,'&array_su
cursales=',paste(sucursales, collapse = ','),'&offset=0&limit=50&sort=-cant_sucursales_disponible')
    response <- fromJSON(url)
    if(response$status == 200) {
      ret <- rbind(ret, response$agrupables)
      total <- response$total
      i <- i + 50
    }
  }
  return(ret)
}
scrap <- function(id_categoria) {
  tryCatch({
    temp <- download_data(id_categoria)
    return(temp)
  },
  error = function(e) return(NULL))
}

data <- data.frame()
for(j in 1:nrow(categorias)) {
  temp <- scrap(categorias$id[j])
  intentos <- 0
  if(is.null(temp) & intentos < 5) {
    temp <- scrap(categorias$id[j])
    intentos <- intentos + 1
    Sys.sleep(1)
  }
  data <- rbind(data, temp)
  cat('\r',j,'de',nrow(categorias),'bajados')
```

```
  Sys.sleep(1)
}
librainstall.packages("xlsx")
ry(readxl)
install.packages("xlsx")
Sys.setenv(JAVA_HOME="C:\\Program Files\\Java\\jre1.8.0_101")
install.packages("rJava")
library("rJava")
install.packages("xlsxjars")
library("xlsx")
Sys.setenv(JAVA_HOME="C:\\Program Files\\Java\\jre1.8.0_101")
install.packages("rJava")
library("rJava")
install.packages("xlsxjars")
library(openxlsx)
write.xlsx(data, "Frescos 3-01-21.xlsx")
```


Appendix III: 1700 Calorie and CPF Models for CABA

Apart from the Basic model, Allen presents 3 alternative diets with different nutritional requirements. These are:

- *1,700 calorie* model. It only requires 1,700 calories per day[24].
- *Calories Proteins Fats (CPF)* model. Three nutrients are required: 2,100 calories per day[25], 50 g of protein, and 34 g of fat[26].
- Full Course model. It includes Basic model requirements plus RDA of six more vitamins and minerals.

[24] As determined by a survey in India of what the people of the second decile consume. This survey was conducted by Deaton and Dréze (2009) and Suryanarayana (2009).
[25] As recommended by US Department of Agriculture (Shapouri et al. 2010)
[26] As recommended by FAO (2008c)

Allen's most elementary model only requires 1,700 calories per day. The resulting diet does not change and consists of 6 kg of oil per month. Monthly expenditure is presented in Table 10. The cumulative price growth rate in Argentine pesos over the 5 months is 8.4%.

Table 10 - Monthly Expenditure (per person)

	August	September	October	November	December
1700 Calorie Model					
In Argentine pesos	527.2	543.0	571.1	571.2	571.2
Growth		3%	5%	0%	0%
In dollars	7.11	7.14	7.30	7.03	6.81
Growth		0%	2%	-4%	-3%
CPF Model					
In Argentine pesos	683.2	703.7	744.0	744.0	744.0
Growth		3%	6%	0%	0%
In dollars	9.21	9.25	9.51	9.15	8.87
Growth		0%	3%	-4%	-3%

Source: Authors' calculations.

Next, we calculate the CPF diet for each month. The monthly price of the diet is shown in Table 10. The food components that yield the lowest cost and meet the requirements in the CPF model consist of wheat flour and oil (approximately 15.2 kg and 1,5 kg per month respectively) and the cumulative price growth in Argentine pesos rate is 9%.

By comparing the results of the 3 models (1700 Calorie, CPF and Basic Model) we notice that adding requirements has implications. First, regarding the volume of food, the average total kg of the Basic diet is 38% higher than the CPF diet, which is in turn 178% higher than the 1,700 calorie diet´s volume. The increase in the amount of foods in the Basic Model relative to the CPF and the 1700 Calorie Models is explained by the addition of animal products to cover the requirements of B12, and vegetables to cover the requirements of vitamin C.

Both the 1700-calorie and the CPF model lack nutrients that prevent the common and serious health issues discussed previously. Table 15 shows the percentage of nutrients that each of these diets lacks, taking as reference the requirements of the

Basic Model. The CPF model, which is less deficient in every nutrient, could cause several diseases. Pellagra, due to 100% deficiency of niacin, Anemia due to 100% deficiency of B12 and 22% deficiency of iron. Maybe the clearest example of why it would be impossible to live on this type of diets is the 98%-100% deficiency of vitamin C, which would cause Scurvy, a potentially lethal disease[27]. To solve this last matter, the inclusion of vegetables in the Basic model cover the requirements of vitamin C (as well as animal products cover the requirements of B12)[28].

Table 11 - 1700 Calorie, CPF and Basic Model: Nutritional Requirements and Overshooting (daily kg per person)

		1700		CPF		Basic	
	Required	Effective	Overshooting	Effective	Overshooting	Effective	Overshooting
Calorie	2,100 kcal	1,700 kcal	-19%	2,100 kcal	0%	2,100 kcal	0%
Protein	5.00E-02	0.00		5.00E-02	0%	8.23E-02	65%
Fat	3.40E-02	1.98E-01	483%	5.63E-02	66%	3.40E-02	0%
Iron	1.91E-05	0.00		1.50E-05	-22%	1.91E-05	0%
B12	8.77E-10	0.00		0.00		1.90E-09	117%
Folate	1.80E-07	0.00		3.15E-06	1647%	1.53E-06	750%
B1 (thiamin)	1.13E-06	0.00		6.50E-06	476%	3.28E-06	191%
Niacin	1.48E-05	0.00		0.00	-100%	1.48E-05	0%
C	4.10E-05	0.00		6.50E-07	-98%	4.10E-05	0%

Source: Authors' calculations.

[27] As explained by a note published by the World Health Organization in 1999: Scurvy and its prevention and control in major emergencies. To see the online version of this note, visit: https://www.unhcr.org/4cbef0599.pdf

[28] It is reasonable that fish entered the solution, given that it is a rich source of Vitamin B12 and Argentina is a coastal area. Also, meat is included due to the fact that one of Argentina's main economic activities is the cattle ranching.

Appendix IV: Basic Basket Expenditure per Category (CABA)

Table 12 - Consumption Basket of CABA (August to december, 2020)

Components of the different baskets	Average expenditure	Average % of the total basket
Food Basket	8,832.4	42%
Rent	0.0	0%
Expenses	3,306.1	16%
Gas	478.0	2%
Electricity	539.8	3%
Water	812.2	4%
Public transport	735.9	3%
Comunications	957.7	5%
Food and Home Services Basket	15,662.0	74%
Education services	0.0	0%
School Supplies	0.0	0%
Cleaning articles	383.2	2%
Recreation services	1,012.3	5%
Goods and services for personal care	1,190.6	6%
Monthly Basket of Goods and Services	18,248.2	86%
Clothes	1,535.3	7%
Health	414.2	2%
Durable goods for home furnishing	941.6	4%
Total Basket	21,139.4	100%

Source: the information was obtained from a document published in 2021 by Dirección General de Estadística y Censos (Ministerio de Hacienda y Finanzas GCBA) (https://www.estadisticaciudad.gob.ar/eyc/?p=24646)