Economic Access to Fruits and Vegetables in the Greater Quebec City: Do Disparities Exist?

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ABSTRACT

Objectives: To examine the cost of fruits and vegetables (FV) with respect to different food store types, urbanization level and material deprivation for various urban areas of greater Quebec City.

Methods: A sample of 85 food stores was selected. They represented five store types (small, conventional, and large grocery stores; greengrocers; convenience stores) in four geographic areas reflecting three different socio-economic levels. We identified three FV baskets (grocery, fresh FV, convenience) by drawing on data on household food spending and consumption, and food supply in the five store types. Four investigators were trained to conduct a survey of prices for the week of September 17-23, 2007. Analysis of variance and t tests were conducted to examine variations in food baskets with regard to the variables defined in this study. A chi-square test was used to measure the frequency distribution of stores throughout the greater Quebec City.

Results: Only food store type had a significant influence on FV cost: cost was much lower in large grocery stores and greengrocers. Convenience stores, where prices are higher, outnumbered all others in deprived urban areas, supporting the contention that there are inequities in economic access.

Discussion: Economic access to FV may differ by area in the greater Quebec City, putting rural inhabitants and less privileged urban dwellers at the greatest disadvantage; this may, in turn, contribute to health disparities. The results point to the need to improve our understanding of the way components of the food environment at the regional level affect social inequality.

Key words: Food cost; fruits and vegetables; economic access; urbanization level; underprivileged area; health inequalities

La traduction du résumé se trouve à la fin de l'article.

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Social inequalities in health are the focus of an increasing number of studies trying to determine the elements and processes involved.¹⁻⁴ Among these studies, those addressing the economic accessibility of food suggest that unequal access can contribute to health disparities by putting low-income people at a disadvantage.⁵⁻⁷ With respect to consumption of fruits and vegetables (FV), 58% of Canadian households with low income (<\$30,000) reported eating fewer than five portions of FV per day in 2004, and this proportion fell to 41% for privileged households (>\$60,000).⁸ Significant associations were found between low consumption of FV and the risk of chronic diseases such as obesity, cancer and diabetes.⁹⁻¹¹

Studies have analyzed the variation in healthy food costs across different socio-economic contexts.¹²⁻¹⁵ In Canada, a few studies have shown no variation in the cost of a Nutritious Food Basket (NFB) according to socio-economic status.¹⁶⁻¹⁸ In these studies, food store type was the only predictor of cost of an NFB, which was lowest in large grocery stores.

A pilot study conducted in Quebec City on the variation in food costs found an uneven distribution of the various food store types and suggested the need for a closer investigation of the variation in costs with respect to socio-economic level.¹⁹ The present study was thus undertaken to respond to the following research question: Are there differences in the cost of FV in different types of food stores according to 1) the level of urbanization (urban or rural) and 2) the socio-economic levels of the urban centres in the greater Quebec City?

METHODS

Area selection

Four areas in the greater Quebec City with various socio-economic contexts were selected for this study. They are identified either as urban (Quebec City) or rural (three regional county municipalities).²⁰ Each rural centre had to be located in a different municipality, and all rural centres were selected to reflect the diversity of the metropolitan-influenced zone. This concept is used in order to better differentiate regions of Canada that lie outside the major metropolitan areas.^{21,22} To examine variations in the cost of FV according to socio-economic level, the Pampalon and Raymond material deprivation index was used to select neighbourhoods reflecting different socio-economic contexts of urban area.²³ Deprivation is expressed as low, medium or high. The index is based on three indicators (education, employment and income) that determine the socio-economic conditions under which people live in small geographic areas with a population between 400 and 700 and for which data are available.

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Food stores census

All areas' food stores likely to offer FV were identified and classified by type (grocery, greengrocer, convenience) using Business 411 software (Tamec Inc., version 7.2, 28th ed., Montreal) and a 2005 database from Quebec's Ministère de l'Agriculture, des Pêcheries et de l'Alimentation. A record was provided by the City of Quebec (2007) to help us sort the type of grocery store into three categories by surface area: small (<800 ft², 74.3 m²), conventional (<30,000 ft², 2,787.1 m²) and large (<100,000 ft², 9,290.3 m²).

A random stratified sample of food stores was drawn according to type of store (5 types), urbanization level (2 levels), as well as the material deprivation index (3 levels). As determined by a statistician, the aim was to include a minimum of six food stores for each stratum to produce sufficient statistical power, but for certain categories it was deemed impossible to reach this number because of the absence of stores located in the designated area. In all, the study sample had 85 stores.

Fruits and vegetables basket content

A list of the 80 most consumed FV (fresh, canned and frozen) was first compiled using statistics on consumption patterns of the Quebec population.²⁴ This list was refined according to the products, brands and sizes most commonly found in some food stores of the study's areas. Final list adjustment was made on the basis of pre-tests in 46 stores. Because the products offered were different from one type of food store to another, the list was split into three baskets: a grocery basket composed of fresh, canned and frozen FV; a fresh FV basket specifically created for greengrocers containing fresh FV also found in the grocery basket; and finally, a convenience basket for convenience stores with canned products also in the grocery basket. Table 1 illustrates the contents of each basket.

Data collection

Four investigators were trained, and data were collected during the week of 17-23 September, 2007. Product description, brand, variety, unit of reference and the regular marked price were collected by each investigator using audio recorders and then transcribed into SPSS (Statistical Package for the Social Sciences).

Organization and analysis of data

Prices were examined for outliers and missing data. To retain a maximum of stores and provide as detailed a list of FV as possible, it was necessary to omit items not available in some stores, with the exception of the convenience basket. To avoid price imputation problems, a store was removed from the analysis when at least one of the items listed in the basket was absent. Therefore, a total of 11 convenience stores (46% of all convenience stores), 11 small grocery stores (55%), six conventional grocery stores (27%), and one greengrocer (11%) were not considered.

To determine whether differences in the cost of FV baskets are related to the level of urbanization and the material deprivation index, a series of *t* tests and analysis of variance were conducted using SPSS software version 13.0. The distribution of food stores included in the initial sample was examined by area and by population using chi-square tests.

RESULTS

Data from 56 food stores (66%) were analyzed (Table 2). Small grocery stores were placed in the convenience store category because of

Table 1. Contents of Fruit and Vegetable Baskets

Product	Reference Unit	Baskets		
		Grocery	Fresh FV*	Convenience
Fresh apples	1 kg	X	X	
Fresh bananas	1 kg	X	X	
Fresh oranges	1 kg	X	X	
Fresh pears	1 kg	X	X	
Fresh white potatoes	4.54 kg	X	X	
Fresh tomatoes	1 kg	X	X	
Fresh carrots	1 kg	X		
Fresh yellow onions	1.36 kg	X	X	
Fruit salad canned	796 mL	X		
Peaches canned	796 mL	X		
Stewed apples canned	796 mL	X		
Whole tomatoes canned	796 mL	X		X
Corn kernels canned	341 mL	X		X
Cream corn canned	398 mL	X		X
Small sweet peas canned	398 mL	X		X
Frozen strawberries	600 g	X		

* Fruits and vegetables.

Table 2. Number of Food Stores by Type and Socio-economic Context

	Urbanization Level				Total (%)
	Urban			Rural	
	Index of material deprivation				
	Low	Intermediate	High		
Convenience+*	2	5	7	7	21 (38)
Conventional grocery	3	4	5	5	17 (30)
Large grocery	2	3	2	3	10 (18)
Greengrocer	2	3	2	1	8 (14)
Total (%)	9 (16.1)	15 (26.8)	16 (28.5)	16 (28.5)	56 (100)

* Convenience+ type includes small grocery stores and convenience stores distributed as follows: in urban areas 5 small grocery stores vs. 9 convenience stores; in rural areas 3 vs. 4.

Figure 1. Comparison of the mean costs of fruit and vegetable baskets by food store types

* $p < 0.001$

† $p < 0.05$

‡ $p < 0.01$

their limited supply and variety of FV compared with the other two types of grocery stores. The convenience store category was thus renamed "convenience+". Only one small grocery store in our study provided a supply similar to that of the other types of grocery stores, and it was thus placed in the conventional grocery category.

Neither the level of material deprivation nor the level of urbanization influenced the cost of FV baskets (Table 3). The type of food store was the only factor having a significant effect on the cost. Figure 1 illustrates that the average price was lower in large grocery

Table 3. Cost Comparison of FV Baskets by Level of Urbanization, Material Deprivation and Food Store Type

	Grocery Basket*			Fresh FV Basket*			Convenience Store Basket*		
	n	t / F	p	n	t / F	p	n	t / F	p
Urbanization level	27	0.80	0.43	35	0.77	0.45	48	0.53	0.60
Index of material deprivation	19	0.06	0.94	26	1.67	0.22	33	0.41	0.67
Food store type	27	2.56	<0.01	35	4.09	0.04	48	16.19	<0.001

* n = number of food stores included in the analysis; t/F = results of t tests (t) or analysis of variance (F); p = level of significance

Table 4. Food Store Distribution by Urbanization Level in Four Areas of Greater Quebec City

	Convenience Store	Small Grocery	Conventional Grocery	Large Grocery	Greengrocer	Total
Urban						
N	132	36	20	7	10	205
N/10,000 res.*	7.87	2.15	1.19	0.42	0.6	12.23
N/100 km ²	181.1.†	49†	27†	9.6†	14†	280.7
Rural						
N	34	8	6	3	2	53
N/10,000 res.*	9.54	2.24	1.68	0.84	0.56	14.86
N/100 km ²	1.54	0.36	0.27	0.14	0.09	2.4

* Residents

† p<0.05

stores and greengrocers when compared with other store types. The price for a convenience basket was also lower in large and conventional stores. For the fresh FV basket prices in greengrocers were significantly lower than in conventional stores and showed a tendency to be lower than in large stores. Finally, the grocery basket was less expensive in large than in conventional stores.

Table 4 shows that for all types of store, the total number of stores per 100 km² was significantly greater in urban settings than rural ones. However, the distribution of stores per 10,000 inhabitants was the same in both settings. The distribution of stores in urban settings was also examined in terms of the material deprivation index, and no differences were found except for the convenience+ category. In this case, the number of convenience+ stores was significantly greater in areas where material deprivation was high (low level of deprivation=3 stores, intermediate=17, high=24; p<0.001).

DISCUSSION

The results of this study corroborate those of previous studies conducted in Canada demonstrating that the store type alone can significantly influence FV basket cost.¹⁶⁻¹⁸ Large stores and greengrocers were, on average, cheaper than any other type. This finding is not surprising given that large grocery stores have more room available to keep low-price bulk food items and are in a position to offer a much larger variety of FV to consumers at very competitive prices.²⁵ Although a significant difference in the price of just one of the four items of the convenience store basket could account for all differences found in the cost of the basket, the reality is that these four products were the only ones common to all convenience stores. Moreover, these products were exactly the same (brand names, reference unit), so we assume they represented the real offer in these stores. The fact that brand names were the same for each product across the stores reinforces our result that the variation of cost found among food stores can be imputed to differences among store types.

In contrast to our results, some previous studies that have monitored food prices in various settings showed that low-income urban households and rural inhabitants face greater disadvantages in terms of economic access to food.¹³⁻¹⁵ In the majority of these studies, discussions emphasize the difficulties in accessing supermarkets or large stores, resulting in increased food costs. In this

study, the fact that every type of food store was established in each kind of setting may have accounted for the finding that food costs did not vary with respect to the level of urbanization and the material deprivation index. Although basket prices were not influenced by urbanization and deprivation, the distribution of store types across settings could contribute to health disparities in the greater Quebec City. In fact, a recent Montreal study found that 40% of the population did not have access to fresh FV (food stores <640 ft², 59.5 m²) within walking distance (500 m) from their home.⁴ The present study observed a significantly lower number of food stores of all types per 100 km² in rural settings compared with urban settings. Travel distances could affect the total cost of FV and expose rural inhabitants and indeed less privileged households without a car to greater difficulties in accessing FV.²⁶

The absence of large grocery stores could contribute to higher food prices in a given setting.¹⁴ In the poor urban settings sampled in this study, convenience stores dominated the food landscape and were more likely to serve low-income households. Such households are faced with a very poor supply of FV, which is limited to whatever these stores are selling, namely canned foods priced much higher than in other types of stores. In spite of this finding, large stores were also located in areas where the material deprivation index is high. This could also contribute to explaining why differences in the cost of FV baskets in relation to the level of deprivation were not found. To provide stronger evidence of social inequalities in economic access to FV, more research is needed to better understand perceptions of low-income people with regard to their access to large food stores, FV purchase patterns and available means of transportation.

Methodological considerations confirmed the representativeness of the food environment of the area under study. For instance, FV baskets were defined according to the target population's consumption frequency of food items, as well as the availability of the food items in the various stores. Greengrocers were included since they are the second most popular place throughout Quebec to buy fresh FV.²⁵

The absence of stores in some strata in the planned sample and the loss of stores because of missing data have reduced the sample size and may limit the ability to generalize the results. The reduced sample was, nevertheless, representative of each area's particular

food environment. While other studies have made use of the price substitution method²⁷ in order to prevent loss of data, it is not without bias. If the price substitution method had been used, the final sample would have been bigger but not as representative of the area's reality.

CONCLUSION

This study revealed no evidence of price disparity in FV across different socio-economic contexts. The type of store, however, does influence cost and, given the distribution of stores, economic access to FV could become a major issue for households living in a disenfranchised urban setting or for rural households without a car.

Economic accessibility to healthy food is but one component of the food environment capable of having an effect on social inequalities in health. To ensure that people have access to high-quality food, everyone must have the physical and material means of acquiring the foods recommended by nutritionists.^{27,28}

To meet the goal of improving the food environment and thus reaching a better overall health status, it is imperative that research help us interpret and understand the components of the food environment and how they relate to social inequalities in health in places.

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RÉSUMÉ

Objectifs : Cette étude visait à examiner le coût des fruits et légumes (FL) en fonction de divers types de détaillants alimentaires, du niveau d'urbanisation et de l'indice de défavorisation matérielle de divers secteurs urbains de la grande région de Québec.

Méthode : Un échantillon de 85 détaillants alimentaires a été sélectionné pour représenter cinq types de détaillants (petite et grande surface; surface conventionnelle; fruiterie; dépanneur) sur quatre territoires aux données socioéconomiques variées. Trois paniers de FL: « épicerie », « fruits et légumes frais » et « dépanneur » ont été établis en fonction des dépenses et de la consommation alimentaires de la population ainsi que de l'offre dans les cinq types de détaillants. Quatre enquêteurs formés ont enregistré les prix du 17 au 23 septembre 2007. Des analyses de variance et tests t ont permis d'examiner la variation du coût des paniers selon les variables à l'étude. La distribution des détaillants recensés selon les milieux a été vérifiée à l'aide du khi-carré.

Résultats : Seul le type de détaillant a influencé significativement le coût, plus faible dans les grandes surfaces et les fruiteries. Les dépanneurs, où les prix sont les plus élevés, dominent les endroits fortement défavorisés du milieu urbain, corroborant ainsi l'existence d'inégalités dans l'accès économique aux aliments.

Discussion : La distribution des types de détaillants alimentaires pourrait contribuer aux disparités de santé dans la région de Québec en désavantagant les habitants ruraux et ceux moins nantis habitant le milieu urbain. Les résultats montrent qu'il faudrait en connaître davantage sur les composantes de l'environnement alimentaire dans la région et leurs impacts sur les inégalités sociales.

Mots clés : coût des fruits; fruits et légumes; accès économique; niveau d'urbanisation; secteur défavorisé; inégalités en santé