

## Education, Income, Exercise and Probiotics Consumption: A Latin American Case, Costa Rica, 2013

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### Abstract

Obesity and physical inactivity are becoming common issues related to health and wellness as a result of sedentary lifestyle as a result of urbanization. The Costa Rican consumers indicate that probiotics are becoming a form of preventive fitness. The purpose of this study, is to provide information about the main factors that determine the consumption of probiotics and whether there is a relationship between the consumption of probiotics and physical exercise

The per item subject to variable relation in the survey and since the survey had 16 questions this meant 80 survey, plus additional 36 were added to cover any incomplete surveys The Cronbach's alpha estimate only the items of perception which was estimated at 0.7163. The consumer of probiotics in Costa Rica, is about 31 years old, lives in the luxury suburbs, have a small family, are is mostly male and with an income level of about \$ 1,500 a month, get information via television and the Internet, 6% said they have never used probiotics, and 4% say they have full knowledge of what they are and do, exercising in gyms as an important way to keep fit, exercise three times a week, purchase probiotics mainly in the supermarket, and prefer local to imported brands . The variables that explain the variation in the time that probiotics are consumed per week are: sex, education level, monthly income, activities to stay in shape, frequency of activities and the number of family members.

**Keywords:** Probiotic; Consumption; Exercise; Model; Profile

### Introduction

In 2009, the global prevalence of inactivity affected 17% of the world population, despite an improvement have occurred in the availability of time to exercise, due to changes in transportation and occupational related reduction activity physics.

Obesity and physical inactivity are becoming common issues related to health and wellness as a result of sedentary lifestyle that urbanization and changes in the type of employment in many developing countries. The relationship between the consumption of probiotics, and socioeconomic factors, exercise and wellness is becoming a reality for the urban consumer of middle and upper income strata.

The Costa Rican consumers indicate that probiotics are becoming a form of preventive fitness, consuming them in the pursuit of health and wellness. In order to solve the problem of lack of physical activity many are seeking alternatives to improve their health and wellbeing with the consumption of probiotics.

There are cases like that of Japan, which allows certain foods to be labeled as "health foods for specialized use" (FOSHU), designation which has increased the sales of probiotics substantially, a decision that some argue is probably due to a combination of tradition and rapidly rising health care costs, which authorities think may be reduced if probiotics are consumed regularly.

In 2008, the market for probiotics consumption was 11.4 million euros in Western Europe. In the UK sales of yogurt, kefir and cultured drinks are the major food categories, with sales of yogurt estimated in

2010 at U.S. \$ 700 [4-10]. In other words, the boom is true and seems to spread to other parts of the world where the sedentary lifestyle is becoming more common.

### The consumption of probiotics in Latin America

The food industry and nutrition in Latin America reached sales of around U.S. \$ 3.67 billion in 2003, of which 14.4% were functional foods [11]. In Brazil, sales of functional foods in 2007 reached \$ 500 million dollars, corresponding to sales of food with probiotics 1% of total food sales. Prospects for Latin America as a producer and consumer of potential functional foods seem to depend largely on the level of information, income, credit products, investment in research and regulatory practices. In this context, Brazil and Mexico are the largest potential markets considered as having an emerging consumer base and growing, with strong and developing economies [12].

The prevailing "ideas" about probiotics depend on the country. In Chile and Argentina probiotics are perceived as a product that helps children digestive system perform better and allows better absorption of vitamins. In Mexico is thought to improve the absorption of nutrients to strengthen the defenses, in Brazil, is believed to contribute to a healthy intestinal flora, helping to keep your intestinal flora in balanced, reducing harmful bacteria, in addition to increased beneficial flora, especially antibodies that enhance and strengthen the natural defense against daily stress, it is important to note that these benefits have not yet been validated scientifically [13, 14].

A survey conducted in southern Brazil showed that consumers interviewed had positive attitudes towards functional foods and also had the purchasing power to buy. Dietitians, nutritionists and other health professionals, with high credibility seem to inform consumers

about the benefits of certain categories of functional foods. Moreover, the food industry itself is not considered the most reliable of sources, indicating the need to pay more attention to this fact from a corporate standpoint. Finally, the study showed that understanding of Brazilian consumers is critical in helping food companies define their strategies, to assign the categories most accepted of functional foods in order to avoid the results of a process of "trial and error" as so far it has been going [15].

Valdez Ramos and Solomon in Mexico and Central America, a recent study concluded that increased consumption of functional foods such as probiotics and prebiotics can be a way to decrease the incidence of infectious diseases, and some of the chronic diseases affecting populations in the region [13].

In Costa Rica, studies conducted in 2008/2009 it was noted that many Costa Ricans feel their quality of life is being negatively affected by a sedentary lifestyle and lack of exercise and have started to look at the combination of exercise and nutrition options to help maintain their health and welfare [1]. This information is very important because in 2020, over 71% of Costa Rica's population will live in cities of more than twenty thousand people and all the capital cities of Central America, most likely, will have greater populations at 1.5 million people. Turning to the binomial, obesity/physical inactivity in one of the leading causes of health problems of the population.

### **Income and consumption of probiotics**

According to the classical theory of consumer income and prices are key variables in explaining consumer expenditures related to the purchase of food in developed countries [16]. Prices and incomes of U.S. consumers could be responsible for 97% of the variation in demand food [17]. A recent study in the United States reports that the factors that affect the likelihood of drinking yogurt purchase are price, income, employment status, education level, region, race, age and presence of children and sex of the head of household [18]. Research by Di Pasquale et al, show that young age, knowledge of functional products and healthy lifestyle are very important factors in determining a greater willingness to pay for functional foods [19]. Cranfield et al. found that the consumption of functional foods is related to the attitude towards functional foods, women often see healthy eating associated with a healthy lifestyle and attitude tend to have greater information search on the topic and its implications [20]. In Mauritius, respondents identified the high prices and doubt about the health benefits attributed to probiotics as the two main factors hindering the use of functional foods and that 67.5% of consumers are unwilling to pay more for functional foods [21]. In India, rising incomes available is one of the engines of industry and consumption of probiotics [22].

### **Probiotics and exercise**

The relationship between physical exercise and consumption of probiotics has been raised many years ago. Mullie et al. reported that age, physical activity, education level, use of vitamin supplements and cultural background are variables that predict the consumption of functional foods [23]. In Australia, West et al. reported that there is a great interest among the sporting community about the potential benefits of probiotics to reduce susceptibility to infections of the upper respiratory tract and gastrointestinal diseases [24]. Disease prevention during intense training and competition is high priority, as some athletes may suffer a higher incidence of upper respiratory tract illness

during intense training and competitions which can adversely affect athletic performance, which makes very attractive probiotics to prevent this kind of problem [25-34].

By way of summary, the evidence seems to indicate that consumption of probiotics is related to income level, education level, number of family members, perceptions of healthy lifestyles and the general perception that consumption has a positive effect on the general well-being and sense of health of those who consume it.

### **A proposed conceptual framework for studying the consumption of probiotics in developing economies**

The classical theory of consumer is concerns with the effect of preferences for consumption expenditures for goods and services, seeking utility maximization subject to the income and budget constraints of consumers; with the assumption of perfect information. However some functional products are products where the consumer learns about them by and through "experience" of the good that is use.

To explain the idea of learning by experience and use, Lancaster and Thaler provide an option that seems more suited to the experience with probiotics assuming that consumption is an activity in which goods, singly or in combination, are inputs and outputs of a collection of features that are converted and ordered in terms of utility or preference, where it is supposed that the sorting of the collection of features, and classification occurs indirectly through the characteristics that the goods and services in question appear to have [35,36]. On the other hand cultural consumption and lifestyle preferences imply a judgment that identifies, classifies, our own particular judgment of taste for something regarding other consumers. This is particularly the case of groups aspiring to adopt a learning mode and to the use and cultivation of a lifestyle that is in line with the socio/cultural stratum in which you are or intend to associate and belong [37]. It's called the imitation effect of those who want to imitate, in the desire to be accepted and belong.

The combination of Lancaster, Thaler, Featherstone and the classical theory of consumers consider the cultural contexts in which consumption takes place, where the perception of well-being is a central consideration, it is proposed that, perceived health and wellness feeling are converted into a product or system output of consumption which becomes central to the utility consideration. The relational model that is used to test the hypothesis is one that seeks to combine the premises of classical consumer theory, the new approach proposed by Lancaster and Thaler approach and Featherstone proposals for cultural context, in order to cope with the attributes economic human as shapers of the utility function of a good making the contextualization of consumption a central behavior of the utility element. This idea leads into a three stage model whose; the graphical representation is presented in Figure 1.

In the first stage, the model proposes that education serves as a trigger for concerns about the health and welfare concerns arising from a sedentary life.

In the second stage, taking into account risks to human health and welfare, consumers begin to look for information and taking into account the income and education, are informed about the possibilities of exercise and consumption of probiotics is in this extent that he or she begins a process of adaptation of this information to their own needs and perception begins to develop and initiating the

development of probiotic consumption patterns and the best way to mix this with exercise.

In the third and final stage, the model postulates that consumption of probiotics (latent variable) is a function of socioeconomic factors as well as socioeconomic and physical location associated with being able to access probiotics regularly and as often they are involved in the exercise, given the perceived benefits of health and wellness derived from the combination of exercise and consumption of probiotics, provided that will be the level of education and income to participate in probiotic consumption, given the budgetary restrictions imposed by the income level of consumers.

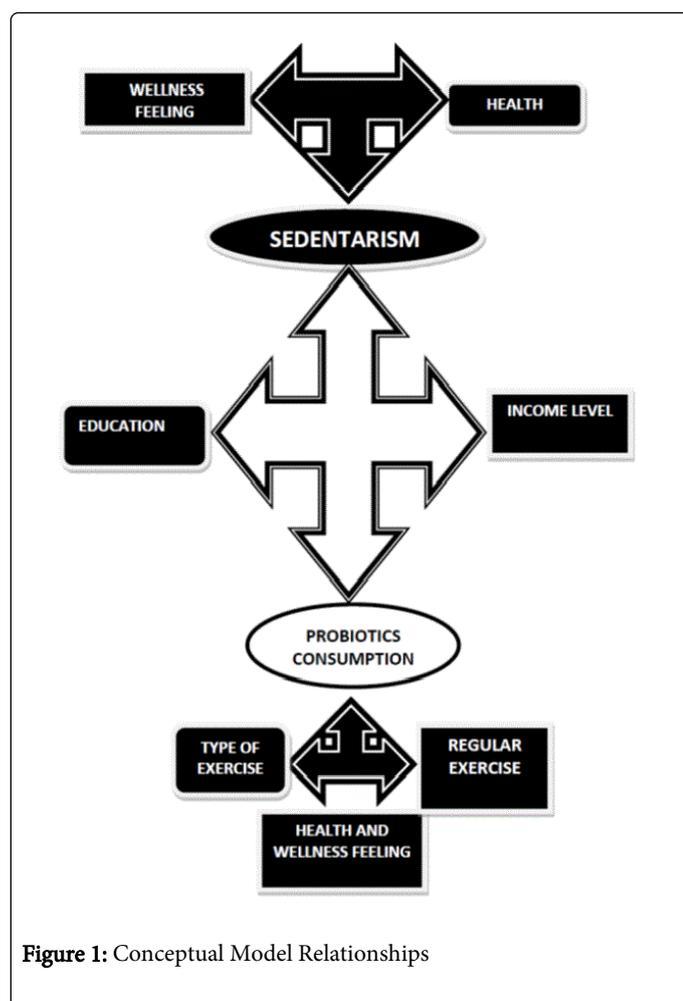


Figure 1: Conceptual Model Relationships

The mathematical formulation of the model is presented below:  
 $Y = f$  [Sociodemfactors Sdf, Locfactors LOCF, EconFactors Ef, and ExerFactors EXF]  
 where  
 $Y =$ time consumed, probiotics week

SDF, socio-demographic characteristics that characterize the consumption of probiotics, those included were sex, age, education level, and household members, LOCF, characteristics that the place of residence and where you buy probiotics, Infest, sources of information and use for information included were: source of information used and the degree of knowledge they felt they had about probiotics, use and benefits EConf, included the economic components influencing consumption were included, income level, the amount spent per week

on probiotics, the maximum price willing to pay probiotics and the actual prices paid by probiotics, EXF, exercise-related, were included, the type of exercise you do and how regularly engaged exercising.

The purpose of this study, the first available in a country in Central America, is to provide information about the main factors that determine the consumption of probiotics and whether there is a relationship between the consumption of probiotics and physical exercise as a way to improve health conditions and welfare of the people of Costa Rica, with the hope that more reliable information will lead to better marketing practices of the companies involved in the production and sale of probiotics in Central America.

### Study Hypothesis

The hypotheses of the study are

#### H1. Income level, influence the consumption of probiotics

The results of an exploratory study conducted in 2008/09 raised the idea of the existence of a possible combination of income, education and physical exercise could probably combination that may have much to do with the rapid growth in consumption of probiotics in Costa Rica, and the fact that this combination seem to be associated with health and wellness [1].

#### H2. Exercise is an important factor in the decision to consume probiotics

The relationship between exercise, health and consumption of probiotics has been suggested and appears to be associated with immunity, gastrointestinal and respiratory problems and the practice of sports in individuals, such as runners, swimmers, marathoners and long distance runners and diseases many other athletes [25-34] where results of linked consumption probiotics at least preliminarily as having positive effects on the performance of athletes.

### Materials and Methods

#### Site selection and sample

The study was conducted in the town of Escazú known as the residence of a person of upper middle class and upper class A pre-test survey was carried out even though the preliminary study helped identify features and preliminary issues with the consumption of probiotics and help the development of the final survey used in 2012 [1]. The total sample size was determined by the subject to variable ratio per item in the survey and since the survey had 16 questions this meant 80 surveys, plus additional 36 were added to cover any incomplete surveys and fieldwork maximize a given resource constraints faced.

The interviews were conducted face to face, in the dairy area of one supermarket selected randomly, every time a customer selected a dairy product containing probiotics (yoghurts liquids and semi-solid) and asked to cooperate in the survey. Of the 116 surveys, 106 usable numbers that represent 93% of those who bought the product during the fieldwork 7% did not cooperate. Minitab 16 was the program used to estimate the models.

#### Modeling Procedure and analytical steps

In order to achieve the objectives, the steps described below were completed

Step 1. Development and testing of the questionnaire to verify understanding of the questions and Cronbach's alpha estimate only the items of perception which was estimated at 0.7163.

Step 2. The implementation of the surveys and the development of the database.

Step 3. Development of supporting information to derive the profile.

Step 4. Estimation of ordinal logistic regression with logit link using non-standardized dependent variables and independent variables standardized to rank the importance of each variable included in the final models obtained. Where the variables included in the final models obtained are interpreted as "relevant" to the situation under study and the independent variables as the "absolute" value of standardized coefficients can be taken as the rank of the importance of the variable in the model derived [25].

## Results and Discussion

The presentation of the results will follow the sequences of the objectives and hypotheses proposed in order to facilitate understanding of the results.

### Consumer profile

The profile developed on the basis of the survey, indicates that the average consumer of probiotics, is around 31 years old, living in suburban areas, highly educated, with a small family (3 members), are mostly male and with an income level almost five hundred dollars, higher than the highest quintile, according to the latest household survey. Is reported via television and the Internet, only six percent indicated that if any ever used before, 4% say they have full knowledge of what they are and do the exercise and diets as the main ways to keep fit, make exercise at least three times a week, mainly probiotics buy in supermarkets, and preferring the local brand (Dos Pinos- Bio Plus) to imported brands (Danone Activia). Imported brand has a market share of 32% and 61% local. The remaining 7% is divided between five imported brands. The weekly expenditure on probiotics is about eleven dollars and the price ranges of the average dose were U.S. \$ 0.80 to \$ 1.10. There are now at least 14 different presentations and 7 different brands offering dairy products containing probiotics, most presentations are drinkable yogurts Table 1.

Consumer Profile		
Age	Years	31
Residence		
San Jose	%	25
Suburbia	%	75
University Education	%	71
Gender		
Males	%	65
Income	US\$month	1500
Family	Members	3

Information		
Television	%	54
Internet	%	24
Knowledge about Probiotics		
No	%	27
Some	%	69
Full	%	4
Activities to Control Weight		
Gym	%	40
Diet/Walk	%	15
Walk	%	12
Days Week	#	5
Brand		
Local	%	61
Imported	%	32
Place of Purchase		
Supermarket	%	75
Weekly Expenditure		
Dollars	US\$	4 to 7.10
Average Price per unit		
Dollars	US\$	0.8 to 1.10
Source: Survey		

**Table 1:** presents the results of the model derived from semi-standardized logistic regression indicated that the most important factor in explaining the consumption of probiotics variable was the frequency of physical activity (Physical Activity Frequency) with an absolute value of the coefficient of 1.47672, a Z value of 5.78 and a P value of 0.000 this result link to -0.90 for type of physical activity is very important because it indicates that exercise is closely linked with the consumption of probiotics something the literature supports and is an indication of the relationship between the idea of exercise and health-probiotics

The second most important variable is the number of family members one with an absolute value of the coefficient of 1.09260, a Z value of 4.84 and a P value of 0.000, reported in other studies as well. In the case of Costa Rica seems that families of the high and upper middle class, when parents begin to consume, the idea seems to be to include the rest of the family in particular and if they are growing children and young adults. New generations of parents also tend to reduce family size 1 or 2 descendants are well aware of the importance of "grow healthy" and will do everything possible to achieve such a family goal. This was already reported by [18] in the United States under similar conditions. The third variable is the level of education (Ed Level) with an absolute value of the coefficient of 0.97143, a Z value of 3.91 and a P value of 0.000.

Final Derived Model Composition 2012			
Variables	Coef	Z	p
Monthly Income	-0,513	-2,26	0,024
# Family Members	1,092	4,84	0
Educa Level	0,971	3,96	0
Type of Physical Activity	-0,906	-4,42	0
Frecuency of Physical Activity	1,1476	5,78	0
Method	Chi Square	DF	p
Pearson	640,125	165	0,000
Deviance	279,785	165	0,000
Measures of Association			
Somers'D	0,64		
Kendall Tau-a	0,53		
Goodman-Kruskal	0,65		
Source: Survey			

**Table 2:** Factors associated with the consumption of probiotics.

The fourth variable is the most important type of physical activity they engage in, with an absolute value of the coefficient -0.906991, a Z value of -4.42, and a P value of 0.000. The values of the coefficient of the variables are the third and fourth are very similar in absolute values, indicating again that the type of physical activity is important. The idea that the frequency and type of physical activity are present among the four most important variables supports the acceptance of the hypothesis about the relationship between the consumption of probiotics and exercise as a way to improve the health and welfare Costa Ricans.

Interestingly, the fifth and last variable present in the final model derived is the monthly income with an absolute value of the coefficient of -0.513576, a Z value of -2.26 and a value P of 0.024, indicating that although the income is relatively lower in importance, their presence certainly shows the underlying importance of the influence of income on the ability of the family to purchase the product and to pay certain amount of money monthly for exercise.

By entering income in shaping the final equation, it makes us think that in Costa Rica consumer identified, exercise regularly as a concerned about their health and wellbeing and probiotics makes part of the "care package" to address physical inactivity, given the price of the products. The inclusion of income in the final model clearly supports the acceptance of the hypothesis that the level of income is a factor affecting the consumption of probiotics.

Two additional comments that deserve attention: First, respondents who use the local brand when asked why they did it, they said, that the local brand was as good as the imported and better priced. An interesting observation was that the imported brand has an information campaign on cable, which makes the local brand benefiting from the imported brand cable TV and Internet advertising. Second, the imported brand market share of 32% is not negligible, and the fact that 88% of customers reported using television

and the internet as way to get information support the idea of the local "piggyback" of the imported brand advertising on TV and cable.

International advertising seems, to influence customers to buy the imported brands given its international image and its association with the idea of health and wellness, that he international brand sells so well in the cable television and Internet advertising along with the idea of regular exercise.

### The theoretical Proposal and the Findings

Essentially one can detect from the study is the existence of a growing group of suburbanites, well-educated, high income and with a genuine concern for their health and wellness, that see the exercise, diet and consumption of probiotics as a way to offset sedentary lifestyle created by the urbanization and economic improvement and that will in the coming years increase their consumption of probiotics and probably other functional food products, making functional foods the raising "new boom" of the food industry . If this is true and we believe it is, this will occur in the other countries of the region as well and we hope this contribution will help better understand what awaits the dairy industry in the future.

If one goes back to the theoretical framework propose, it can be observed that the variables included do in fact support the role of probiotics and its association with education, income level and exercise as a way to improve the chances of health and wellness in a socio-cultural environment were economic improvement usually is associated with overweight and sedentary, given the healthy lifestyle they seem to desire.

### Conclusion

The consumer of probiotics in Costa Rica, about 31 years old, lives in the suburbs of luxury, have a small family, are is mostly male and with an income level of about \$ 1,500 a month, get information via television and the Internet, 6% said they have never used probiotics, and 4% say they have full knowledge of what they are and do, exercising in gyms as an important way to keep fit, exercise three times a week , purchase probiotics mainly in the supermarket, and prefer local to imported brands. The weekly cost is about eleven dollars and the average dose costing you on average between eighty cents and one dollar.

The variables that explain the variation in the time that probiotics are consumed per week are: sex, education level, monthly income, activities to stay in shape, frequency of activities and the number of family members.

Since exercise via type and frequency and income are part of the consumption function, the hypothesis H1, that income will be a factor affecting consumption of probiotics and H2, exercise will be an important factor in the decision to consume probiotics are both accepted.

Finally, the need for developing criteria's for future management of probiotics claims is something worth considering by the local health authorities because years to come their consumption in the region could increase as income, education and urbanization grow and the problems generated by obesity and a sedentary lifestyle increase.

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