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FACTORS INFLUENCING CONSUMPTION OF DAIRY PRODUCTS: AN EXPLORATORY STUDY IN KOTA KINABALU, SABAH, MALAYSIA

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ABSTRACT

Increasing demand for dairy products in Malaysia is driving government initiatives and structural change in the domestic dairy industry to increase its competitiveness and self-sufficiency. To be successful, the industry must take a value-chain approach and focus on the needs of domestic consumers. This study endeavours to investigate the drivers of increasing dairy demand by examining the factors influencing Malaysian consumers' consumption and perceptions of various types of dairy products. A survey of 435 respondents was conducted and the data were analysed using logit models. The results indicate that demographic variables such as age and ethnicity as well as other attitudinal variables significantly influence consumers' increasing consumption of dairy products. Managerial recommendations for the domestic dairy industry are suggested and policy implications are discussed.

Keywords: Dairy products, consumer behaviour, milk consumption, Malaysia

INTRODUCTION

Similar to many Asian countries, significant transformation is occurring in Malaysia's food marketing system as a result of industrialization, economic growth, urbanization, globalization, and trade liberalization (Arshad, Mohamed, & Latiff, 2006). These changes have resulted in more affluent consumers who demand higher quality food products that are differentiated through branding, labelling information, and a variety of quality attributes to meet consumer's increasingly diverse needs and preferences (Ishida, Law, & Aita, 2003). Additionally, as consumers become more educated, they tend to become more conscious about health and wellness issues thus reflecting on food choices and diet (Quah & Tan, 2010). All of these factors are driving the shifts in Asian diets away from starch-based staples (e.g., rice) and increasing demand for wheat-based, meat, and dairy products as well as fruits and vegetables (Prescott, Young, O'Neill, Yau, & Stevens, 2002; Warr, Rodriguez, & Penm, 2008).

Food consumption patterns in Malaysia appear to be evolving in a pattern similar to other emerging Asian economies, most notably Thailand, China, and the Republic of Korea (Ishida et al., 2003; Warr et al., 2008). Per capita consumption of livestock products in

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Malaysia, including dairy, is substantially below member countries of the Organisation for Economic Cooperation and Development (OECD) such as the United States, Australia, and Japan. Yet, compared to Thailand, China, and the Republic of Korea, per capita consumption of livestock products is relatively high. For example, in 2005 (the latest consumption data available), Malaysians consumed approximately 44 kg of milk per person a year, compared to 25, 18, and 40 kg in Thailand, China, and the Republic of Korea, respectively (Warr et al., 2008). From 1990 to 2005, per capita consumption of fresh whole milk increased 33% from 32.9 kg to 43.5 kg. Dong (2006) and Beghin (2006) projected that dairy consumption in Malaysia will continue to increase substantially over the next 10 years because of continued population and income growth.

Unlike the domestic fruit, poultry, and pig meat sectors, the Malaysian beef and dairy industries are relatively small. Various conditions, such as the tropical weather and limited land availability and a structure consisting of mostly smallholders with small herds have constrained domestic productivity, leading to higher imports and Malaysia's low level of self-sufficiency (approximately 5% in 2010) for beef and dairy (Warr et al., 2008). In 2005, imports of dairy products were valued at approximately USD 444 million and accounted for the second largest share of agricultural imports into Malaysia. In 2010, imports of dairy products by the government increased by 16% from 2005 (Department of Statistics, Malaysia, 2010).

A range of Malaysian government research and development programmes and initiatives have been implemented over the years in an attempt to encourage growth of the domestic beef and dairy industries and to increase productivity. Examples include the establishment of Milk Collection Centres (MCC), the introduction of more productive dairy breeds, and the improvement of veterinary and extension services (Boniface, Gyau, Stringer, & Umberger, 2010). Various scholars have studied the Malaysian dairy sector and have suggested methods to help increase the competitiveness and to develop the domestic dairy industry, including reducing production costs by promoting integrated farming methods (Wan Hassan, Phipps, & Owen, 1989), improving animal husbandry and management by using computerised record systems (Pharo et al., 1990), and improving the quality of domestic milk supplies (Chye, Abdullah, & Ayob, 2004).

More recently, the Ninth Malaysia Plan (2006-2010), of the Malaysian Government focuses on increasing self-sufficiency by increasing domestic dairy production through large-scale commercial farming and value-added processes (Warr et al., 2008). For this initiative to be successful, the dairy industry must focus not only on increasing production capacity, but also on developing a consumer-focused value chain (Boniface et al., 2010). Currently, there are no known studies examining the factors influencing Malaysian consumer demand for dairy products. Thus the primary aims of this study are (1) to explore Malaysian consumers' purchasing patterns, perceptions of and preferences for various types of dairy products; (2) to determine the relative importance of various product attributes and information to Malaysian consumers when purchasing dairy products; and (3) to investigate factors influencing Malaysian consumers' increasing demand for dairy products and fluid milk. The findings of this research can be used to improve the

management of dairy supply chains, and to develop strategic plans and policies to aid in the development and expansion of the domestic Malaysian dairy industry.

Factors Influencing Malaysian Food Consumption

Although no studies have specifically addressed the objectives of Malaysians with regard to dairy consumption behaviour explored in this research, several studies have examined food consumption trends and factors influencing demand for food products that may be considered by Malaysians to be of higher quality or perceived to be safer or healthier (e.g. organic, natural, monosodium glutamate (MSG)-free meat). Recent consumer research suggests that Malaysian food consumption is becoming increasingly diverse and consumers are growing more concerned about the quality, safety, and nutritional content of their food (Prescott et al., 2002; Ishida et al., 2003; Liana, Radam, &Yacob, 2010; Rezai, Mohamed, & Shamsudin, 2011).

A number of consumer characteristics such as socio-demographics (e.g., gender, age, income, education, presence of young children in the household, ethnicity), knowledge, attitudes, and perceptions have been shown to influence Malaysian consumer's demand for quality-differentiated food products (Prescott et al., 2002; Ong, Kitchen, & Jama, 2008; Sheng, Shamsudin, Mohamed, Abdullah, & Radam, 2008; Quah & Tan, 2010; Radam, Yacob, Siew Bee, & Selamat, 2010; Rezai, Mohamed, Shamsudin, & Chiew, 2010; Shaharudin, Pani, Mansor, Elias, & Sadek, 2010; Rezai, et al., 2011). Additionally, extrinsic product cues such as packaging, food labels, quality certifications, brands, and promotional/marketing material can influence both consumer's perceptions and choices of food products (Prescott et al., 2002; Ong et al., 2008; Liana et al., 2010).

Several studies suggest that ethnicity has a significant impact on Malaysians' food consumption preferences and behaviour. Sheng et al. (2008), Warr et al. (2008), and Quah and Tan (2010) found Malaysians' food consumption patterns to be significantly different across three ethnic groups: Malay (approximately 50%), Chinese (25%), and Indian or other ethnic backgrounds (25%). Generally speaking, the Malays are predominantly Muslim and require food to be *Halal* certified. Chinese and Indian consumers tend to have more diverse diets, particularly with respect to consumption of proteins (Warr et al., 2008). The Malay segment is experiencing the largest growth both in terms of size and household income. Malays are demanding more functional fruit and vegetable food products rather than higher valued meat and fish products (Sheng et al., 2008; Quah & Tan, 2010). Quah and Tan (2010) found that Malay and Chinese consumers are more likely to purchase organic food products than Indian or other ethnicities.

Several studies have found that gender and the presence of children in the household significantly influence food purchasing decisions. Malaysian men were found to spend significantly more than women on food and beverages away from home (Ong et al., 2008). Radam et al. (2010) found that females were generally more health conscious than men and consumers in households with children less than 12 years of age were generally less concerned about price and more interested in purchasing safe and wholesome food. Additionally, females were more likely to be willing to pay a premium for "MSG-free"

meat, but consumers from households with four or more people, including children, tended to be more prices sensitive and less likely to pay a premium for "MSG-free" meat. Consistent with organic consumer studies in other countries, Quah and Tan (2010) found that women are significantly more likely than men to purchase and consume organic food.

In addition to ethnicity, gender, and household composition, other demographic variables such as income, education, and age have been found to significantly influence Malaysian food consumption. Higher income consumers were more likely to purchase organic food products (Quah & Tan, 2010; Rezai et al., 2011) and more likely to be willing to pay a premium for "MSG-free" meat (Radam et al., 2010). Rezai et al. (2011) found that respondents who had completed some level of tertiary education were more likely to buy organic vegetables, which were perceived by respondents to be "healthier", and Radam et al. (2010) found consumers with some university education were more likely to pay a premium for "MSG-free" meat.

Malaysian consumers between the age of 20 and 40 years were found to purchase more organic and "healthy" food, whereas consumers aged 65 and over were found to spend relatively more on beverages and tobacco products (Ong et al., 2008; Rezai et al., 2011). When examining the relationship between age and organic food consumption, Quah and Tan (2010) found that for each 10-year increase in age, Chinese-Malaysian consumers are about 11% more likely to purchase organic food products. Interestingly, age was not a significant variable in the Malaysian consumer models examining Malay and Indian consumer's organic food purchases.

As well as the socio-demographic factors discussed above, extrinsic cues, particularly quality or production certifications authorized by government agencies or religious organizations (e.g. *Halal*), have been found to significantly influence Malaysian food purchase decisions. For example, Rezai et al. (2011) and Liana et al. (2010) found that Malaysian consumers were more likely to purchase organically grown vegetables and meat products, respectively, certified by a government agency versus products not carrying the government certification. These studies shed light on the various factors that influence Malaysian consumer preferences and purchases for food products. The following section summarizes key literature related to the increasing global consumption of dairy products.

Factors Influencing Consumption of Dairy Products

As discussed previously, global demand for dairy products is increasing dramatically as consumers in developing countries become more affluent (Ishida et al., 2003; Warr et al., 2008). Much of this demand growth is driven by growing evidence and awareness that dairy products can provide essential vitamins and nutrients as well as other health benefits (Heaney, 2000; McGill et al., 2008; Wang, Manson, Buring, Lee, & Sesso, 2008). An example of this change can be seen in Malaysia, where traditionally, the morning meal (breakfast) consisted of rice or noodles, but has now significantly shifted to milk and bread and butter. Malaysians also now spend more on milk and dairy products than rice (Ishida et al., 2003).

Consumer behaviour, preferences, and attitudes toward consumption of dairy products differ substantially across countries (Grunert, TionBeck-Larsen, & Bredahl, 2000; Richardson-Harman et al., 2000; Bus & Worsley, 2003; Hatirli, Ozkan, & Aktas, 2004; Hsu & Lin, 2006; Robb, Reynolds, & Abdel-Ghany, 2007; Yee & Chin, 2007; Francesconi, Heerink, & D'Haese, 2010). Grunert et al. (2000) discuss that consumer perceptions of dairy product quality are complex and involve much more than sensory attributes. They contend that consumers consider four dimensions when forming perceptions about dairy product quality: (1) hedonic (e.g., sensory attributes such as taste or smell), (2) health-related, (3) convenience-related, and (4) process-related (e.g., production processes such as organic, animal welfare, or genetic modification). Thus, manufacturers/processors and marketers must understand the role each of these dimensions plays in driving consumer demand for dairy products and realize consumers may be heterogeneous in their preferences or perceptions of what constitutes dairy product quality.

Richardson-Harman et al. (2000) were able to segment the New Zealand dairy market based on consumer preferences for creaminess and liking of fluid dairy products, demographic characteristics, and attitudinal variables. Bus and Worsley (2003) found Australian consumers perceived whole milk to be of lower quality than other types of milk. In particular, women and elderly consumers were more likely to consume milk with reduced fat versus milk with higher fat content. A similar study of US consumers found low fat milk consumption was positively related to age, education level, and income (Robb et al., 2007). Taiwanese consumers who purchased relatively greater amounts of fluid milk had statistically higher levels of household incomes than consumers who purchased mostly yogurt drinks and flavoured milk (Hsu & Lin, 2006). In Turkey, households' choice of fluid milk sources was found to be significantly influenced by the number of children living in the household and education levels of the respondent (Hatirli et al., 2004).

Only a few studies have examined Malaysian households' dairy consumption patterns (Prescott et al., 2002; Norimah et al. 2008; Babolian Hendijani & AbKarim, 2010). Malaysian consumers rated health as the most important factor when purchasing powdered milk and product familiarity as the least important (Prescott et al., 2002). The 2003 Malaysian Adults Nutrition Survey examined the food consumption patterns of 6,742 consumers aged 18–59 years. The study revealed that adults aged 50–59 were the most frequent consumers of full cream milk, and only 15% of consumers under age 20 consumed milk daily (Norimah et al., 2008). Women were more likely to consume full cream milk daily, whereas men were more likely to prefer and consume less-healthy sweetened condensed milk daily. Norimah et al. (2008) suggest that this difference is likely because of women being more knowledgeable than men about potential health benefits of consuming milk.

To determine how milk intake could be increased among children, Babolian Hendijani and AbKarim (2010) studied the relationships between personal and environmental factors and beverage consumption preferences of primary school children in Malaysia. Consumption of milk relative to other beverages (e.g. mineral water, Milo, and fruit juice) among children was relatively low; not surprisingly, children preferred flavoured

milk to plain milk. Individual positive attitudes about the sensory aspects of milk, social acceptability (e.g. having family and friends who regularly consumed milk), availability of milk at home, and packaging were more likely to positively influence milk consumption among children than exposure to advertising or awareness of the health benefits. Bobolian Hendijani and AbKarim (2010) suggest that the most efficient way to increase milk intake of children is to focus on increasing the social acceptability of milk through marketing campaigns to increase consumer perceptions of the sensory aspects of milk.

The above literature summarizes the key factors shown to affect consumption behaviour of food products, particularly products such as dairy that are often associated with nutritional and health benefits. This research endeavours to add to this literature by analysing the increase of Malaysian's dairy product consumption behaviour, attitudes and perceptions regarding various types of fresh and processed dairy products. The remaining sections summarize the research methods, results, and conclusion.

MATERIALS AND METHODS

Survey Instrument and Design

To understand Malaysian consumer preferences and consumption patterns, a questionnaire/ survey instrument was designed to ascertain information on (a) consumers' purchasing frequency and consumption patterns of several fresh and processed dairy products, (b) the relative importance of factors that may influence purchases and purchase location of dairy products, (c) perceived benefits gained from consuming dairy products, (d) perceptions of fluid milk compared to powdered milk products, and (e) sociodemographic information. This consumption behaviour and attitudinal questions were developed based on the literature discussed previously and additional related consumer studies including Jensen, Kesavan and Johnson (1992), and Hsu and Lin (2006).

The purchasing frequency and consumption patterns section asked consumers to indicate how frequently (5 = daily and 0 = never) they purchased fluid milk, milk powder, cheese, yogurt, butter, and ice cream. Respondents were asked if they had increased their consumption of dairy products in the last three years, and if so, which products were applicable. A seven-point scale was used by respondents to determine the perceived influence (7 = strongly influential and 1 = not at all influential) of 16 factors to respondents when purchasing (1) dairy products in general and (2) fluid milk. These factors were related to health/nutrition, convenience, quality, affordability, packaging, and marketing aspects of dairy products. Respondents were then asked to state the most preferred retail format for purchasing dairy products, and to indicate, using a seven-point scale, the influence of 10 different retail format characteristics (e.g., availability of products) play in determining where dairy products were purchased.

To determine respondent's attitudes toward dairy products (in general), respondents indicated how strongly they agreed or disagreed (1 = strongly disagree and 7 = strongly

agree) with 16 statements regarding the quality and acceptability of dairy products. Both positive and negative statements were included in this section to avoid biasing answers. These statements related to health aspects (e.g., good source of protein, good source of vitamins, good source of calcium, dairy is fattening) and sensory and social acceptability aspects. Consumer perceptions of the quality of fresh (fluid) milk relative to powdered milk were then assessed by asking respondents to indicate how strongly they agreed (1 = strongly disagree and 7 = strongly agree) with 20 statements regarding product quality and acceptability. All four quality dimensions discussed by Grunert et al. (2000) were included in these attitudinal questions.

Respondents then indicated their awareness and opinion of the government's school milk programme. The final section assessed socio-demographics of respondents (e.g., age, level of education, income, and household makeup). The questionnaire was pretested with 30 consumers. Respondents involved in the pre-test were asked to provide feedback on the length, content, format, comprehensibility, and accuracy of the survey instrument. After each stage of pretesting, the questionnaire was modified, incorporating the feedback and revising the survey instrument accordingly.

Data Collection

The survey was administered and data was collected in 2010 at various locations in Kota Kinabalu, the capital city of the Sabah state of Malaysia. This city is one of the fastest emerging consumer markets in Malaysia with increasing numbers of modern food retailers, including supermarkets and hypermarkets such as Giant, Parkson, Ngiu Kee, and Survey supermarkets. The population of Kota Kinabalu is very culturally diverse and comprises consumers of various ethnic and religious backgrounds of the Malaysian population. A convenience sample of 435 consumers was obtained using mall intercept recruitment methods and face-to-face interviews. Each respondent was randomly approached by a trained enumerator placed in front of one of 12 shopping centres located in Kota Kinabalu. Respondents who were 18 years and older were asked to fill in the questionnaire by completing an interview with the enumerator. A token of appreciation/gift was provided to each respondent upon completion of the survey. Table 1 provides a summary of the sociodemographic profile of the respondents.

Table 1: Summary Statistics for Demographic Variables

Variable	Description (coding)	%	Mean	Std. Dev.	N
Level of education	0 = Primary school	6.9	NA	NA	435
	1 = Secondary school	58.6			
	2 = Technical institutions, Polytechnic	20.7			
	3 = Bachelor	12.4			
	4 = Master, PhD	1.4			

Table 1 (continued)

Variable	Description (coding)	%	Mean	Std. Dev.	N
Education	0 = if having primary and secondary schools	86	NA	NA	435
	1= if having tertiary education	14			
Age	0 = 18-24 years	43.7	NA	NA	435
	1 = 25-34 years	31.3			
	2 = 35-44 years	12.4			
	3 = 45-54 years	8.7			
	4 = 55-64 years	3.0			
	5 = 65 years and above	0.9			
Income	Monthly household income in Malaysian Ringgit		NA	NA	435
	0 = < MYR 2,079	64.4			
	1 = MYR 2,080-MYR 4,159	26.0			
	2 = MYR 4,160-MYR 6,239	4.8			
	3 = MYR 6,240-MYR 8,319	1.8			
	4 = MYR 8,320-MYR 10,399	2.1			
	5 = MYR 10,400-MYR 15,599	0.9			
Household size	Number of family members including children and elderly (over 60 years old)	NA	4.31	2.79	435
Children	Number of dependent children aged between 0-14 years old*	62	0.88	1.36	435
Wchildren (Children in household)	0= if Yes	62	0.38	0.49	435
	1= if No	38			
Elderly	Number of individuals living in household aged 60 years and above	9.8	0.10	0.31	435
Single	0= if married, divorced/ widowed	46	NA	0.50	435
	1= if single and not married	54			
Gender	0 = if female	65	NA	0.48	435
	1 = if male	34			
Employment	0 = if unemployed, stay at home parent, retired and disabled.	17	NA	0.38	435
	1= if working part time and full time	83			

Table 1 (continued)

Variable	Description (coding)	%	Mean	Std. Dev.	N
Ethnicity	1 = Malay	27.1	NA	2.12	435
	2 = Chinese	12.6			
	3 = Indian	9.0			
	4 = Kadazandusun	28.0			
	5 = Bajau	23.4			
	6 = Murut	1.4			
	7 = Iban	2.0			
	8 = Bidayuh	7.0			
	9 = Others	5.5			

***** Note: The Malaysian government promotes the School Milk Programme (provides free fluid milk to school), which includes children under 14 years old.

Data Analysis and Model Development

Several steps were involved in data analysis and development of empirical models to determine factors influencing dairy consumption behaviour. The Data Analysis and Statistical Software (STATA) package (version 10) was used for all statistical analysis. The first step involved basic statistical analysis and evaluation of consumer responses to the survey questions. The initial analysis revealed that consumer responses to several of the attitudinal statements were highly correlated. Therefore, principal component analysis was used to create various attitudinal variables to be used in models to help explain consumer dairy consumption behaviour.

Principal Component Analysis

The results of the Principal Component Analysis (PCA) are shown in Table 2. Varimax rotation was used to determine the dimensionality of the variables considered. Factors with Eigen Values of above 1.00 were extracted and factors loading above 0.5 were retained. Five factors: *Nutrition, External, Dairy Negative, Milk Negative,* and *Dairy Packaging* had loadings within the acceptable range of higher than 0.50 (0.680–0.867) and were retained. The variables were named based on the statements/items that were used to form the variable. For instance, *Nutrition* factor is based on consumers' indicated level of agreement with statements that dairy products are 'a good source of calcium' and 'a good source of protein'. The *External* factor consists of consumers' responses related to the influence of social status, family or friends, embedded with *Halal* logo. *Milk Negative* is composed of respondents' agreement with three statements related to negative perceptions of fluid milk: hard to digest, watery, and genetically modified. *Dairy Packaging* is a factor representing the relative importance that consumers placed on the type of packaging used for dairy products, the brand of milk, and availability of product information on the label or package.

The Kaiser-Meyer-Olkin Measure of sampling adequacy (KMO-MSA) was used to test the appropriateness of the factor analysis scale. As shown in Table 2, all of the KMO values are between 0.500 and 0.920, which is within the accepted region (KMO greater than or equal to 0.50). A reliability test using the Cronbach Alpha was conducted to purify the measurement scale for each of the constructs used in the study. The alpha coefficients for most of the components were above the conventional cut off point of 0.60 (Boniface et al., 2010).

Table 2: Principal Component Analysis Results

Factors and Item	Factor Loadings
Nutrition Factor :	
KMO = .920,Cronbach's alpha = .917	
Dairy product is healthier for me and my family	0.867
A good source of vitamins	0.861
A good source of protein	0.856
A good source of calcium	0.843
Dairy products provide good nutrients	0.834
Low in cholesterol	0.801
A good source of vitamin D	0.716
Dairy products are necessary in my diet	0.680
External Influencing Factor :	
KMO = .663,Cronbach's alpha = .704	
Family or friends influence	0.820
Social status	0.819
Embedded with *halal* logo	0.745
Dairy Negative Perceptions :	
KMO = .500,Cronbach's alpha = .650	
Not all dairy products good for my health	0.861
Dairy products too fattening	0.861
Milk Negative Perception :	
KMO = .677,Cronbach's alpha = .729	
Hard to digest	0.836
Watery	0.798
Genetically modified	0.786
Dairy Packaging	
KMO = .680,Cronbach's alpha = .740	
Type of packaging (eg : in bottle/boxes)	0.838
Milk brand (eg : Nestle,Dutch Lady)	0.813
Complete label information (e.g.: Expired date, milk nutrition)	0.783
Fluid Milk Expenses*	
Fresh milk is cheaper and less expensive	NA
*is a composite statement representing fluid milk expenses	

Empirical Models

Two logit models were used to 1) determine the factors that help explain consumers who are more likely to have increased their consumption of dairy products over the past three years and 2) to understand the factors influencing the probability a consumer increased consumption of dairy products over the past three years. The traditional logit model as described by Greene (2003) is

(1) Prob(Y) = 1$|X_i$) = [?].
The first model explores the factors that help explain the probability why an individual increased consumption of dairy products over the past three years:

$$(2)\ CONSUP_i = \beta_0 + \beta_1 Education + \beta_2 Age + \beta_3 Wchild + \beta_4 Gender + \beta_5 Chinese + \beta_6 Malay + \beta_7 Income + \beta_8 Elderly + \beta_9 Nutrition + \beta_{10} External + \beta_{11} DairyNegative + \beta_{12} Packaging \quad (1)$$

where the dependent variable *CONSUP* is used to represent consumers who indicated that "yes" they had increased their consumption of dairy products in the last three years. Thus *CONSUP* is equal to 1 if a consumer increased their dairy consumption in the last three years and is equal to 0 otherwise. The subscript *i* is used to represent each individual consumer (*i*=1…435). *Education* is a dummy variable equal to 1 if the respondent acquired higher levels of education (a university degree or at least some postgraduate studies) and equal to 0 if the respondent acquired lower levels of education (e.g. primary, secondary, and polytechnic levels of education). *Age* is a categorical variable representing the age level of the respondent. *Wchild* is a dummy variable indicating the presence of children in the household. *Gender* is a dummy variable indicating the respondent was a female. *Chinese* and *Malay* are ethnicity dummy variables equal to 1 if the respondent was Chinese and Malay, respectively, and equal to 0 if the respondent was any other ethnicity such as Kadazan dusun, Bajau, or Indian. *Elderly* is the number of elderly (age above 60 years) people living in the household. *Nutrition*, *External*, *Dairy Negative*, and *Packaging* are the factors created using Principal Component Analysis (see Table 2).

The second model explores the factors that may explain the probability why an individual consumer increased consumption of milk in the last three years:

$$(3)\ CONSUMILK_i = \beta_0 + \beta_1 Education + \beta_2 Age + \beta_3 Wchild + \beta_4 Gender + \beta_5 Chinese + B_6 Malay + \beta_7 Income + \beta_8 Elderly + \beta_9 Nutrition + \beta_{10} External + B_{11} DairyNegative + \beta_{12} MilkNegative + \beta_{13} FluidMilkExense$$

The dependent variable *CONSUMILK* is equal to 1 if a consumer indicated they increased consumption of fresh milk in the last three years and is equal to 0 otherwise. The demographic variables *Education, Age, Wchild, Gender, Chinese, Malay, Income,* and *Elderly* are as defined in Eq. 2. *Nutrition*, *External*, *Dairy Negative*, and *Milk Negative* are also as explained in the Principal Component Analysis section. We created composite measures by combining two or more related statements (O'Toole & Donaldson, 2000). For instance, one variable such as *Dairy Negative Factor* was derived from two related statements namely "Not all dairy products are good for my health" and "Dairy products too

fattening." Another variable (*Fluid Milk Expense*) was developed from a single statement (Fresh milk is cheaper and less expensive). A single statement can be used as composite measure if the statement is composite in nature and represents the intended variable (Gyau & Spiller, 2007). Summary statistics and further explanations of each of the variables are provided in Tables 1 and 2.

RESULTS AND DISCUSSION

Characteristics of Survey Respondents

In total, 435 respondents fully completed the questionnaire. The sociodemographic profiles of the respondents are summarized in Table 1. Approximately 65% of the sample was female, the average age was between 24 and 34 years and average income was around MYR 2,080 to MYR 4,159 monthly. Only 14% of respondents indicated they had completed a university degree or higher level of education. The average household size was 4.31 family members and 38% of the respondents had children aged 14 or younger living at home.

Preferences of the Dairy Consumers

In this study, we examined consumer purchasing behaviour of six types of dairy products: fresh milk (fluid milk including pasteurised and Ultra-high Temperature (UHT) milk), powdered milk, butter, cheese (any type), yoghurt, and ice cream. Table 3 shows respondents' purchasing frequency for each dairy product. Fluid milk and ice cream are consumed most frequently, with nearly 41% and 34%, respectively, purchasing these products at least weekly. Powdered milk is also purchased regularly (considering the mean consumption frequency); however, the largest share of respondents (22%) purchased powdered milk on a monthly basis. Interestingly, cheese is the least frequently purchased dairy product, with 61% indicating they never purchased cheese.

Table 3: Consumers' Purchasing Patterns for Dairy Products

Dairy Product	5 = Daily (%)	4 = Week (%)	3 = Fort-nightly (%)	2 = Monthly (%)	1 = Less than once month (%)	0 = Never (%)	Mean	Std. Dev.	N
Milk	12.4	28.5	16.6	23.7	6.0	12.9	1.94	1.46	435
Powder Milk	3.9	9.9	12.4	22.3	9.7	41.8	1.12	1.31	435
Cheese	1.1	6.7	6.0	11.7	14.0	60.5	0.68	1.02	435
Butter	1.4	6.9	7.1	18.2	17.2	49.2	0.89	1.08	435
Ice Cream	8.7	25.1	14.9	12.4	10.6	28.3	1.49	1.47	435
Yoghurt	2.5	11.7	10.6	9.4	12.9	52.9	0.89	1.20	435

Table 4 shows the various store characteristics that influence consumers' decision on where to purchase dairy products. Based on the mean values, cleanliness of the store, convenient location, and the availability of higher quality dairy products appear to be the three most important characteristics influencing where consumers purchase their dairy products. The opportunity to socialize was least influential.

Table 4: Factors Influencing Retail Outlet where Dairy Products are Purchased

Varieties	0 = Strongly not influential (%)	1 = Not influential (%)	2 = Somewhat not influential (%)	3 = Neither (%)	4 = Somewhat influential (%)	5 = Influential (%)	6 = Strongly influential (%)	Mean	Std. Dev.
Cleanliness of store	3.9	3.9	3.0	3.0	13.6	27.1	45.5	4.82	1.60
Convenient location	3.9	5.5	2.3	3.2	14.7	32.6	37.7	4.68	1.62
Availability of higher quality products (taste, quality etc)	5.5	4.1	3.0	3.9	13.6	33.1	36.8	4.62	1.68
Store,market variety availability	5.3	6.9	4.6	5.3	18.4	35.2	24.4	4.28	1.72
Knowledgeable staff	7.1	6.4	5.1	8.5	19.3	25.5	28	4.15	1.84
Store, market's reputation	6.4	9.9	5.5	6.4	20.4	27.4	23.9	4.02	1.86
Speed, efficiency of shopping experiences	7.8	9.2	4.6	5.1	20.7	31.3	21.4	4.01	1.87
Social opportunities	10.1	13.3	7.6	14.3	20.2	20.7	13.8	3.38	1.91

Note: N = 435

Consumers were also asked to rate the importance (influence) of 16 different factors when purchasing dairy products. Considering the mean values displayed in Table 5, information displayed on the label, perceived health benefits gained, and *Halal*-certified are the most influential factors. Quality certifications by an international agency and brand are also considered to be "somewhat influential" to respondents when purchasing dairy products.

Table 5: Factors Influencing Consumers' Dairy Product Purchasing Behaviour

Variables	0 = Strongly not influential (%)	1 = Not influential (%)	2 = Somewhat not influential (%)	3 = Neither (%)	4 = Somewhat influential (%)	5 = Influential (%)	6 = Strongly influential (%)	Mean	Std. Dev.
Household necessity	13.8	11.3	6.2	5.7	14.3	23.7	25.1	3.67	2.16
Product price	6.4	13.3	10.8	6.2	21.1	24.1	17.9	3.66	1.89
Milk brand	6.9	9.0	4.8	5.3	14.9	37.0	22.1	4.12	1.84
Packaging	5.3	11.7	7.4	8.5	21.4	29.0	16.8	3.93	1.79
Health benefits	5.7	5.3	4.4	4.4	16.1	29.2	34.9	4.47	1.76
Locally produced	7.8	9.4	7.1	7.4	21.4	26.4	20.5	3.86	1.88
Imported	9.2	15.2	8.7	10.6	20.5	24.8	11.0	3.37	1.90
Complete label information	4.8	6.0	4.4	4.4	8.7	26.4	45.3	4.67	1.78
Milk location	6.4	12.0	5.5	8.7	17.2	24.8	25.3	3.94	1.92
Affordable	6.2	8.5	8.3	6.9	24.6	24.4	21.1	3.93	1.80
Frequently advertised	8.0	13.1	6.4	10.8	21.6	21.1	18.9	3.64	1.92
Company marketing package	9.0	12.0	4.8	10.8	22.8	26.9	13.1	3.58	1.88
Quality verified by international agency	5.8	7.1	6.5	6.9	20.0	23.7	30.0	4.19	1.82
Family or friends influence	7.1	12.9	7.1	11.7	23.0	23.9	14.3	3.59	1.83
Social status	10.3	16.6	8.3	12.4	22.5	19.5	10.3	3.20	1.89
Embedded with halal logo	9.9	6.9	3.2	5.5	8.0	16.6	49.9	4.44	2.09

Note: N = 435

Respondents also indicated how strongly they agreed or disagreed with several statements revealing their perceptions of fluid milk. Considering the mean level of agreement for each statement (Table 6), it appears that consumers generally agreed that fluid milk is easy to purchase, durable, a good source of protein, calcium, and vitamins, and is healthy.

Table 6: Consumers' Perceptions of Fluid Milk

Fresh milk is…	0 = Strongly disagree(%)	1 = Disagree (%)	2 = Somewhat disagree (%)	3 = Neither (%)	4 = Somewhat agree (%)	5 = Agree (%)	6 = Strongly agree (%)	Mean	Std. Dev.
More environmentally friendly	3.0	10.3	4.8	13.8	21.8	32.9	13.3	3.93	1.61
Necessary in my diet	2.1	10.1	5.7	14.0	23.7	33.3	11.0	3.91	1.54
Cheaper, less expensive	4.4	9.4	8.7	12.9	21.8	31.0	11.7	3.78	1.66
Feels good in the mouth	4.1	13.6	9.9	16.1	19.1	27.6	9.7	3.54	1.7
A good source of vitamins	2.1	4.1	4.1	9.7	16.1	43.2	20.7	4.46	1.42
Hard to digest	8.3	15.9	7.8	18.4	18.2	23.0	8.5	3.25	1.8
Convenient to drink	1.8	7.4	4.4	8.7	14.3	45.3	18.2	4.35	1.51
Genetically modified	3.0	7.8	5.3	15.6	20.2	37.5	10.6	3.97	1.53
Easily purchased from the shop	2.1	2.5	3.7	4.8	10.8	51.2	24.9	4.73	1.32
Watery	10.3	23.4	6.9	14.9	19.1	19.1	6.2	2.91	1.86
Low in cholesterol	3.2	6.9	4.8	14.0	19.3	38.2	13.6	4.08	1.55
Higher quality	3.9	7.4	6.7	12.0	24.1	32.0	14.0	3.97	1.6
Fresher	3.9	12.2	7.1	14.9	16.6	33.8	11.5	3.75	1.7
Tastes better	3.2	10.3	6.4	13.6	19.5	34.5	12.4	3.89	1.63
Healthy for me and my family	2.1	2.3	6.4	12.6	22.3	37.2	17.0	4.31	1.37
Packaged better	1.4	5.3	5.3	12.2	18.6	41.4	15.9	4.53	1.25
Creamy	1.4	5.3	5.3	12.2	18.6	41.4	15.9	4.29	1.41
A good source of calcium	1.1	2.1	3.7	7.4	13.6	50.6	21.4	4.68	1.22
Durable and long-lasting	1.8	2.5	3.4	7.1	11.7	44.4	29.0	4.73	1.34
A good source of protein	1.8	1.8	3.7	6.2	13.6	49.2	23.7	4.7	1.27

Note: N = 435

To understand how consumption of dairy products is changing in Malaysia, consumers were asked if they had increased their consumption of dairy products in the past three years. If consumers indicated they had increased their consumption, then they were asked to indicate which products they were consuming more over time. Interestingly, 72% of the respondents indicated "yes" they had increased their consumption of dairy in the last three years. This is not surprising considering the projections discussed in the literature earlier (Prescott et al., 2002; Warr et al., 2008). The percentage of respondents indicating they had increased consumption of each of the six dairy products is displayed in Fig. 1. More than half (57%) of consumers indicated they increased their consumption of fluid milk, roughly one-third (38%) increased consumption of powdered milk (21%), 27% increased consumption of ice cream, and approximately 20% increased consumption of yoghurt, butter, and cheese.

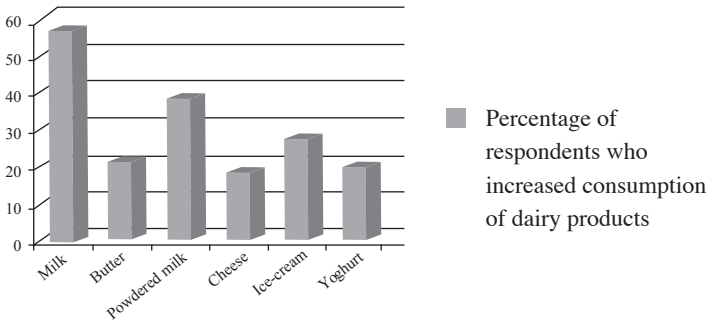

Figure 1: Share of Consumers who Increased Consumption of Dairy Products Over the Last Three Years

Empirical Analysis

The logit model results are shown in Tables 7 and 8. Both models were significant at α = 0.01 and with the Chi Square values equal to 45.76 and 47.21, respectively.

Factors Influencing Increased Consumption of Dairy Products

The results of the logit estimation of Equation 2 are presented in Table 7, including estimated coefficients and marginal effects. In total, only four of the independent variables were significant in predicting consumers who were more likely to have increased their consumption of dairy products in the past three years. Two demographic variables, *Age, Malay,* and two factors, *Nutrition,* and *External*, were significant and positive. As *Age* increased by one category, the probability of the consumer increasing their consumption of dairy products in the last three years increased by 7%. Thus, older consumers in this study tended to be more likely than young consumers to have increased their consumption of dairy products. This outcome is consistent with previous dairy consumption behaviour research by Bus and Worsley (2003), Jensen et al. (1992), and Robb et al. (2007).

With respect to ethnicity, *Malay* was significant at the α = 0.05 level and based on the marginal effects, consumers who were Malay in ethnicity were 11% more likely to have increased their consumption of dairy products in the last three years than consumers from other ethnic backgrounds. The result suggests that Malays, the largest ethnic category in Malaysia, are changing their lifestyles toward healthy and nutritional food. This finding is supported by Quah and Tan (2010) who found that Malay and Chinese were highly concerned with the healthiness and nutrition of their food.

Table 7: Estimated Coefficients and Marginal Effects for Equation Estimating the Probability Consumers Increased Their Consumption of Dairy Products

Variable	Coefficient	Std Error	Marginal Effects	Std Error	z	P>z
Highedu	-0.46	0.32	-0.09	0.07	-1.35	0.18
Age	0.36	0.12	0.07	0.02	3.03***	0.00
Wchild	0.23	0.26	0.04	0.05	0.91	0.36
Female	0.14	0.24	0.03	0.05	0.57	0.57
Chinese	-0.36	0.33	-0.07	0.07	-1.03	0.30
Malay	0.63	0.28	0.11	0.05	2.43**	0.02
Income	0.18	0.13	0.03	0.02	1.38	0.17
Elderly	0.15	0.15	0.03	0.03	1.03	0.30
Nutrition	0.22	0.12	0.04	0.02	1.82*	0.07
External factor	0.26	0.14	0.05	0.03	1.88*	0.06
Dairynegative	-0.04	0.12	-0.01	0.02	-0.34	0.73
Packaging	-0.14	0.14	-0.03	0.03	-1.04	0.30
Constant	0.22	0.27				
Number of obs =	435					
LR chi2(12) =	45.76					
Prob > chi2 =	0.00					
Pseudo R2 =	0.09					
Log likelihood =	-233.33					

Notes: *** significant at 0.01, ** significant at 0.05, * significant at 0.10

The variables *Nutrition* and *External* were both significant at $\alpha = 0.10$ level and carry the expected positive sign. The *Nutrition* factor is composed of respondents' level of agreement with statements such as 'dairy products are a good source of nutrients' and 'a good source of protein.' Considering the marginal effect, consumers who perceive dairy products to be a good source of nutrients are 4% more likely to have increased their consumption of dairy in the last three years. This finding suggests that Malaysian consumers are well aware of the health benefits and nutrition gained by consuming dairy products and this awareness is positively impacting their consumption of dairy. This finding is positive considering that several researchers emphasize the vital roles of dairy products in sustaining health and reducing the risk of critical health problems such as breast cancer and osteoporosis (Heaney, 2000; McGill et al., 2008; Wang et al., 2008).

The factor *External* was derived from statements related to the influence of family or friends, social status, and with *halal* logo embedded on dairy consumption. Based on the marginal effect, consumers who believe that their decision to consume dairy products is influenced by these external factors are 5% more likely to have increased dairy product consumption in the last three years. Other studies also found that Malaysian consumers' food consumption decisions are very much influenced by their peers and family (Kamaruddin & Mokhlis, 2003; Quah & Tan, 2011). Furthermore, Quah and Tan (2011) explain that some consumers tend to buy organic food for their sick family member or friends. The outcome further indicates that family and friends play a significant role in influencing dairy consumption.

Factors Influencing Increased Consumption of Fluid Milk

An additional objective of the research was to understand consumer perceptions of buying fresh milk. It is important to note that in Malaysia, "fresh milk" is used to describe fluid milk that can either be pasteurized or UHT (long-life) milk. Often it is not clear to consumers whether the milk is UHT or pasteurized, yet the shelf-life for UHT milk is relatively long compared to pasteurized milk. Focus groups and pretesting of the questionnaire revealed consumers were generally unaware of the differences and therefore the term fluid milk is used. Equation 3 was estimated using a logit model to investigate the factors that help explain the probability that a consumer increased their consumption of fluid milk in the past three years.

The results of the logit estimation are shown in Table 8. Interestingly, the same independent variables that were significant in explaining the probability consumers increased their consumption of dairy were also significant in this estimation. However, in all cases, the marginal effects are larger. As age increases by one category, the probability a consumer increased consumption of milk increases by 9%. Consumers who are Malay in ethnicity are 13% more likely to have increased their consumption of fluid milk in the past three years.

Table 8: Estimated Coefficients and Marginal Effects for Equation Estimating the Probability Consumers Increased Their Consumption of Fluid Milk

Variable	Coefficient	Std Error	Marginal Effects	Std Error	z	P>z
Highedu	-0.19	0.31	-0.5	0.08	-0.62	0.53
Age	0.35	0.10	0.09	0.02	3.45***	0.00
Wchild	0.23	0.23	0.06	0.05	1.04	0.30
Female	-0.01	0.22	0.00	0.05	-0.06	0.95
Chinese	-0.26	0.33	-0.06	0.08	-0.77	0.44
Malay	0.56	0.25	0.13	0.06	2.36**	0.02
Income	0.04	0.11	0.01	0.03	0.33	0.74
Elderly	0.08	0.13	0.02	0.03	0.65	0.52
Nutrition	0.24	0.12	0.06	0.03	1.98**	0.05
External factor	0.24	0.11	0.06	0.03	2.13**	0.03
Dairynegative	0.38	0.40	0.09	0.10	0.95	0.34
Negativemilk	-0.59	0.41	-0.14	0.10	-1.43	0.15
Fluidmilkexpense	0.10	0.08	0.02	0.02	1.32	0.19
Constant	-0.69	0.41				

Number of obs	=	435
LR chi2(12)	=	47.21
Prob > chi2	=	0.00
Pseudo R2	=	0.08
Log likelihood	=	-273.62

Notes : *** significant at 0.01, ** significant at 0.05, * significant at 0.10

The significance of the *Nutrition* and *External* variables indicate that consumers who believe fluid milk is a good source of nutrition and who are more influenced by external factors such as family and friends are 6% and 9% more likely to have increased their consumption of fluid in the last three years. The results indicate that both *Nutrition* and *External* factors play an important role in influencing consumers' decision to buy dairy products, particularly fluid milk. The outcomes also indicate that Malaysian consumers are very well aware of the fluid milk nutrition and health benefits.

CONCLUSION AND IMPLICATIONS

The objectives of the study were (1) to explore Malaysian consumer's purchasing patterns, perceptions of, and preferences for various types of dairy products; (2) to determine the relative importance of various product attributes and information to Malaysian consumers when purchasing dairy products; (3) to investigate factors influencing Malaysian consumers' increasing demand for dairy products and fluid milk. The results support the findings of researchers that suggest demand for dairy products will continue to increase and supersede domestic milk supplies. Fluid milk, ice cream, and powdered milk are consumed most frequently by respondents. The largest share of respondents indicated they had increased their consumption of fluid milk (32%) and powdered milk (21%) in the last three years, but only 10% of consumers indicated increasing their consumption of cheese. Modern retail outlets such as supermarkets were the main destination to buy dairy products influenced by the cleanliness, convenient location, and availability of higher quality products. Reardon et al. (2003) argue that the rise of supermarkets especially in Asia will be a great challenge and an opportunity for local farmers and fresh food suppliers to be part of the "supermarket-oriented" supply chain. The outcomes of this study give some insight into the possibility for local producers to be integrated with the modern retailers.

There are several implications of this study. Modern retailers such as supermarkets may have an advantage in promoting dairy products compared to a traditional retailer. Particularly, given that they have the advantages of cold storage facilities to store fresh milk. Processors and producers, for example, Sabah producers who are currently producing high milk yields, may consider developing collaborative partnerships with modern retailers, particularly those who want to sell local and fresh milk. To promote their products, milk processors should consider marketing strategies that involve influential factors such as the nutritional quality of the dairy products. They may also try to increase the social status of dairy product consumption using key influencers such as family and friends.

As for the policy implications, considering the influence of external factors, it seems that the government health educational programmes such as school milk programme should be continued, which in turn are likely to help increase the development of the dairy industry. Considering that consumers generally prefer purchasing dairy products at modern retailers, the government should consider ways to facilitate the supply-chain coordination between retailers and domestic dairy processers to help grow the domestic industry.

The limitations of this research should be considered when interpreting the results and developing further research on understanding Malaysian consumers' perceptions and consumption of dairy products. The first limitation is that this study was done only in the urban city of Kota Kinabalu, Sabah. Expanding the study to include other cities and rural areas may present a more representative overview of the factors influencing change in Malaysian consumers' consumption of dairy products. Furthermore, fluid milk supplies in the supermarket consist of both pasteurized milk and UHT milk. Research on consumers' perceptions of different types of fluid milk, as well as the importance of shelf life, may give some new insight that will aid in domestic dairy industry development and motivate innovation in the Malaysian dairy industry.

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