Consumer Preferences and Willingness-to-Pay for IMMUNEPLUS Dairy Products in Canada

By

Ifeoluwa Fasakin

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ABSTRACT

CONSUMERS' PREFERENCES AND WILLINGNESS TO PAY FOR IMMUNEPLUS

DAIRY PRODUCTS IN CANADA

Ifeoluwa Fasakin   Advisor:

University of Guelph, 2021   Michael Von Massow

Given the role of diet in disease prevention, the dairy industry recently developed

IMMUNEPLUS dairy products, which may potentially provide the human body with a higher

level of immunity against diseases. However, due to fluctuating consumer preferences, it remains

unknown whether there is a market for these products. This study used discrete choice

experiment to examine consumer preferences, willingness-to-pay for, and the most preferred

forms (pills and yogurt) of IMMUNEPLUS dairy products in Canada. The data was collected

through an online stated preference survey and analyzed using conditional logit model. The

findings revealed that there is a general consumer interest in IMMUNEPLUS dairy products, and

consumers are willing to pay for them. The preferred form depended on consumer's preference

for either nutraceuticals or functional foods. The findings are useful in assisting dairy companies

in taking informed decisions pertaining to the marketing strategies of IMMUNEPLUS dairy

product.

ACKNOWLEDGEMENTS

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Chapter 1: Introduction

The role of diet in disease control and prevention cannot be overemphasized, as more consumers have continued to identify the relationship between diet and health. Milk and dairy products are excellent sources of vital nutrients that are essential for physiological functions (Khan et al., 2019). However, consumers have received a wide variety of both positive and negative information regarding the health effect associated with the consumption of dairy products, and it was predicted that the future demand will continuously be affected by health concerns (Cash et al., 2005).

As presented in Figure 1.1, there has been a decline in the demand for dairy products in overtime (Government of Canada, 2017b). The percentage of Canadians consuming plain milk declined from 70.2% to 56.1% (Islam et al., 2021); this is as a result of changing consumer preferences, which can be linked to conflicting medical findings. For instance, Guasch-Ferré et al., (2017) finds that dairy products increase the risk of type II diabetes, while Thorning et al., (2016) finds that milk protects the body against chronic diseases.

Figure 1.1: Per capita Milk Available for Consumption, Canada, 1960 to 1960

litres per person per year

Note: Does not adjust for losses (e.g. waste or spoilage) in stores, households, private institutions or restaurants, or losses during preparation.
Source: Statistics Canada, Food available in Canada, annual, CANSIM table 002-0011.
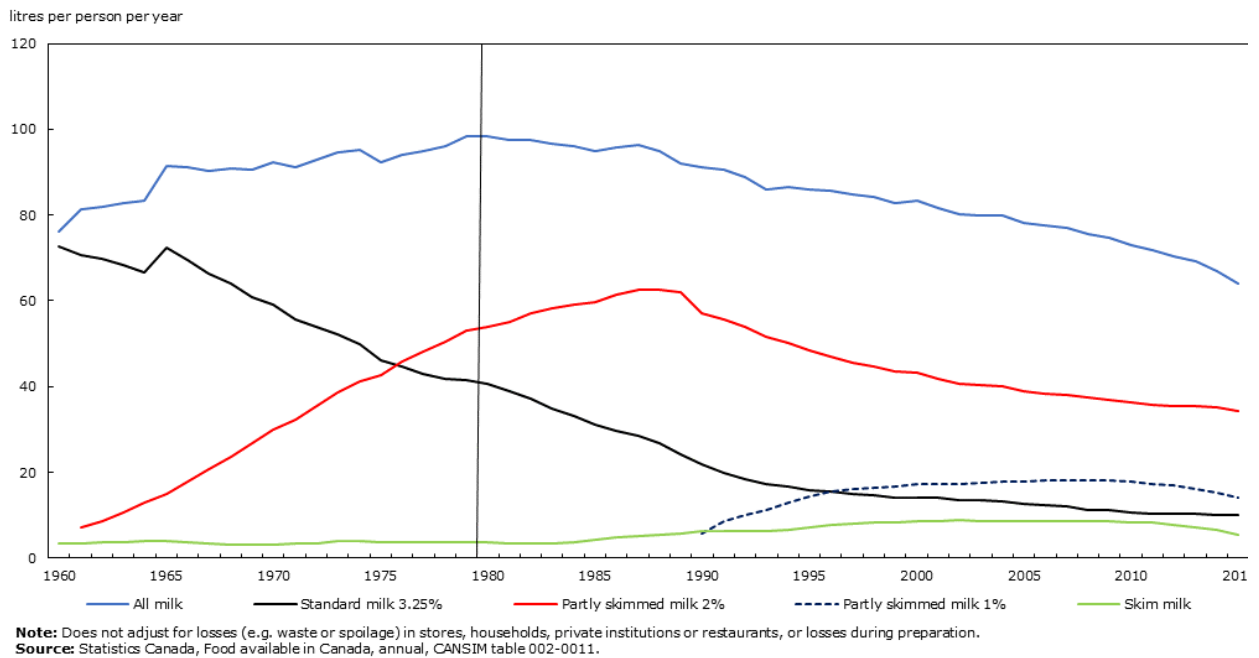
Source: (Government of Canada, 2017b)

In order to make dairy products more appealing to consumers, the dairy industry continues to find more creative techniques of enhancing their products with ingredients that are beneficial to the human health. SEMEX (a Canadian company owned by WestGen, EastGen and CIAQ), recently developed a functional dairy ingredient from high immune responding dairy animals, which is referred to as the IMMUNEPLUS colostrum/early milk. The early lactation milk also contains high levels of immunoglobin and are rich in vital nutrients.

Colostrum is the first milk newborns receive after birth, which contains biologically active compounds that are rich in vital nutrients, essential for the development and growth of the newborn (Hammon et al., 2013; Lima et al., 2017). Generally, colostrum has the potential of providing the human body with essential nutrients that may prevent diseases, however, IMMUNEPLUS dairy products have a higher potential of providing the body with these

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nutrients. They can also be infused into other food products or consumed in the form of medicine.

It remains unknown whether there is a market for IMMUNEPLUS dairy products. Given the current environment (global pandemic), this study aims to find out if consumers are generally interested in boosting their immune system through IMMUNEPLUS dairy products, the form they prefer, and how much they will be willing to pay. This research will enable SEMEX and other companies to determine the consumer demand for their new immune boosting products, which are not yet on the market. For goods that are not yet on the market, researchers often use hypothetical choice experiments to find how consumers respond to the different attributes of such products (Lusk & Hudson, 2004). Price is also incorporated as an attribute, in order to estimate how much consumers will be willing to pay.

The dairy industry is the largest functional food market, which accounts for about 33% of the general market (Raeisi et al., 2013). Functional foods are foods that have been fortified with ingredients capable of providing health benefits beyond the basic nutritional functions((Alongi & Anese, 2021; Martirosyan & Singh, 2015). There is an increased interest towards functional foods (Alongi & Anese, 2021), and the market is gradually growing in Canada. Literatures suggest that the perception of disease threat, diet, age and the functional ingredient carrier, play a key role in consumer acceptance of functional foods (Bimbo et al., 2017; Herath et al., 2008; Siegrist et al., 2015). Studies also find that consumers are more receptive to functional foods that the forms are perceived to be healthy (Herath et al., 2008; Siegrist et al., 2008). For instance, yogurt may be perceived to be healthier, if compared to ice-cream.

In the Canadian context, there are limited studies that address consumer preferences for dairy functional foods that are not yet on the market. However, some previous studies show that

heterogeneity may exist in consumer preferences. For example, Siegrist et al. (2008) examine factors that influence willingness to buy functional foods in Switzerland. Herath et al. (2008) also examine consumer segments related to consumption of functional food and nutraceutical products in Canada using a cluster analysis. Results of the above studies show that older consumers are more likely to buy functional foods with physiological health benefits.

Bimbo et al. (2017) in a study on consumer acceptance and preferences for nutritional-modified and functional dairy products finds that the acceptance of dairy products increase among consumers with health-related knowledge and age. In contrast, Peng et al., (2020) examine consumer attitudes and acceptance of dairy products enriched with Conjugated linoleic acid. The study finds that consumer target segment for the product are health-conscious, middle-aged consumers. This gives an indication that there is a difference between how consumers may perceive different functional foods, especially, dairy products. Therefore, conclusions cannot be made based on past studies regarding consumer preferences for IMMUNEPLUS dairy products. Also, to the best of our knowledge, there is no study yet that has analyzed how consumers may perceive IMMUNEPLUS dairy products.

This study, therefore, addresses the gap in the literature by using a stated preference survey to understand how consumers may react to dairy functional foods that are not yet on the market. To be specific, the study seeks to evaluate consumer preferences, willingness-to-pay for, and the most preferred form of IMMUNEPLUS dairy products in Canada. In order to achieve this, a discrete choice experiment is used to understand the trade-offs between the different attributes of IMMUNEPLUS dairy products; these attributes include prices and other inherent product attributes. The choice experiment was administered in the Winter of 2020, online, along with other questions about perceptions, attitudes, knowledge, consumption, and demographics.

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We analyze using conditional logit and multinomial logit models, and willingness-to-pay is also estimated.

From this study, the economic knowledge about IMMUNEPLUS dairy products will be generated. This knowledge will include Canadians' willingness-to-pay for, their preferences for IMMUNEPLUS dairy products, as well as their most preferred form of the products. Also, the segment of consumers who are more interested in the products will be revealed. Analysis from this study will be useful for SEMEX or other dairy companies to take informed decisions pertaining to the marketing strategies for IMMUNEPLUS dairy products. It will also contribute to the limited literature on functional foods that are not yet on the market, especially in Canada, which is a growing area of interest.

There are six chapters in this thesis. The next chapter consists of a review of past studies that are relevant to consumer preferences for IMMUNEPLUS dairy products in Canada. Chapter 3 outlines choice theory and theoretical foundations useful for understanding the empirical framework of this study. Chapter 4 describes in detail the methods used in the collection of data, while Chapter 5 describes the empirical framework used in the estimation. In Chapter six, the results from the analysis are presented and discussed. The last chapter provides a summary of results and the implications for companies thinking of introducing this sort of product. The limitations and future research are also outlined.

Chapter 2: Literature Review

This section identifies the gaps that exist in understanding consumer preferences and willingness-to-pay for IMMUNEPLUS dairy products in Canada. The chapter begins by exploring the trend in milk consumption in Canada. The role of dairy in immune health is also discussed. Extensively, the methods and findings that are useful to the current study are fully explained.

2.1   Canada Milk Consumption per capita (2004 – 2018)

Milk and dairy consumption have been linked to controversies overtime. Consumers have received a wide variety of both positive and negative information about the health effect of consuming dairy products, and it was predicted that future demand for dairy products will continuously be affected by health concerns (Cash et al., 2005). Guasch-Ferré et al., (2017) finds that dairy products increase the risk of type II diabetes, while Thorning et al. (2016) finds that milk protects the body against chronic diseases.

In recent years, the consumption of milk has gradually reduced in Canada. Between 2004 and 2015, the percentage of Canadians consuming plain milk declined from 70.2% to 56.1% (Islam et al., 2021). In 2007, the Canadian food guide laid emphasis on low-fat milk alternatives, with fortified soy beverages as the recommended alternative to milk. While the market for fluid milk decreased after 2009, the demand for milk substitutes increased alternatively (Government of Canada, 2017). However, the food guide was modified in 2019, in which both dairy milk and plant-based alternatives were recommended as protein sources (Haas et al., 2019). Islam et al., (2021) suggest that the decline in the dairy milk consumption may be as a result of the transition from dairy milk to plant-based milk beverages.

2.2 Bovine colostrum and IMMUNEPLUS colostrum

Bovine colostrum (BC), is the milk secreted by a mammal between the first three to five days of lactation; It contains essential nutrients that are needed to strengthen the immune system, maintain tissue regeneration and develop the gastrointestinal system of a calf (Dzik et al., 2017), all of which differentiates it from the mature milk. BC is made up of many immunological agents that play a huge immunity role in newborns, by protecting them against infections (Nikolic et al., 2017). It is also rich in solids, immuglobulins, fats, protein, and other nutritional compounds, that are beneficial in developing health products for humans (Marnila & Korhonen, 2011).

IMMUNEPLUS dairy colostrum is secreted by high immune responding dairy animals that have been tested at the University of Guelph, for both antibody and cell mediated immune responsiveness. Over time, the colostrum and early milk of these dairy animals have been found to possess beyond the basic amount of antibodies possessed by the conventional colostrum of non-IMMUNEPLUS dairy cows (Larmer & Mallard, 2017).

Although studies are still ongoing on the benefits of BC to humans, it is effective in treating the side effects of chemotherapy and antibiotic (Bagwe-Parab et al., 2020). Colostrum-based products have been found to improve health and maintain body weight (Dzik et al., 2017). Studies also show that colostrum has been utilized in the feeding of adults and infants for preventives purposes. Bagwe et al., (2015) emphasize that BC contains a larger amount of fatty acids, when compared to mature milk, which plays a huge role in preventing diseases such as cancer and immune related diseases (Conte & Scarantino, 2013). Owing to the value of colostrum in human health, colostrum has been used over the years in the enhancement and fortification of food products and pharmaceuticals (Silva et al., 2019). On the market today, there are colostrum based dietary supplements, gummies, and drinks (Marnila and Korhonen, 2011).

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2.3 Approaches to assessing Consumer Preferences

The methods and types of data that are used in the area of food economics to measure consumer preferences are discussed. Two types of data; stated preference and revealed preference data are reviewed below.

2.3.1 Revealed versus Stated Preferences

Revealed preference (RP) data are collected based on the actual choices made by consumers (Hensher et al., 2005), which implies that it is a representation of an event that has been observed to have occurred. Scanner or purchase data are the two types of data that are often used in studies that adopt the RP data type.

On the other hand, stated preference data (SP) is frequently collected through surveys and choice experiments (Hensher et al., 2005). In this type of data, survey respondents make choices based on a hypothetical situation. The data type allows researchers to examine consumer preferences for goods that may not be on the market yet, and also compare the different attribute levels of such goods.

In RP data, participants make purchase decision based on real-life situations, where budget constraint is considered. However, one major limitation of SP data is that choices are not made in a real-life situation, so it is subject to the potential for hypothetical bias. As a result, it is unavoidable that some respondents may exaggerate the amount they would normally pay for a certain type of good. However, Lusk (2003) finds that cheap talk reduces hypothetical bias. Researchers often present a "cheap talk" script that describes a scenario and reminds survey participants to make choices like they would in a real-life situation, putting into consideration their budget constraint and how much they would normally pay for such a product. While SP

data allow analysts to examine products that are not yet on the market, RP data do not, which is a major limitation. The RP data may also be more difficult to collect, as it is more expensive and time consuming.

2.3.2 Conjoint Analysis

In order for analysts to understand consumer purchase decisions, conjoint analysis (CA) has been used to rank or rate the attractiveness and importance of different attributes that are attached to a particular product. This method describes alternative products prepared from fractional factorial design, which is useful in evaluating the trade-offs consumers make among competing products (Green et al., 2001).

In recent years, conjoint analysis has been employed in several studies to investigate preferences for functional food. Ares & Gámbaro (2007) used conjoint analysis to investigate the influence of gender, age and motives underlying food choices on perceived healthiness and willingness to try functional foods. Findings reveal that functional foods may not be accepted by all but may be tailored to a particular segment.

In a study that evaluated consumer perception of functional foods by exploring conjoint analysis with probiotics, it was revealed that the base product was the attribute consumers considered to be most important to them while making a decision to choose probiotics. (Annunziata & Vecchio, 2013).

Conjoint analysis was also used in a study that examined Spanish consumer preferences for functional and organic eggs. Findings revealed price to be the most important attribute in determining consumer choice. Preference heterogeneity also existed, as some groups were found to be willing to pay a premium for alternative methods of egg production (Mesías et al., 2011).

In Hailu et al. (2009) study that examined consumer preferences for attributes of nutraceuticals and functional foods in Canada. The authors also used probiotics as the functional ingredients of interest in the study. Findings from the study indicate that the sources of health claims (e.g., either by the product manufacturer or government) and type of product used to deliver the functional benefit (ice cream, yoghurt, pill) play a major role in the consumers' preferences and strong premiums are placed on claims verified by the government. However, a major limitation of conjoint analysis identified is that respondents have to rank alternatives significant, which may place a significant level of cognitive burden on respondents.

2.3.3 Contingent Valuation Method

Contingent valuation method (CVM) is a stated preference method, that uses a survey-based approach, too, in understanding how non-market goods are valuated (Boyle, 2017). The method is considered as flexible; it uses either a single binary choice approach or an open ended question approach, and has the capacity of estimating overall values (Carson et al., 2001).

Overtime, it has also been used to determine the WTP for different functional food attributes (Markosyan et al., 2009; Maynard & Franklin, 2003). In a study conducted in the United States, contingent valuation method was used to estimate consumers' willingness-to-pay for antioxidant-enriched apples. The study adopts a dichotomous choice CVM with follow-up approach (a take-it-or-leave-it with follow-up). Findings reveal that although little, consumers are willing to pay a premium for antioxidant-enriched apples (Markosyan et al., 2009).

In another study that estimated the willingness-to-pay for more value-added pomegranate juice, contingent valuation was explored. It was revealed that contingent valuation method was useful in estimating willingness-to-pay. Findings from the study indicated that consumers were

interested in buying non-traditional value-added juice and majority were willing to pay a premium for pomegranate juice (Romano et al., 2016).

Maynard & Franklin (2003) also used CVM to determine the willingness of consumer to pay premiums for high-CLA dairy products (cancer-fighting dairy products). Findings from the research show that health-conscious consumers and individuals with children are the group of people most willing to pay premiums for high-CLA dairy products. Although research on CVM is still on going, the method may be subject to some hypothetical bias, due to the inability of survey participants to make real cash payment (Hausman, 2012). However, it provides a good starting point for estimating willingness-to-pay (Haab et al., 2013).

2.3.4 Discrete Choice Experiments

Discrete choice experiments (DCE) can be used to evaluate consumer preferences for goods that are not yet on the market, or goods that allow respondents to select one alternative from a set of mutually exclusive alternatives (Hensher et al., 2005). Consumers choose between two or more alternatives in DCEs, which portrays a better image of a real life purchase scenario, which is an advantage the method has over other methods (Carlsson et al., 2007). They are based on theories that assume that attributes describe alternatives, individual's valuate a product based on the attributes, and choices are based on a latent utility function Researchers find DCE very useful in estimating the value of attributes attached to a product (Soekhai et al., 2019).

In recent years, several studies have been conducted by using choice experiments to examine consumers' preferences for functional food. Some of which include Thilmany et al., (2008) study, which used choice experiment to examine consumers' preferences for red leaf lettuce attribute bundles. Findings show that consumers differentiate between labeling claims and attribute bundling effects are present.

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Also, Barreiro-Hurlé et al., (2008) explored choice experiment method in investigating the market for functional wines in Spain, a study that investigated whether the impact of functional attribute has an impact on the probability of a consumer selecting red wine. Results suggest that functional attributes of wine positively increase the likelihood of a consumer selecting a red wine. Wolf et al., (2011) in a study to determine U.S. consumer demand for milk production attributes. Choice experiment was used to examine various fluid milk attributes value. Findings show that consumers are willing to pay substantial premiums for milk produced without the use of bovine growth hormone.

2.4 Previously conducted studies on Functional Foods and Nutraceuticals

Hasler (2002) defines functional foods as enriched, fortified, or enhanced food capable of providing quality health benefits beyond the basic nutrients, while Nutraceuticals are substances that are different from food but provide health or medical benefits (Pszczola, 1992).

The use of nutraceuticals has increased over the years, but studies addressing consumer preferences for them remain limited. Nevertheless, (Teoh et al., 2021) used conditional logit to evaluate consumer preferences for nutraceuticals, with data that was obtained at a local community pharmacy in Malaysia. Results obtained show that consumers choose nutraceuticals based on clinical proofs; consumers are less likely to take nutraceuticals that do not have proven clinical evidence. Herath et al., (2008) in a study that investigates the segments that consume functional foods and nutraceuticals in Canada, links receptivity towards functional foods and nutraceuticals to perceptions of disease threat and age. However, findings also reveal another segment with low receptivity towards functional and nutraceuticals but validate the relationship between health and diet.

Over the years, many studies have been carried out in food economics to examine functional food acceptability. Labrecque et al., (2006) compare the acceptance of functional foods among the following consumers: French Canadian, American, and French consumers. Findings from the study reveals that there are little differences among the consumers' attitude (French Canadian, American, and French consumers) towards functional foods. The authors further explain that various factors positively influence consumers' attitudes, among which are high knowledge, product-related and health-related benefits, as well as the credibility of the information.

Peng et al., (2020) also examine the acceptance of conjugated linoleic acid (CLA)-enriched dairy products among consumers in Canada, using an ordered probit estimation. Study outcome revealed that gender and education of consumers do not influence acceptance of such functional food products. The authors further reveal that consumers with teenagers in the household and middle-aged consumers are more likely to purchase conjugated linoleic acid-enriched dairy products.

In a study that investigates the potential marketing strategies for biotechnology soybeans with functional health attributes in the united states, with a sample size of sixty households, findings show that biotechnology functional foods are generally acceptable to the participants. Although some segments considered soy taste as inferior, there is a value for its functional health attributes (Chema et al., 2006).

Another similar study was conducted by Ares & Gámbaro (2007) to examine the effect of different enrichments and carriers on perceived healthiness and consumers' willingness to consume functional foods. The findings reveal that a significant difference exists between consumers' willingness to take functional product, perception of healthiness and carrier products.

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The authors further stated that consumers' acceptance of functional foods depends on the product enrichment and carrier as some consumers may accept some functional foods while some may not. Siegrist et al., (2008) also investigate consumers' willingness to purchase functional food in China and Germany. Findings reveal that consumers with higher health motivation and trust in the food industry in both countries are more interested in functional foods.

2.5   Consumers' Willingness-To-Pay (WTP) Estimates

Consumers are more inclined to pay more when there are proven health claims. Using a discrete choice experiment, Teoh et al., (2021) finds evidences that consumers are willing to pay a premium of $252 for nutraceuticals proven to have no side effects and $198 more for nutraceuticals with side effects but with proven effectiveness. In a Conjoint analysis, Consumers have placed more premium on both functional foods and nutraceuticals with claims that are government verified (Hailu et al., 2009).

Siegrist et al., (2008) also investigate consumers' willingness to purchase functional food in China and Germany. Findings reveal that consumers with higher health motivation and trust in the food industry in both countries were willing to buy and consumer functional foods compared to participant with lower health motivation and less trust in the health industry. In Chema et al., (2006) study, the marketing strategies of biotechnology soybeans with functional health was investigated, and similar results were found. Consumers who already purchase soymilk associated it with better health, variety, and happiness, therefore were more willing to purchase the functional soy attributes.

In a study that used sensory evaluation, feasibility analysis and willingness-to-pay survey to examine commercial potential of "cancer-fighting" dairy products, findings suggest that

individuals that are health-conscious and households with children are willing to pay a premium for "cancer-fighting" dairy products (Maynard & Franklin, 2003). The study also suggests that producers who have small-scale ventures with niche market have the potential to make profit. Although there seems to be limited literature on the premiums associated with nutraceuticals and functional foods, it is true that consumers place a value on health claims.

In a study carried out in Italy, choice experiment was used to investigate consumer willingness to pay for food safety, specifically, mycotoxins in milk. Findings obtained reveal that consumers are willing to pay a 29% average premium for a reduction in milk mycotoxins. Furthermore, it finds that the premium is higher for the older age group, students that have completed tertiary education, who shop frequently and are financially stable (Sckokai et al., 2014).

2.6 Identified Gap in the Literature

This section has reviewed existing literature on consumer preferences and willingness-to-pay for functional foods and nutraceuticals. It justifies that there may be a market for functional products and nutraceuticals, and that consumers are willing to pay premium on products with proven health claims. However, in the Canadian context, there are limited studies that justify this claim, especially on dairy functional foods that are not yet on the market. Also, IMMUNEPLUS dairy products are novel products, and have never been evaluated. As a result, this study seeks to fill this gap, by using discrete choice experiment to find out consumer preferences and willingness to pay for IMMUNEPLUS dairy products in Canada, which is even more valuable, given the current pandemic.

Chapter 3: Conceptual Framework

3.1   Introduction

This section provides the theoretical foundation for the empirical models used to estimate consumer preference and willingness-to-pay in this study. Since the study uses a stated preference survey, we address two theories that are fundamental in evaluating how consumers make choices among alternative goods. Random Utility Theory is useful in understanding why consumers select one good over another.

3.2   Consumer Choice Theory

Frequently, individuals are faced with multiple choices, where they have to compare alternatives and make decisions on what option gives them the highest level of satisfaction. These decisions are based on preferences that vary across individuals, and in many cases, are shaped by past experiences, information and other factors (Hensher et al., 2005). The choice theory has been used across disciplines over the years, to better understand and explain how different individuals come about the decisions they make.

Choice theory, which stems from neoclassical economics, was initially developed by Thurstone. It was established on the basis of paired comparisons of specimens (Thurstone, 1927). His approach described how different specimens possess diverse attributes; so, an individual chooses from different options by deciding on that, which offers more stimuli (Thurstone, 1927).

In the neoclassical economic theory, consumers are assumed to choose goods that maximize their utility while faced with a limited budget constraint. Consumers are faced with possible consumption set Z, which includes all the alternatives a consumer can choose from. Let

m be the consumer's budget constraint, and $\mathbf{q} = (q_1, q_2, q_3 \ldots q_i)$ be the price of the goods 1,2,3,

....i. The consumer's problem can be written as:

$$max\ U(\mathbf{z})$$

$$\text{subject to } \boldsymbol{qz} \leq m \qquad\qquad (3.1)$$

$$z \in Z$$

However, the Lancastrian approach was developed several years later to expand on the neoclassic economic theory. Contrary to the neoclassic approach that goods are goods, Lancaster(1966) argued that a good does not give utility to a consumer, but the attributes that the good possesses does. Furthermore, he posited that a good possesses more than an attribute and different goods can possess similar attributes.

In the Lancastrian approach, choice was not based on only quantity of a good, but also on the attributes it possesses; individuals derive utility from the attributes that make up a good (Lancaster, 1966). Consumers will choose a good or a combination of goods that possess(es) the highest bundle of attributes that maximizes their utility subject to a budget constraint (Louviere et al., 2000). This approach puts into account how consumers might react to new or differentiated goods, which is essential to this study. In this case, a consumer can choose between probiotic and IMMUNEPLUS yoghurts, considering the yogurt that has more attributes that give the highest level of satisfaction.

Let $\boldsymbol{x}$ denote a vector of observed attributes, where x_{nj} denotes attributes of good j for consumer n. The new utility maximization problem is:

$$max\ U(\boldsymbol{x})$$

$$\text{subject to } \boldsymbol{qz} \leq m$$

$$\mathbf{x} = Ay \qquad\qquad (3.2)$$

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$$z = By$$

$$x, y, z \geq 0$$

y is a dummy variable matrix. $y_{nj} = 1$ if good j is selected by consumer n, such that $y_{nj} = 0$ if not selected. A and B are matrices, which are determined by the good and the attributes they possess. The theory illustrates that consumers maximize utility with respect to the consumption bundle with attributes that provides them with the highest level of utility subject to a budget constraint.

Contributions by Lancaster enable researchers to observe consumers' choices and other attributes associated with the alternatives but is not sufficient in observing utility. The model is a deterministic model of consumer behaviour which does not account for unobserved consumer behaviour; this makes it challenging for researchers to model goods that are not yet on the market. As a result, we also use the random utility model to connect this model with the econometric model of consumer behaviour.

3.3 The Random Utility Model

When an individual chooses a good from a set of alternatives, the choice is a function of the individual's preference (Holmes & Adamowicz, 2003). An analyst's objective is to discover and understand the factors that are responsible for the individual's decisions. The analyst may explore these factors, such as price, but in the real world, it might be impossible to observe every responsible factor. There are some factors that are responsible for an individual's decision but are not visible to the analyst; however, the random utility model enables researchers to adequately account for them.

In random utility model, the utility an individual derives from consuming a good can either be a systematic component or random component (Louviere et al., 2000). The systematic components are the attributes of the alternatives in a choice set, and an individual's attributes that can be observed by an analyst. The random components are all other factors that influence an individual's decision but cannot be observed by a researcher. In a choice experiment, an individual chooses a alternative *i* from two or more alternatives, and each of the alternatives possesses different attribute levels; the selected good *i* provides the highest level of utility (U_{ni}) (Hensher et al., 2005). Since the whole of U_{ni} cannot be observed, let the observable components be denoted by V_{ni}, which comprises of both the attributes of the individual (S_n) and the alternative (X_{ni}), such that $V_{ni}(x_{ni}, s_n)$. The unobservable component is denoted by ε_{ni}. Both components are independent and additive, hence, can be written as follows:

$$U_i = V_{ni} + \varepsilon_{ni} \tag{3.3}$$

An individual endeavours to maximize utility, so the probability that an individual n chooses an alternative, i over alternative, j, can be written as:

$$P_{ni} = prob(U_{ni} > U_{nj})$$

$$= \text{prob } ((V_{ni} + \varepsilon_{ni}) - (V_{nj} + \varepsilon_{nj}) > 0) \tag{3.4}$$

$$Prob_i = Prob\left(U_{ni} \geq U_{nj}\right), \forall j \text{ in } j = 1, \dots J; i \neq j$$

The equation implies that an individual chooses alternative i over alternative j if only the utility derived from consuming i is more than the one derived from alternative j (Hensher et al., 2005). Observing the equation above, the absolute value of utility is not relevant, however, the difference in utility value is (Petrin & Train, 2003).

3.4   Conceptual Framework

In the context of this study, according to the theory of Lancaster, we assume that an individual n derives utility from a number of attributes attached to each yogurt alternative. These attributes give a total utility V_{ni} to a an individual, which is an observed component of the utility. For better understanding, an individual can observe the two attributes of yoghurt alternatives, such as price and type (e.g., probiotics, IMMUNEPLUS), which give the utility of $\beta_1 X_1$ and $\beta_2 X_2$ respectively. The total utility an individual derives from those set of attributes is V_{ni}. However, there is an unobserved component, ε_{ni} ; therefore, the utility an individual derives from choosing yoghurt i can be written as:

$$V_{ni\,+}\, \varepsilon_{ni} = U_{ni} \tag{3.5}$$

In a situation whereby there is another yogurt alternative j, $V_{nj} = \beta' x_{nj}$. Where β' is the coefficient vector for each of the attributes of x and x_{nj} is the attribute level of alternative j. An individual n will choose yoghurt i over j if

$$\beta\, 'x_{ni} + \varepsilon_{ni} > \beta' x_{nj} + \varepsilon_{nj} \tag{3.6}$$

while the probability that an individual chooses yogurt *i* over *j* can be written as

$$P_{ni} = Prob\ (U_{ni} > U_{nj})$$

$$= Prob\ ((V_{ni} + \varepsilon_{ni}) - (V_{nj} + \varepsilon_{nj}) > 0) \tag{3.7}$$

$$= Prob\ (\beta' x_{ni} + \varepsilon_{ni} > \beta' x_{nj} + \varepsilon_{nj})$$

$$= Prob\ (\varepsilon_{nj} - \varepsilon_{ni} < \beta' x_{ni} - \beta\, 'x_{nj})\ \forall j \neq i$$

If ε_{ni} and ε_{nj} are distributed as a type I extreme value, then,

$$P_{ni} = \frac{exp(\beta' x_{ni})}{\Sigma_j exp(\beta' x_{nj})} \tag{3.8}$$

These equations are consistent with logit model and will be further discussed in the empirical framework section of this study.

Chapter 4: Data and Survey Method

Over time, stated preference surveys have been used as an effective means to understand consumer preferences for goods that are not yet on the market. In this section, we describe the data and method of data collection used to evaluate consumer preferences and willingness to pay for IMMUNEPLUS dairy products across Canada.

4.1   Introduction to Data

In this study, a stated preference survey was administered online, in both English and French through Qualtrics, in the Winter of 2021 across Canada. The survey included questions pertaining to attitudes, perception, willingness-to-pay, and sociodemographic information. Pre-screened questions were initially asked to ensure that the respondents were at least 18 years old and not from Northern Territories.

Initially, some general questions about healthy foods were asked, after which, respondents were randomly assigned to a group, out of two variations of surveys, yogurt, and pills. In each of the groups, all respondents had the same questions as regards to socio-economic and demographic information. In total, one thousand and twenty-one (1021) complete and valid responses were returned, in which 525 respondents answered questions on yogurt and the remaining 496 were on pills. The data will be fitted into conditional logit model and results will inform SEMEX and other dairy companies about the market for IMMUNEPLUS dairy products in Canada.

4.2 Stated Preference Data

IMMUNEPLUS dairy products are not yet on the market; therefore, we will adopt a stated preference survey method for this study. This survey method enables us to access

information relating to sociodemographic characteristics, attitudes, and other information necessary to evaluate consumer preferences.

Over time, the contingent valuation method (CVM), choice experiment, and conjoint analysis are the three methods that have been used to collect stated preference data. The CVM gives room for a researcher to estimate consumer willingness-to-pay for a good with many attributes, but it is more expensive and difficult to evaluate the WTP for a specific attribute of a good. However, choice experiments and conjoint analysis are better methods for estimating the willingness-to-pay for a particular attribute of a good(Carlsson et al., 2007).

CA and CE are quite alike in their approach, however, while CA demands that participants rank or rate alternatives, CE demands that respondents only choose one out of two or more alternatives. Also, CA uses a more mathematical approach and does not account for some important components, such as participants behavior when making a choice. However, CE addresses the basics, such as the trade-offs an individual makes when making a choice; the method involves more of random utility theory (Louviere et al., 2010). In a real-life scenario, consumers are more likely to make a purchase decision by making a choice and not by ranking; thus, we use the choice experiment method for the purpose of this study.

The CE method demands that participants assumes a hypothetical situation, so, it does not involve a real cash payment; This may make participants to overstate the value they would normally pay for a particular type of good. As result, CE method is subject to hypothetical bias, which is a major drawback of the method (Lusk, 2003). However, we used the cheap talk method, which has been widely used by researchers to reduce the likelihood of hypothetical bias. We presented participants with a script before each of the choices in this format:

"Again, *we would like to ask you questions about some of the factors that might influence your decision to purchase IMMUNE PLUS yoghurt. All the yoghurt products you will encounter below are in 650-gram packages. Whether or not you currently take yoghurts to boost your immunity, we would appreciate that you complete the following choice comparisons below.*

Even though the purchase decision in this part of the survey is hypothetical, we ask that you respond to the questions as if it were an actual decision involving real cash payment. As you answer this question please keep in mind what your interest in the products described, and how much you generally spend on food".

4.3   Choice Experiment specification

Since we are interested in the forms that consumers may prefer, two choice experiments were carried out. Each of the choice sets contains different information. In the first-choice experiment, participants were placed in a hypothetical situation of purchasing yogurt in a retail store, while the second also placed them in a hypothetical situation for the purchase of pills. This will enable us to evaluate consumer preferences for the specific characteristics of the two forms of IMMUNEPLUS dairy products.

4.4   Attributes and Levels

4.4.1   Yogurt choice experiment

The purpose of this choice experiment is to examine respondents' preferences for immune supporting yogurts. In each choice set, there are two potential 650g packages of yogurt products that a participant can choose from, included also, is an option of not making a choice. Yogurt has a wide variety of attributes, and if all are considered, the model could become too complex. Therefore, alternatives are varied by only two attributes: price and product type. The

product type consists of four levels: conventional yogurt, probiotic yogurt, IMMUNEPLUS yogurt and a combination of probiotic with IMMUNEPLUS yogurt.

Conventional yogurts are made with basic yogurt ingredients and may not provide other specific benefits. IMMUNEPLUS yogurt contains IMMUNEPLUS early milk, which has a higher concentration of compounds that boost immunity; this product is not currently on the market. Probiotic yogurt is conventional yogurt enriched with probiotics, which is made up of healthy bacteria that are beneficial to the body. IMMUNEPLUS with probiotic yogurt contains a combination of both IMMUNEPLUS colostrum and probiotics; there is also no yogurt with this type of attribute currently on the market.

Table 4.1: Discrete choice experiment attributes and levels

Attributes	Product type	Price
	Conventional yogurt	$3.49
	Probiotic yogurt	$3.49
	IMMUNEPLUS yogurt	$3.49, $3.84, $4.21, $5.24
	IMMUNEPLUS with probiotics	$3.49, $3.84, $4.21, $5.24
	Conventional Immune pills	$23.31
	Colostrum pills	$59.56
	IMMUNEPLUS colostrum pills	Base price +10%, + 20%, +40%, + 50%

The price levels were selected based on the market price of a yogurt brand, "Activia", which has both the conventional and the probiotic type in different packages. The price per 650g package of Activia yogurt was taken from mid-level grocery stores (Zehrs, Metro), discount stores such as No frills and food Basics were excluded. The price for a conventional Activia yogurt per 650g is $3.49, which is also the same as probiotic yogurt; Therefore, we set the base price to be $3.49. Throughout the choice sets, the price levels of the yogurts with conventional and probiotic attributes are fixed at $3.49, while we vary the prices of the yogurt with IMMUNEPLUS and IMMUNEPLUS with probiotics attributes.

Table 4.1 above, describes the attributes and price levels in the discrete choice experiment. In total, 16 yogurt choice sets were generated, using a full factorial design to generate all possible combinations. However, each respondent randomly received 10 choice sets,

in order to reduce the level of fatigue that may be experienced during participation. Table 4.2 provides an example of yogurt choice set. There are four price levels, including the base price. The remaining three price levels are base price +10%, + 20% and +50%.

Before each choice set, respondents were presented with the following statement.

"Suppose you learn that different immune boosting yogurts are sold in the stores near you, which product, if any, would you purchase?"

Table 4.2: Example of choice experiment for yogurt

	Yogurt A	Yogurt B	
Price	$3.49/650g	$3.84/650g	I would not choose any of these products
	Conventional	Immune plus	
I would choose:	❏	❏	❏

4.4.2 Pill choice sets

Again, the purpose of this choice experiment is to examine respondents' preferences for different types immune pills. In each choice set, there are two different packages of pills that a participant can choose from, and each package contains 90 counts of pills. Participants also have an option of not making a choice. Like yogurt, pills have several attributes, but in order to reduce the complexity of our model, the attributes were limited to only two: price and product type. The

product type has three levels: conventional immune pills, immune colostrum pills, and IMMUNEPLUS colostrum pills.

The immune colostrum pills are made up of colostrum, which may improve the immune system. IMMUNEPLUS colostrum pills contain IMMUNEPLUS colostrum, which has a higher concentration of antibodies and other immune boosting compounds that may improve the immune system. Lastly, conventional immune pills do not contain colostrum, but are demonstrated to strengthen the immune system. Immune colostrum pills and conventional immune pills are currently on the market, while IMMUNEPLUS colostrum pills are not.

The price levels are selected based on the market price of a pharmaceutical brand, "NOW foods", which has both the conventional immune pills and immune colostrum pills in different packages. The prices per 90 counts are different for the different packages of pills, with immune colostrum being higher than conventional; thus, there are two base prices: $23.31 per 90 counts, and $56.59 per 90 counts. Table 4.1 describes the attributes and price levels in the experiment. A total of 7 choice sets were generated, using a full factorial design to derive all possible combinations. All respondents received the same choice sets, but in no definite order.

Table 4.3 provides an example of pill choice set. The price levels for conventional immune pills and colostrum immune pills are fixed throughout the choice sets at $23.31 and $59.56 respectively, while the price level of IMMUNEPLUS colostrum pills vary across the choice sets. Other price levels are base price + 10%, +20%, +40% and + 50%.

Before each choice set, respondents were presented with the following statement.

"*Suppose you learn that different immune boosting pills are sold in the stores near you, which product, if any, would you purchase?*"

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Table 4.3: Example of discrete choice experiment for pills

	Yogurt A	Yogurt B	
Price	$56.59/90pills	$65.52/90pills	I would not choose any of these products
	Colostrum	Immune plus colostrum	
I would choose:	❏	❏	❏

4.5 Socio-demographic and Psychographic Data

There were series of other questions that were asked in the surveys, asides choice experiment. This part of the survey information that include behavior, psychographic and socio-demographic characteristics.

Age, education level, household size, household income, presence of children under the age of fifteen living in the household and gender. These variables are also useful in recognizing consumer segments that may exist within the population and it will be useful in the analysis to find out some unobserved heterogeneity in consumer preferences. They will be used to further describe the results estimated in conditional logit.

Table 4.4 illustrates the socio-demographic characteristics of the sample and compares them to the data from the 2016 census conducted in Canada; this is useful in examining whether

the sample characteristics appropriately represent the national Canadian population. In comparison to the general population sample, gender characteristic is a true representation of it, the percentage of male and female participants are equal to that of the general population. The younger groups (18 – 24 and 25- 34) were oversampled, while the older group (55+) were slightly under sampled, compared to the Canadian sample. However, they are generally representative of the national population. Overall, the sample is a good representation of the national population. Higher income earners ($125,000 above) were also oversampled, while other income distribution categories were slightly under sampled. The different education categories were majorly under-sampled, except for bachelor's degree and graduate degree categories, which were over-sampled, Innes & Hobbs, (2011) finds this common with online surveys. Overall, the survey sample is a good representation of the Canadian population.

Table 4.4: Sample Statistics Compared to Canadian population

Sociodemographic	Characteristics	Survey Sample	Canadian population
Gender	Female	50.9%	50.9%
	Male	49.1%	49.1%
Age group	18 – 24	15.3%	10.9%
	25 – 34	18.0%	16.4%
	35 – 44	16.9%	16.1%
	45 – 54	16.6%	17.9%
	55+	33.3%	38.7%

Household Income	Under $25,000	14.4%	14.0%
	$25,000 - $49,999	24.9%	20.8%
	$50,000 - $74,999	22.0%	18.3%
	$75,000 - $99,999	18.5%	14.5%
	$100,000 - $124,999	9.0%	10.4%
	$125,000 or more	11.2%	22.0%
Region	Atlantic	8.5%	6.6%
	Quebec	12.1%	23.2%
	Ontario	44.3%	38.3%
	West	35.1%	31.5%
	Northern territories	0.0%	0.3%
Education	Less than High school	2.9%	18.3
	High school diploma	21.7%	26.5%
	Associate degree	14.2%	32.0%
	Bachelor's degree	26.7%	15.5%
	Graduate degree	9.9%	7.7%

(Government of Canada, 2017a)

Following a description of IMMUNEPLUS dairy products, participants also indicated their willingness to consume by rating their likelihood of consuming the products. Likert scales ranging from one to five ranked participants' most important factors that may be considered before making a purchase. In order to find out if children are potential target markets, those who indicated as parents rated their likelihood of feeding the products to their children. The forms

that are more preferred by both the children and the parents were also indicated. These scales are useful in evaluating consumers' preferences for IMMUNEPLUS dairy products.

Chapter 5: Empirical Framework

5.1 Conditional Logit Model

In this study, we estimate the models using conditional logit model (CL), which uses maximum likelihood estimation technique. The conditional logit model is similar to the standard multinomial logit model theoretically, but it is more suitable for estimating the type of data used in this study. The conditional logit model assumes that error terms are independently and identically distributed (McFadden, 1973). It is based on the independence of irrelevant alternatives (IIA), which assumes that an individual's preference for an alternative is independent of another alternative (Louviere et al., 2000); which may not be true in the real world.

Also, the CL model, evaluates choices as a function of alternative characteristics and provides a starting point to estimate consumer willingness-to-pay and preferences in general. Since the current study is interested in the form of IMMUNEPLUS colostrum consumers prefer better, we use the CL model to evaluate consumers preferences for two forms of IMMUNEPLUS dairy products (pills and yogurts). The model for each of the forms will be estimated individually.

5.2 Estimating the Empirical Model

Following the conceptual framework, we can estimate the marginal utility an individual receives from the different attributes of yogurt alternatives. Therefore, the utility function of yogurt is

$$U_{ni} = V_{ni} + \varepsilon_{ni}$$

$$= \beta_0 \, ASC_{ni} \; + \; \beta_1 \, price_{ni} \; + \; \beta_2 \, Probiotics_{ni} + \beta_3 \, Immuneplus_{ni} \; + \; \\ \beta_4 \, ImmuneplusProbiotics_{ni} + \varepsilon_{ni} \qquad\qquad (5.1)$$

where V_{ni} is the observed component of the utility of consumer n for product i.

ε_{ni} is the unobserved component of the utility of consumer n for product i.

Price$_{ni}$ – price of yoghurt (continuous variable)

ASC – alternative specific constant, which is included to account for the optout option in the survey. (Dummy variable, 0 if selected, 1 otherwise)

Probiotics – probiotic yogurt. (Dummy variable, 1 if probiotics, 0 otherwise)

IMMUNEPLUS – IMMUNEPLUS yogurt. (Dummy variable, 1 if IMMUNEPLUS, 0 otherwise)

All the β_s are coefficients for the attribute levels of yogurts to be estimated.

For pills, the utility function is

$$U_{nj} = V_{nj} \; + \; \varepsilon_{nj}$$

$$= \beta_0 \, ASC_{nj} + \beta_1 \, price_{nj} \; + \; \beta_2 \, Colostrum_{nj} + \; \beta_3 \, Immunecolostrum_{nj} + \varepsilon_{nj} \qquad\qquad (5.2)$$

Again, V_{nj} is the observed component of consumer n utility for product j

ε_{nj} is the unobserved component of consumer n utility for product j

ASC – alternative specific constant, which is included to account for the optout option in the survey. (Dummy variable, 0 if selected, 1 otherwise)

Price$_{nj}$ – price of pills (continuous variable)

Conventional – conventional immune boosting pills. (Dummy variable; 1 if conventional, 0 otherwise)

Colostrum – colostrum immune boosting pills. (Dummy variable; 1 if colostrum, 0 otherwise)

IMMUNEPLUS colostrum – IMMUNEPLUS colostrum pills. (Dummy variable; 1 if IMMUNEPLUS colostrum, 0 otherwise)

All β_s are coefficients for the attribute levels of pills to be estimated.

Note that conventional yogurt and pills will be omitted in the estimation, this is because the marginal utilities of other attributes will be estimated in comparison to them.

5.3   Willingness to Pay

In order to identify the value a consumer places on the yogurt attributes, the estimated parameters from conditional logit model will be used to estimate the marginal willingness-to-pay (WTP) for different IMMUNEPLUS products. Willingness-to-pay elicits explains the trade-off between the utility parameter of price and the utility parameter of an attribute. The marginal WTP for an attribute c can be determined by taking the negative ratio of the price coefficient and the coefficient of c. Mathematically, it can be written as:

$$MWTP_c = -\frac{\beta_c}{\beta_{price}} \qquad (5.3)$$

In order to calculate the ratio, a large number of draws has to be taken from the distributions, so I use the Krinsky-Robb method of calculating confidence intervals, using 1000 draws.

Chapter 6: Results

6.1   Introduction

This chapter presents the results of this study. The first section provides an overview of the survey respondents' general interest in IMMUNEPLUS dairy products. The marginal utility and willingness-to-pay estimates for different forms of IMMUNEPLUS dairy products are presented in the subsequent section. The last section explores the variability in consumer preferences, which includes interaction effects between the experimental design and variables from the data set.

As earlier mentioned in chapter five, price is a continuous variable, and all other variables are coded as dummy variables (0 or 1), including the choice made by a respondent. The marginal utilities are estimated in comparison to conventional yogurt, which is the base case; hence, the coefficient of conventional yogurt is omitted in the results. For pills, results include the variable coefficients of IMMUNEPLUS colostrum pills, colostrum pills and alternative specific constant. Also, the marginal utilities are estimated in comparison to conventional immunity pills, so it is omitted in the results.

6.2   Respondents' General Interest in IMMUNEPLUS dairy products

After a brief description of IMMUNEPLUS dairy products in both the yogurt and pill subgroups of the survey, respondents were asked if they would consume IMMUNEPLUS yogurt in the yogurt subgroup, or IMMUNEPLUS colostrum pill in the pill subgroup. Figures 6.1 and 6.2 illustrate the results of participants' responses for pills and yogurt, respectively. In the pill subgroup, 13.1% of the sample size (496) indicated that they definitely will not consume IMMUNEPLUS pill, however, a larger percentage are more likely to be interested in it. The result

is quite similar to that of yogurt subgroup; out of a sample size of 525, only 8.57% will definitely not consume IMMUNEPLUS yogurt.

Many of the participants who were hesitant about their consumption, indicated that they would not consume either IMMUNEPLUS yogurt or IMMUNEPLUS colostrum pill because they do not know enough about the product. Individuals who indicated that they probably will, might or might not, probably will not and definitely will not consume either IMMUNEPLUS yogurt or pills are categorized as the hesitant proportion.

For pills, 63.02% of the hesitant proportion (457) were unlikely to consume IMMUNEPLUS colostrum pills because they do not have adequate knowledge of the product. Cost was the second most common reason participants gave, while personal preference was third. In the case of yogurt, 43.34% of the hesitant proportion (453) would not consume IMMUNEPLUS yogurt if it is expensive. Similar to pills, inadequate knowledge of IMMUNEPLUS yogurt would also prevent respondents from consuming it; this was the second most common reason, while taste was third. Other reasons given include ethics, personal preference, dietary restrictions, and health related reasons.

Figure 6.1: Respondents' general interest in IMMUNEPLUS colostrum pill (N = 525)
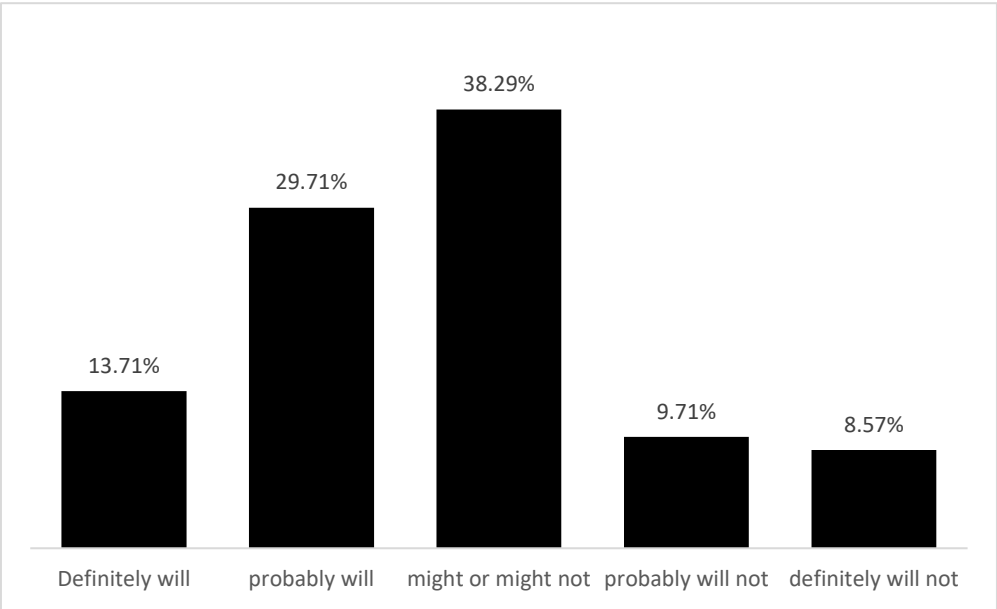

Figure 6.2: Respondents' general interest in IMMUNEPLUS yogurt (N = 496)
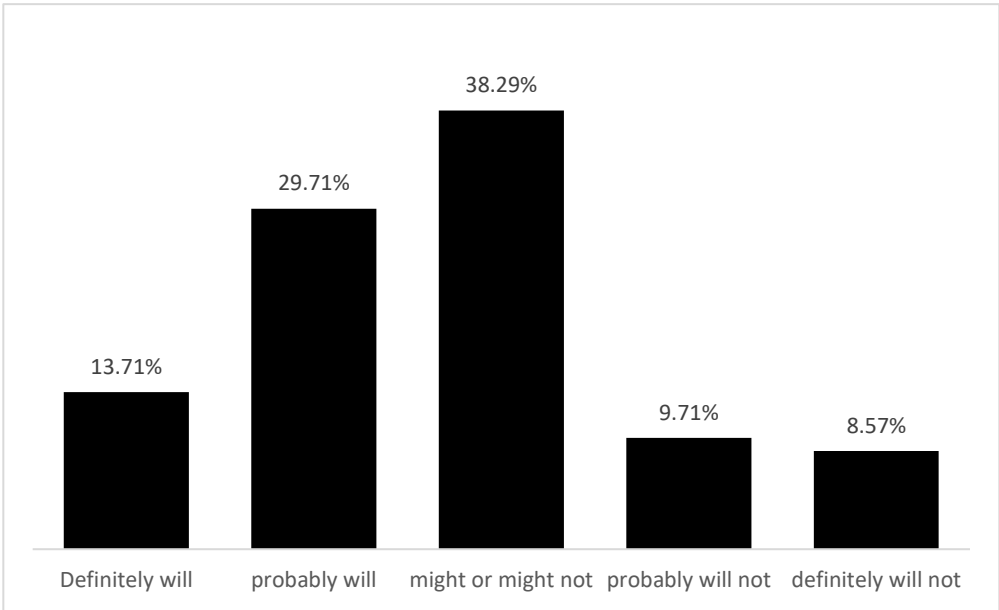
6.3 Marginal Utility

In order to examine the factors that may influence consumer preferences and willingness-to-pay for IMMUNEPLUS dairy products across Canada, we utilize conditional logit model.

6.3.1 Conditional Logit Regression Results

Based on the empirical model, the utility an individual derives from selecting a good is a function of price, product attribute, and the alternative specific constant (ASC). In order to capture those who did not choose any of the product alternatives, but choose to optout, the ASC is included in the model.

Pseudo R^2 value was obtained to evaluate the overall goodness of fit of the conditional logit model. The output ranged from 0.013 to 0.019 for pills and yoghurt. From Tables 6.1 and 6.2, it can be observed that the price coefficients are negative and significant at the 1% level across the two models, which suggests that marginal utility decreases with an increase in the price of product. This is expected, as consumers would generally receive disutility when there is an increase in the price of a good. Also, the alternative specific constant is positive and significant at the 1% level across both models, which implies that consumers derive utility from making a consumption decision, rather than opting out.

For the subgroup of pills, the results are presented on Table 6.1. The coefficient on the IMMUNEPLUS colostrum is positive and also significant at the 1% level, meanwhile, the coefficient on colostrum is negative and not significant. The positive and significant coefficient on IMMUNEPLUS colostrum imply that consumers derive utility from choosing IMMUNEPLUS colostrum.

Table 6.1: Conditional Logit Model Results for pills

Variables	Coefficient
y = Choice	(SE)
Price	- 0.021 ***
	(0.002)
ASC	0.451 ***
	(0.107)
Colostrum	- 0.183
	(0.115)
IMMUNEPLUS colostrum	0.346 ***
	(0.089)
Pseudo R2	0.019
Observations	11,904
R2	0.019
Max. Possible R2	0.279
Log Likelihood	-1,831.916

Note: *p < 0.1; **p < 0.05; ***p<0.01

Table 6.2: Conditional Logit Regression for yogurt

Variables y = Choice	Coefficient (SE)
Price	- 0.251 ***
	(0.050)
ASC	1.146***
	(0.181)
Probiotics	0.369***
	(0.067)
IMMUNEPLUS	0.458 ***
	(0.064)
IMMUNEPLUS with probiotics	0.534***
	(0.076)
Pseudo R2	0.013
Observations	24,432
R2	0.013
Max. Possible R2	0.334
Log Likelihood	-4,806.671

Note: *p < 0.1; **p < 0.05; ***p<0.01

Table 6.2 presents the conditional logit model results for consumer preferences for the attributes of yogurt. The coefficients of probiotics yogurt, IMMUNEPLUS yogurt and a combination of IMMUNEPLUS with probiotics yogurt are all positive and significant at the 1% level. This indicates that consumers derive utility from all the attributes. However, IMMUNEPLUS and IMMUNEPLUS probiotics have higher marginal effects, if compared to probiotics. IMMUNEPLUS yogurt has a 59% predicted probability of being chosen, while probiotics has a

37% predicted probability of being chosen. The estimated marginal effects of all the explanatory variables are illustrated on Table 6.3.

Table 6.3: Mean Marginal Effects for Conditional Logit Model Result (yogurt)

Variable	Predicted probability
Conventional	37%
IMMUNEPLUS	59%
IMMUNEPLUS probiotics	64%
Probiotics	37%

By taking the ratio of the coefficients estimated above, we also compute willingness-to-pay for yogurt and pills attributes. This enables us to understand the trade-offs between product attributes and cash. However, the estimate of WTP is non-linear function of random variables, so we adopt a different approach to compute their confidence intervals and test their significance. Krinsky & Robb (1986) proposed a parametric bootstrapping method to estimate the confidence intervals and the distribution of non-linear function. For the purpose of this study, we adopt the Krinsky-Robb method. The confidence intervals with 1000 replications are presented as well, to show the level of significance. An estimate is significant if the upper and lower limits have the same sign.

The willingness-to-pay estimates for different attributes of pill and yogurt are presented in Tables 6.6 and 6.7 respectively. All WTP estimates are significant at the 1% level, except colostrum pills. There is a positive and significant WTP for all yogurt attributes, which indicates that respondents are willing to pay a premium for them. Respondents place the highest premium for IMMUNEPLUS with probiotic yogurt. IMMUNEPLUS is the next most valued attribute, with consumers placing the second highest premium for it. Respondents place the least premium

is on probiotics. Also, respondents are willing to pay a premium for IMMUNEPLUS colostrum pills. However, the WTP estimate for colostrum is negative, but not significant. There seems to be an aversion to colostrum as compared to other broadly available products for immune enhancement. The premiums of alternative specific constants for both yogurt and pills are both positive and significant, which implies that a premium exists for having a choice to make.

Table 6.4: Conditional Logit Marginal Willingness to Pay for pill Attributes

Attributes	MWTP	CI_LOW	CI_HIGH
ASC	21.65***	15.07	28.24
IMMUNEPLUS colostrum	16.63***	10.45	22.81
colostrum	-8.80	-18.44	0.84

Table 6.5: Conditional Logit Marginal Willingness to Pay for yogurt Attributes

Attributes	MWTP	CI_LOW	CI_HIGH
ASC	4.550***	4.047	5.07
IMMUNEPLUS	1.822***	1.38	2.56
IMMUNEPLUS probiotics	2.124***	1.67	2.85
Probiotics	1.469***	0.94	2.34

For comparison, Figure 6.8 displays the WTP premiums of both pills and yogurt in percentages. Percentage is used due to the differences in the base prices. The percentage willingness to pay for pills was calculated using the base price of colostrum pill ($56.59cad), while $3.49cad was used as the base price of yogurt. IMMUNEPLUS with probiotics yogurt had a percentage premium of 60%, while IMMUNEPLUS yogurt had a percentage premium of 52%. Probiotic yogurt received the least percentage premium of 40%. These findings suggest that consumers are willing to pay a premium for IMMUNEPLUS yogurt, however, the premium is

higher if it is a combination of IMMUNEPLUS and probiotics. IMMUNEPLUS colostrum pills

had a percentage premium of 29%. Results suggest that respondents place more value on pills

that contain IMMUNEPLUS colostrum.

Figure 6.3: Conditional Logit Marginal Willingness-to-pay for yogurt and pill attributes
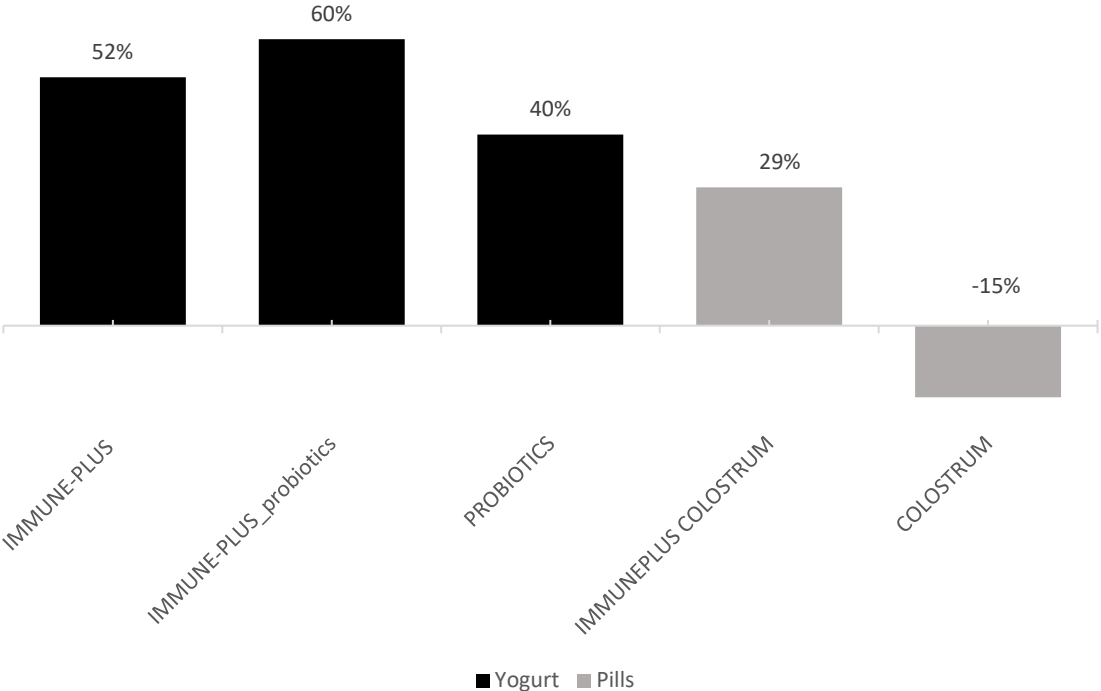
6.4 Incorporating Heterogeneity

Heterogeneity is incorporated in the model by taking account of interaction effects between the

product specific variables and other variables that are individual specific and may influence a

consumer's choice. The product specific variables include all product attributes, including price,

while the individual specific variables include socio-demographic, general questions on healthy

eating and consumption pattern.

6.4.1 Socio-demographic variables

Socio demographic variables such as age, income, education, presence of children in the household and gender were examined. Using conditional logit model, we conducted likelihood ratio tests to find out if the socio-demographic variables were statistically significant in determining consumer's choice.

For pills, when the sociodemographic variables were interacted with the explanatory variables in the nested model, using conditional logit model. Presence of children under the age of fifteen and age variable were statistically significant. Therefore, we failed to reject the null hypothesis for the sociodemographic variables of gender, education, and income are not statistically significant. To test if the significant variables could be estimated separately, likelihood ratio test was performed. We rejected the null hypothesis at the 1% level of significance, so the dummy variables of age and the presence of children under the age of fifteen were estimated individually. The result of the likelihood ratio tests can be found on Table 6.9.

Also, the conditional logit model results for yogurt revealed that income, education, presence of children below the age of fifteen and gender were significant in explaining consumer choice of yogurt. At the 1% significance level, we rejected the null hypothesis that stated that the model was better without each of the interaction terms. Therefore, the sociodemographic variables were estimated separately with the explanatory variables in the nested model for yogurt. The result of the likelihood ratio tests can be found on Table 6.10.

Table 6.6: Likelihood Ratio test for Model Significance: Sociodemographic Variables (Pill)

Variables	Chi-squared stat.	Prob > X^2
Age	72.426***	0.0000
Children in the household	84.586***	0.0003

Table 6.7: Likelihood Ratio test for model significance: Sociodemographic variables (Yogurt)

Variable	Chi-squared stat.	Prob > X^2
Education	54.240***	0.0002
Age	72.672***	0.0003
Income	56.131***	0.0000
Children in the household	24.550***	0.0000
Gender	81.655***	0.0034

6.4.1.1 Interaction Effect with Age (Pills)

Previous literature has linked consumer receptivity of functional foods and nutraceuticals to age and level of education. Herath et al. (2008) suggest that consumers that are receptive towards functional foods and nutraceuticals are older and have received less education. In another study that examined the influence of gender, age and motives underlying food choice on perceived healthiness to try functional foods, differences were found to exist in preference patterns with gender and age segments (Ares & Gámbaro, 2007a). As a result, age was divided into four segments.

The base case used in the estimation was the age group of 18-30 years. The results presented on Table 6.8 reveal that respondents above the age of 60 received disutility from

choosing any type of pill, compared to individuals below the age of 30. This result suggest that

older consumers may be less likely to consume IMMUNEPLUS colostrum pills.

Table 6.8: Conditional logit model: Interaction Effect with Age (Pills)

Variables	Demographics
Y-choice	Coefficient
	SE
Price	- 0.023 ***
	(0.003)
ASC	0.905***
	(0.214)
IMMUNEPLUS Colostrum	0.406*
	(0.179)
Colostrum	0.088
	(0.237)
Conventional: Age above 60	- 0.715**
	(0.232)
IMMUNEPLUS Colostrum: Age above 60	- 0.699***
	(0.174)
Colostrum: Age above 60	-1.552***
	(0.264)

Note: *$p < 0.1$; **$p < 0.05$; ***$p<0.01$

6.4.1.2 Interaction Effect with Age (Yogurt)

Similar to pills, age was divided into four segments. The four segments were assessed to

find out if they are sources of heterogeneity. To achieve this, the dummy variables of age were

interacted with the explanatory variables. The results on Table 6.9. reveal that respondents above

the age of 60 had negative attitudes towards yogurt, compared to those between the ages of 18 to

30 years. The marginal utilities of the explanatory variables were all significant at the 1%, excluding probiotics, which would have been captured by the interaction terms.

Table 6.9: Interaction Effect with Age (Yogurt)

Variables	Age
y = choice	Coefficient SE
Price	- 0.252***
	(0.050)
ASC	1.508***
	(0.209)
IMMUNEPLUS	0.391***
	(0.119)
IMMUNEPLUS probiotics	0.514***
	(0.130)
Probiotics	0.224***
	(0.138)
Conventional: Age above 60	-0.887***
	(0.162)
IMMUNEPLUS: Age above 60	-0.683***
	(0.133)
IMMUNEPLUS probiotics: Age above 60	-0.632***
	(0.143)
Probiotics: Age above 60	-0.544***
	(0.152)

Note *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

6.4.1.3 Gender

The coefficients of the main explanatory variables were all significant at the 1% level. The results obtained from the interaction effect with gender reveal that a negative relationship exists between the explanatory variables and the indicator variables of gender, which was

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significant at the 1% level. While female was used as the base case, the males were found to be

less receptive to yogurt, regardless of the type. Comparing the coefficients, the differences were

less noticeable. However, the coefficient of the interaction with IMMUNEPLUS yogurt was the

lowest, at 0.091, while that of conventional yogurt was the largest, at 0.109. The result is

presented on Table 6.10. Results reveal that there may be a distinction in the market for

IMMUNEPLUS yogurt when it comes to gender.

Table 6.10: Interaction Effect with Gender (Yogurt)

Variable y = choice	Gender Coefficient SE
Price	-0.255*** (0.051)
ASC	1.508*** (0.209)
Probiotics	0.687*** (0.136)
IMMUNEPLUS	0.515*** (0.085)
IMMUNEPLUS probiotics	0.741*** (0.097)
Conventional: Male	-0.341*** (0.109)
IMMUNEPLUS: Male	-0.427*** (0.091)

IMMUNEPLUS probiotics: Male	-0.720***
	(0.100)
Probiotics: Male	**-**0.507***
	(0.602)

Note *p < 0.1; **p < 0.05; ***p < 0.01

6.4.1.4 Education

All the main explanatory variables remain significant at the 1% level. The base case used represented respondents who had above high school degree (Bachelors and associate degrees). We found that negative and significant relationship exist between the explanatory variables and the indicator variables of educational attainment or lower. Individuals who had high school degree or lower, and those who had graduate degree had negative attitudes towards all yogurt attributes. The results are presented on Table 6.11. Results indicate that some level of education may make yogurt appealing, but further education could make it less appealing as well.

Table 6.11: Interaction Effect with Education (Yogurt)

Variables	Education
y = choice	Coefficient SE
Price	-0.256***
	(0.050)
ASC	1.346***
	(0.186)
IMMUNEPLUS	0.435***
	(0.087)
Probiotics	0.376***
	(0.082)
IMMUNEPLUS probiotics	0.07482***

	(0.554)
Conventional: Education (below HS)	-0.420***
	(0.128)
IMMUNEPLUS: Education (below HS)	-0.465***
	(0.115)
IMMUNEPLUS probiotics: Education (below HS)	-0.465***
	(0.115)
Probiotics: Education (below HS)	-0.566***
	(0.122)
Conventional: Education (graduate degree)	-0.701***
	(0.181)
IMMUNEPLUS: Education (graduate degree)	-0.579***
	(0.151)
IMMUNEPLUS probiotics: Education (graduate degree)	-0.752***
	(0.165)
Probiotics: Education (graduate degree)	-0.393**
	(0.170)

Note *p < 0.1; **p < 0.05; ***p < 0.01

6.4.1.5 Income

There were two segments in the income category, low-income and high-income earners. Low-income earners were classified as those who earned less than $62900, which is the Canadian median household income. High income was used as the base case, so we compare low income to it. The Conditional logit model estimated, revealed that heterogeneity may exist across both segments.

At 1% level of significance, Table 6.12 shows a negative relationship between low-income dummy variables and the explanatory variables (IMMUNEPLUS, IMMUNEPLUS

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probiotics and probiotics. The explanatory variables remain significant at the 1%. The marginal utility of the interaction effect of income with conventional yogurt was positive but not significant, while other interaction terms were negative and significant at the 1%. This implies that low-income earners have negative attitudes towards yogurt; as income went up, yogurt became less appealing.

Table 6.12: Interaction Effect with Income (Yogurt)

Variables	Income
y = choice	Coefficient SE
Price	-0.254***
	(0.051)
ASC	1.131***
	(0.197)
IMMUNEPLUS	0.738***
	(0.097)
IMMUNEPLUS probiotics	0.942***
	(0.108)
Probiotics	0.602***
	(0.110)
Conventional: Income	0.047
	(0.114)
IMMUNEPLUS: Income	-0.403***
	(0.094)
IMMUNEPLUS probiotics: Income	-0.621***
	(0.102)
Probiotics: Income	-0.325***
	(0.108)

Note *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

6.4.1.6 **Interaction effect: Presence of Children in the Household (pill and yogurt)**

We examined how the presence of children in a household may influence respondent's choice, particularly, respondents who have children below the age of fifteen. Like it was earlier mentioned, a conditional logit model was estimated to explore how the presence of children of children may be a source of heterogeneity, and likelihood ratio test was performed. The indicator variable for parents who had children under the age of fifteen was interacted with the explanatory variables in the nested model.

For pills, results revealed positive marginal utility values for all the interactions effects at the 1% level of significance, with and exception of the interaction with conventional pills, which was at the 5% level of significance. According to the description of the interacted variable, respondents with children below the age of fifteen present in their household are more receptive to pills. Respondents who had children below fifteen in their household received the highest marginal utility if the product was IMMUNEPLUS colostrum pills. Results are presented on Table 6.13.

The conditional logit model result obtained from yogurt subgroup were quite similar to that of pills. Respondents who had children below the age of fifteen were also receptive to yogurt. The marginal utility was also higher when the product was IMMUNEPLUS yogurt. The results are presented on Table 6.14. The coefficients of the explanatory variables remained significant at the 1% level, excluding probiotics which became negative, but statistically significant at the 5%.

Both results suggest that the households who had young children were more likely to choose both pills and yogurt; thus, may be more health cautious and inclined to immune boosting diets.

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Table 6.13: Conditional logit Model: Interaction Effect with Presence of Children in the Household (Pill)

Variables y = Choice	Kids Coefficient SE
Price	- 0.021 ***
	(0.002)
ASC	0.457***
	(0.124)
Colostrum	-0.265*
	(0.153)
IMMUNEPLUS colostrum	0.050
	(0.115)
Conventional: children below 15	0.615**
	(0.189)
Colostrum: children below 15	0.971***
	(0.215)
IMMUNEPLUS colostrum: children below 15	1.086***
	(0.165)

Note: *p < 0.1; **p < 0.05; ***p<0.01

Table 6.14: Conditional Logit Model: Interaction Effect with Presence of Children in the Household (Yogurt)

Variables y = Choice	Kids Coefficient SE
Price	- 0.292 ***
	(0.076)
ASC	0.931***
	(0.291)
probiotics	-0.350**
	(0.155)
IMMUNEPLUS	0.810***
	(0.137)
IMMUNEPLUS Probiotics	0.970***
	(0.154)
Conventional: Children below fifteen	0.653***
	(0.189)
IMMUNEPLUS: Children below fifteen	0.337***
	(0.215)
IMMUNEPLUS probiotics: Children below fifteen	0.381**
	(0.165)
Probiotics: Children below fifteen	0.670***
	(0.164)

Note: *p < 0.1; **p < 0.05; ***p<0.01

6.4.2 Interaction Effects with other variables

6.4.2.1 Nutritional Information and Preference for yogurt

In the survey, participants were also asked how often they check nutritional information. The dummy variable indicating the frequency of consumers checking nutritional information was interacted with the explanatory variables in the conditional model. A likelihood ratio test was also performed in order to confirm if the interaction terms improved the model, and it was hypothesized that the interaction variables had no impact, therefore, equaled to zero. However, the null hypothesis was rejected at the 1% level.

In comparison with individuals who check nutritional information about half the time, the results in Table 6.15 reveal that individuals who always check nutritional information are more receptive to all yogurt attributes. This is significant at the 1% level with the exception of the interaction between conventional yogurt attribute and nutritional information. However, results also reveal that individuals who rarely check nutritional information had negative attitudes towards all yogurt attributes, a result that is significant at the 1% level.

This result clearly shows that individuals who are more likely to check nutritional information have more interest in yogurt attributes, but those who rarely check have negative attitude towards yogurt attribute.

Table 6.15: Interaction Effect: Pill and Nutritional Information

Variables	Nutritional Information
y = Choice	Coefficient SE
Price	- 0.264*** (0.074)

ASC	1.415***
	(0.283)
Probiotics	0.040
	(0.153)
IMMUNEPLUS	0.054
	(0.136)
IMMUNEPLUS probiotics	0.212
	(0.155)
Conventional: Nutritional Information (Always)	-0.013
	(0.351)
IMMUNEPLUS: Nutritional Information (Always)	0.643***
	(0.902)
IMMUNEPLUS probiotics: Nutritional Information (Always)	0.619***
	(0.117)
Probiotics: Nutritional Information (Always)	0.316**
	(0.121)
IMMUNEPLUS: Nutritional Information	-0.680***
	(0.271)
IMMUNEPLUS probiotics: Nutritional Information	-1.146***
	(0.323)
Probiotics: Nutritional Information	-0.779***
	(0.302)

Note: *p < 0.1; **p < 0.05; ***p<0.01

6.4.2.2 Ingredient Information and Preferences for pills

Following a likelihood ratio test which was conducted through conditional logit model,

the variable that indicated whether respondents check ingredient list on a product was found to

significantly influence consumer's choice of immune pills. The variable indicating respondents who rarely check ingredient list was interacted with the explanatory variables in the nested model, while the variable indicating the respondents that always check ingredient list was used as the base case. The results are presented on Table 6.16. The main explanatory variables (price, IMMUNEPLUS colostrum and ASC) were significant at the 1% level, while colostrum remained insignificant. The interaction effects were all negative and significant at the 1% level, which indicates a negative relationship between the marginal utilities received from the attributes of pills and the indicator variables for those respondents that rarely check ingredient lists. This result suggests that respondent who rarely check ingredient lists were less likely to choose any pill attribute.

Table 6.16: Interaction effect: Pill Attributes and Ingredient Information

Variables	Healthy Foods
	Coefficient
y = Choice	SE
Price	- 0.033 ***
	(0.005)
ASC	0.907***
	(0.240)
Colostrum	-0.140
	(0.243)
IMMUNEPLUS colostrum	0.527***
	(0.133)
Conventional: Ingredient List (Rarely)	- 0.824***
	(0.334)
Colostrum: Ingredient List (Rarely)	-1.621***
	(0.426)

IMMUNEPLUS colostrum: Ingredient List (Rarely)	-1.506***
	(0.472)
Pseudo R2	0.024

6.4.2.3 Healthy Food Consumption Pattern

The survey included questions asking whether respondents ate specific foods to improve their health. The definitions and examples of functional foods and nutraceuticals were given, and respondents were asked to choose which one they usually consume.

In order to find out if heterogeneity exists in respondents' preferences for forms or mode of delivery (nutraceutical or functional foods), the indicator variables for nutraceutical consumers and functional foods consumers were interacted with each explanatory variable in the nested model. Results presented in Table 6.17 and 6.18 show that heterogeneity exists in the preferences for mode of delivery. Respondents that consume functional foods are less likely to choose any type of pills; this was statistically significant at the 1% level.

In the case of yogurt, individuals who consume only nutraceuticals are less receptive towards yogurt, which is significant for all interaction terms at the 1% level. This indicates that individuals who consume only nutraceuticals receive disutility from consuming functional foods.

Table 6.17: Interaction Effect: Yogurt Attributes and Nutraceuticals

Variables	Nutraceuticals
	Coefficient
y = Choice	SE
Price	- 0.292***
	(0.051)
Optout	1.205***
	(0.225)
Probiotics	0.237
	(0.170)
IMMUNEPLUS	0.244*
	(0.147)
IMMUNEPLUS probiotics	0.121
	(0.161)
Conventional: Nutraceutical	-0.715***
	(0.156)
IMMUNEPLUS: Nutraceutical	-0.738***
	(0.129)
IMMUNEPLUS probiotics: Nutraceutical	-0.755***
	(0.140)
Probiotics: Nutraceutical	-0.886***
	(0.149)
Pseudo R2	0.030

Note: *p < 0.1; **p < 0.05; ***p<0.01

Table 6.18: Interaction Effect: Pill Attributes and Functional foods

Variables	Healthy Foods
	Coefficient
y = Choice	**SE**
Price	- 0.038 ***
	(0.002)
ASC	1.666***
	(0.209)
Colostrum	-0.056
	(0.187)
IMMUNEPLUS colostrum	0.366**
	(0.133)
Conventional: Functional foods	- 1.792***
	(0.183)
Colostrum: Functional foods	-1.989***
	(0.185)
IMMUNEPLUS colostrum: Functional foods	-1.833***
	(0.142)
Pseudo R2	0.026

Note: *p < 0.1; **p < 0.05; ***p<0.0

6.5 Summary

The objective of this section was to use conditional logit model to estimate marginal utilities, willingness-to-pay, and assess the sources of heterogeneity that may be relevant in explaining consumer preferences for IMMUNELLUS dairy products. Therefore, this section presented the result and interpretation of the analysis performed.

The results obtained from estimating conditional logit model revealed that marginal utility was derived from choosing IMMUNEPLUS yogurt, IMMUNEPLUS probiotics yogurt,

probiotic yogurt, and conventional yogurt, in the yogurt subgroup, and IMMUNEPLUS

colostrum pill in the pill subgroup. Willingness-to-pay for all the attributes was also calculated

based on the estimates from the conditional logit model, in order to know the value placed on

these attributes. The willingness to pay estimates were found to be positive and significant for all

IMMUNEPLUS dairy products across both subgroups. When percentage willingness to pay for

each of the attributes was calculated, IMMUNEPLUS probiotics received the highest premium

of 60%. IMMUNEPLUS yogurt received a percentage premium of 52%, while the least premium

was attached to probiotic yogurt in the yogurt subgroup. For pills, IMMUEPLUS colostrum pill

received a percentage premium of 29%, while colostrum was -15%, but insignificant.

Although IMMUNEPLUS yogurt received more premium than IMMUNEPLUS

colostrum pill, the positive and significant willingness-to-pay estimates suggest that there is a

general consumer interest in IMMUNEPLUS dairy products, and consumers are willing to pay a

premium for them. The percentage premium of the IMMUNEPLUS yogurt could be higher than

IMMUNEPLUS colostrum pill due the ease of consuming yogurt. However, the positive

willingness to pay for both pill and yogurt implies that there is a potential market for

IMMUNEPLUS dairy products

Further investigation about the sources of heterogeneity was made by incorporating

sociodemographic variables. It was revealed that participants above the age of sixty were less

receptive to both yogurt and pills, compared to those below the age of thirty years. Also,

individuals who had children below the age of fifteen in their household had positive attitude

towards yogurt and pills. Other variables that were found to significantly influence respondents'

choice of yogurt include gender, education, and income. In comparison to females, males were

less receptive to yogurt. Individuals who had below high school certificate or had graduate

degrees were less receptive to yogurt. Low-income earners were not also receptive to yogurt.

Lastly, the findings from this study revealed that individuals who normally consume functional foods receive disutility from choosing pill, and those who normally consume nutraceuticals also received disutility from choosing yogurt.

Chapter 7: Conclusion

The dairy industry continues to launch new products on the market. Recently, there was an opportunity to develop immunity enhanced products to grow the market. The products are known as IMMUNEPLUS colostrum and early milk. They are made up of more than the basic compounds and nutrients that are present in the conventional colostrum and early milk, which may have the potential of boosting the human immune health. However, there has been an inconsistent change in consumer preferences for milk and dairy products in Canada. Therefore, the current research aims to find out if there is a potential market for IMMUNEPLUS dairy products and how much consumers may be willing to pay for them.

IMMUNEPLUS dairy products are not yet on the market but will possibly be produced either in the form nutraceuticals or as functional foods; So, consumer preferences were examined based on the two forms, through discrete choice experiments. Yogurt, which was the functional food examined, had two attributes: price and product types. The product types were probiotics, conventional, IMMUNEPLUS and IMMUNEPLUS yogurts. Pill was used to represent the nutraceutical category, which had two attributes: price and product type. The product attribute includes conventional immune pills, colostrum pills and IMMUNEPLUS colostrum pills. The two groups (pills and yogurt) were examined separately, in a conditional logit model. Price attribute was estimated in each of the models to calculate marginal willingness-to-pay.

Findings from this study reveal that consumers are generally interested in IMMUNEPLUS dairy products. In line with past findings on nutraceuticals and functional foods, consumers are also willing to pay a premium for IMMUNEPLUS dairy products that are either in the nutraceutical form or as functional foods. In the Canadian context, there are limited studies

that have accounted for consumer preferences for functional foods and nutraceuticals distinctively. However, findings from the current study also show a clear distinction between preferences for nutraceuticals and functional foods.

7.1 Summary of findings

The findings from the current study confirm the findings of previous studies that consumer are willing to pay a premium for functional food and nutraceuticals (Hailu et al., 2009). What differentiates this study is that it was more specific to IMMUNEPLUS dairy products, and consumer preference for two forms (nutraceuticals and functional food) were examined distinctively. The conditional logit model adopted, identified that consumers are interested in IMMUNEPLUS dairy products in comparison to the different types of dairy products that already exist on the market. The premium estimated from conditional logit model for IMMUNEPLUS yogurt was higher than the premiums of probiotic and conventional yogurts. Similarly, premium estimated for IMMUNEPLUS colostrum pill was higher than colostrum pills. Generally, a positive utility was attached to consuming IMMUNEPLUS dairy products in Canada. The study also explored the potential sources of preference heterogeneity that may exist within the survey sample.

Hailu et al. (2009) used conjoint analysis to examine consumer preferences over attributes of functional foods and nutraceuticals, with probiotics being the functional compound of interest. The study identified three segments of consumers (pill lovers, yogurt lovers and pill loathers), and findings reveal that differences exist in their preferences for mode of delivery, health claims and health claim sources. The current study adds to this insight, by also distinguishing the preferences of the identified segments. Although the responsible factors are

not elicited, we find that consumers who are more interested in functional foods are less receptive towards pills, and those who are also more interested in nutraceuticals have a negative attitude towards yogurt. When the percentage premiums of pills and yogurt were compared, consumers are willing to pay a higher premium for yogurt. However, this does not clearly justify that consumers may prefer yogurt to pills, as findings show that consumer preferences for nutraceuticals are quite distinct from preferences for functional foods.

With regard to socio-economic and demographic characteristics, Ares & Gámbaro (2007) who examined the influence of gender, age, and motives of underlying food choice on perceived healthiness and willingness to try functional foods, suggest that the attractiveness of a product may differ by product. Findings from the study show that differences exist in the perception of healthiness and willingness to try functional foods, and a gender might find a product type more attractive than the other. Although only applicable to yogurt subgroup, we found that in comparison to women, more males have negative attitude towards yogurt. This is consistent with previous findings, but there was no noticeable difference observed for how males perceive different types of yogurt; they received a disutility from choosing any type of yogurt.

Education was another important determining factor. Individuals who have received low or no form of education, especially those without a high school certificate, showed less interest in both pills and yogurt. These findings confirm past studies that found that individuals who had least education have negative attitudes towards health promoting foods (Herath et al., 2008; Niva & Mäkelä, 2007). In the case of yogurt, individuals who have received graduate education also showed a negative attitude towards yogurt, in comparison to individuals who had bachelor's or an associate degree. This could be as a result of their exposure and may require more information about IMMUNEPLUS yogurt.

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Herath et al. (2008) also identified age as one of the factors that determine consumer choice of nutraceuticals and functional food. Older consumers were found to be more receptive to nutraceuticals and functional food. In contrast, we found younger individuals to be more receptive to pills, while older people significantly show a negative attitude towards pills. Ares & Gámbaro (2007) found that older individuals were less interested in trying iron enriched food, suggesting that functional foods may be targeted towards younger consumers, which supports findings from our study. However, conclusions cannot be made, since our study finds the claim true exclusively for pills, and not functional foods.

Presence of children that are under the age of fifteen years was one of the factors that determined consumers' interest in both pills and yogurt, which is consistent with a previous study that found parents who have children have more interest in functional foods, even if their level of familiarity with the product is very low (Annunziata et al., 2016). Another study also found that the presence of children in a household increases receptive to cancer-preventing dairy products (Maynard & Franklin, 2003). This may be an indication that the consumer segment with children in their household may be a potential target market for IMMUNEPLUS dairy products.

Previous studies identified the link between information and positive valuation of functional foods and nutraceuticals (Hailu et al., 2009; Markosyan et al., 2009; Teoh et al., 2021). Teoh et al. (2021) found information to be preferred by consumers, therefore suggested the need to inform consumers about clinical evidence of nutraceuticals. Hailu et al. (2009) also found that consumers who love pills place a higher value on health claims. Result from the current study also confirms these claims. Individuals who often check ingredient lists and nutritional information have a positive attitude towards pills and yogurt, respectively. This

suggests that they may be more health cautious and having information about IMMUNEPLUS dairy products may enhance consumer interest in them.

7.2 Implications

The fluctuating consumer preferences for dairy products in Canada may impact the demand for IMMUNEPLUS dairy products. This study focused on the demand aspect and examined consumer preferences and willingness to pay for two forms of IMMUNEPLUS dairy products in Canada. Findings from the study revealed that there is a distinction between the market for nutraceuticals and functional foods. However, consumers are willing to pay a premium for IMMUNEPLUS dairy products, either in the nutraceutical form or as functional foods. More importantly, we found that there is a potential demand for IMMUNEPLUS dairy products in Canada.

Evidence from this study provides information that may be useful in assisting SEMEX and other dairy companies in making informed decisions pertaining to the marketing strategies of IMMUNEPLUS dairy products. Young individuals and individuals who have children present in their households are more likely to be the right candidates for IMMUNEPLUS dairy products. Thus, products that are children friendly may be targeted towards children. Low-income earners, individuals with lower degree or graduate degree and males may be better candidates for IMMUNEPLUS colostrum pills, since they are less receptive to IMMUNEPLUS yogurt.

In this study, we also found that consumers are sensitive to information regarding ingredient list and nutritional information. Consumers who check ingredient list and nutritional information showed interest in IMMUNEPLUS dairy products. This implies that the knowledge of the ingredients used and associated health claims of IMMUNEPLUS dairy products, may

stimulate consumers' interest. Although conclusions cannot be made and more research is required, communicating nutritional claims with consumers might be a useful strategy for SEMEX to drive the demand for their products.

7.3   Limitation of the research

One of the disadvantages of using stated choice preference data is that it is subject to potential hypothetical bias, which makes survey participants overstate their willingness-to-pay for a particular product. Since IMMUNEPLUS dairy products are not yet on the market, a stated choice preference survey was used to collect data, which implies that the findings from the current study may be subject to potential hypothetical bias. As a result, respondents might have overstated the price they would normally pay, implying that willingness-to-pay may not portray the actual value consumers may pay in the real world.

The choice experiment design may also be a constraint. In order to reduce the complexity of the model used, the attributes of the products in the choice experiment were limited to two. Therefore, some other attributes (e.g., flavor, sizes, brand, etc.) that may influence consumer choice were not accounted for. The independent and identically distributed assumption on the unobserved part of utility enables analysts omit some attributes, however, the error terms may increase if several attributes are omitted. Also, some attributes may contain more levels than they did in the choice experiment. For example, probiotic yogurt could be strawberry or vanilla flavor, however, this was not differentiated in the design, implying that there may be an incomplete information on valuation.

Although it seems interesting to find out consumer preference for the combination of IMMUNEPLUS and probiotics yogurt; however, the product is additive, and respondents may be

confused on how best to place a value on the combination of the two products. Therefore, the marginal utility and willingness-to-pay estimations on IMMUNEPLUS and probiotics may not necessarily be the case in the real world.

7.4   Suggestions for Future Research

The current study accounts for the forms of IMMUNEPLUS dairy products that consumers may prefer based on only two forms, functional foods (yogurt), and nutraceuticals (pills). Findings obtained give an indication for what the market segments are, however, there is room for further research in understanding the heterogeneity that may exist better.

The markets for both forms are different, therefore, should be treated as such. Future research may evaluate consumer preferences by comparing different forms of functional foods, or different forms of nutraceuticals. For example, yogurt and milk may be compared in the case of functional foods, while powder and gummies as carriers of IMMUNEPLUS dairy products may be compared in terms of nutraceuticals.

It may also be of interest to evaluate preferences for IMMUNEPLUS dairy products by considering the existence of heterogeneity among different consumer segments. Consumer segmentation can be understood by evaluating each segment's willingness to pay. More information about consumer preferences can be obtained by examining other psychographic and sociodemographic characteristics of individuals in that segment. Also, the current study revealed that consumers value information. Future research may also present survey participants with different levels of information about IMMUNEPLUS. This is important because it will reveal how information about IMMUNEPLUS dairy products may affect the preferences of the interested segments.

In order to reduce potential hypothetical bias, future research may examine willingness-to-pay for IMMUNEPLUS dairy products by incorporating real cash payment in the survey experimental design. Differences in the results from the experimental design involving real cash payment and this study can be compared, in order to have a more accurate valuation of IMMUNEPLUS dairy products.

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Appendix A: Sample of Survey

Q1 CONSENT TO PARTICIPATE IN RESEARCH

You are invited to participate in this survey conducted by faculty at the University of Guelph, Department of Food Agricultural & Resource Economics. The purpose of this form is to provide you with the information needed to make an informed decision about participating in this research. This research is funded by the OAC chair in food systems leadership.

The Researchers Principal Investigator: Michael von Massow, Department of Food, Agricultural and Resource Economics, University of Guelph, mvonmass@uoguelph.ca, 519-824-4120 ext. 56347. Other Investigator: Andrew Baynham, Department of Food, Agricultural and Resource Economics. If you have any questions or concerns about the research, please feel free to contact the principal investigator.

The purpose of this survey is to understand Canadian's attitudes toward food and food related issues that are relevant to the Canadian population. We will be asking questions related to a variety of food related issues throughout the survey. If you agree to participate in this study, we will ask you to do the following things: If at any point through the survey you do not feel comfortable answering a question or would rather not answer the question, please leave that response area blank. Completing the experimental procedure should take 15 minutes, however there are no time restrictions, and you make take as long as you like to complete the survey.

If you respond to this survey using a public computer, we recommend you ensure your confidentiality by taking the following precautions to clear all private data from the computer you are using to respond to the survey: Clear the browsing history, Clear the cache, Clear the cookies, Clear the authenticated session, and LOG OFF. If you are using Internet Explorer, the first 4 steps can be accomplished by going to Tools and selecting Delete Browser History. Your browser application may have a similar system to remove potentially identifying personal information.

There are no risks to you when participating in this project. The survey is anonymous and does not collect any identifying information. This survey is run through your panel provider, and they or their subsidiary will provide direct compensation for taking the survey. There are no additional benefits to you the participant from taking this survey. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind by closing your browser. By participating in this survey, you are contributing to research that will be used to improve the understanding of how consumers make decisions when shopping.

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. The survey is anonymous and therefore not linked to your personal information. Due to the lack of individual identifiers in the data, upon completion of the survey, there is no way to remove your responses from the data set. The investigator may withdraw you from this research if circumstances arise that warrant doing so.

This project has been reviewed by the Research Ethics Board for compliance with federal guidelines for research involving human participants. You do not waive any legal rights by

agreeing to take part in this study. If you have any questions regarding your rights and welfare as a research participant in this study (REB #20-01-10) please contact: Manager, Research Ethics, University of Guelph, reb@uoguelph.ca, 519-824-4120 ext. 56606.

No individual identifiers will be attached to the survey data. Your responses on the survey will be anonymized. Please note that confidentiality cannot be guaranteed while data are in transit over the internet. After the survey has concluded, the raw data collected will only be available to the researchers associated with the University of Guelph: the primary investigator (Michael von Massow) and the other investigator (Andrew Baynham). All data will be stored on an encrypted computer.

Exclusion Criteria: Relationship with researchers - no participants with a professional or personal relationship with the researchers will be allowed to participate in the research.

Inclusion Criteria: fluent in English or French, Canadian resident, 18 Years or older. SIGNATURE OF RESEARCH PARTICIPANT: if you have the information provided for the study "Annual food issues survey" as described herein, and your questions have been answered to your satisfaction, please answer the following question:

Do you agree to participate in the research outlined above?

○ Yes, I understand the consent form and agree to participate

○ No

Skip To: End of Block If CONSENT TO PARTICIPATE IN RESEARCH   Food issues survey You are invited to participate in this survey... = No

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Q3 To understand how responses vary across Canada, please select the province/region in which you live.

○ Alberta

○ British Columbia

○ Manitoba

○ New Brunswick

○ New foundland and Labrador

○ Northwest Territories

○ Nova Scotia

○ Nunavut

○ Ontario

○ Prince Edward Island

○ Quebec

○ Saskatchewan

○ Yukon

Q4 Please, select the category that includes your age.

○ Under 18

○ 18-24

○ 25-30

○ 31-35

○ 36-40

○ 41-45

○ 46-50

○ 51-55

○ 56-60

○ 60+

Q5 I identify my gender as:

○ Female

○ Male

○ Prefer not to say

○ Neither

Q6 What is the highest level of school you have completed or the highest degree you have received?

○ Less than high school degree

○ High school graduate (high school diploma or equivalent including GED)

○ Some college but no degree

○ Associate degree(2-year)

○ Bachelor's degree(4-year)

○ Master's degree

○ Doctoral degree

○ Professional degree (JD, MD)

Q7 Have you looked at the new Canada Food Guide?

○ Yes

○ No

Q8 Do you drink milk?

○ Yes

○ No

Q9 Do you eat cheese?

○ Yes

○ No

Q10 If no, for what reason(s) do you not consume milk and/or cheese, please select all that apply?

☐ Dietary restrictions

☐ Taste preference

☐ Health

☐ Lactose intolerant

☐ Personal preference

☐ Vegan

Q11 Do you consume certain food or food related products with specific health benefits?

○ Yes

○ No

Q12 Which of the following do you consume? (select all that apply)

☐ Nutraceutical (such as multivitamins, fish pill oil; they are generally sold in medicinal forms and are not usually associated with food, but are demonstrated to have health benefits)

☐ Functional foods (Such as probiotic yogurt and oatmeal; they are demonstrated to have health benefits beyond their basic nutritional functions)

☐ Others (please specify)

Q13 Functional foods are consumed as part of a usual diet and are demonstrated to have physiological benefits beyond basic nutritional functions. Examples of functional foods are Probiotic yoghurt and

Vitamin-B fortified cereal.
Please indicate how much you agree with the following about functional foods.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
It is completely safe to eat them.	○	○	○	○	○
They can improve my health.	○	○	○	○	○
I would buy more if they were affordable.	○	○	○	○	○
I consume functional foods to boost my immunity.	○	○	○	○	○
I can compromise on the taste of food if they are healthy.	○	○	○	○	○
They could have some side effects if consumed in excess.	○	○	○	○	○
I do not like to eat foods that feel like medicine.	○	○	○	○	○

IMMUNE PLUS dairy products are produced from the colostrum and early milk of dairy animals, which test high in immune responsiveness. Colostrum from dairy cows is the milk secreted after the birth of a new calf within the first few days, which has high levels of protein and immune enhancing components that support health. Although, colostrum and early milk are generally high in several immune boosting properties, IMMUNE PLUS dairy products contain a higher level of those properties.
In order for you to access these immune benefits from early milk, it will be delivered to you as a flavored yoghurt.

Even though IMMUNE PLUS yoghurts are not yet on the market, we would like you to answer the next set of questions as if you were actually making this choice with the product available.

Q14 Would you consume IMMUNE PLUS yoghurt?

○ Definitely will

○ Probably will

○ Might or might not

○ Probably will not

○ Definitely will not

Q15 Which of the following reasons would prevent you from consuming it? (please, select all that apply)

☐ Health

☐ Vegan

☐ Dietary restrictions

☐ Lactose intolerant

☐ Taste preference

☐ Cost

☐ I don't know enough about the product

☐ Personal preference

☐ Others (please specify)

Q16 If there were other alternatives, which of the following would you choose? (select all that apply)

☐ Milk

☐ Cheese

☐   Flavored drink

☐   Ice cream

☐   Pills

Q17 Rank the top five factors you would consider if you were to purchase IMMUNE PLUS dairy products (1 is the most important and 5 is the fifth most important).

To rank the factors below, please fill the associated boxes.

_____ Nutritional benefits
_____ Taste
_____ Brand
_____ Cost
_____ Convenience
_____ Safe for kids
_____ Availability
_____ Approved by the government
_____ Recommended by family / friends
_____ Recommended by a physician

Q18 Again, we would like to ask you some questions about some of the factors that might influence your decision to purchase IMMUNE PLUS yoghurt. All the yoghurt products you will encounter below are in 650-gram packages. Whether or not you currently take yoghurts to boost your immunity, we would appreciate that you complete the following choice comparisons below.
Although the purchase decision in this part of survey is hypothetical, we would like you to answer the following set of questions like you would, if you were to make an actual purchase decision involving a real cash payment. Also, we would like you to keep in mind your interest in this product, how much you would normally pay for such a product and how much you generally spend on food.
In order to answer the following questions accurately, please carefully read the following definitions.
  IMMUNE PLUS yoghurt: It contains IMMUNE PLUS colostrum, which has a higher concentration of compounds that boost immunity. Probiotics Yoghurt: It contains probiotic, which is made up of healthy bacteria that are beneficial to the body. Conventional yoghurt: it is made with basic yoghurt ingredients and may not provide other benefits. Probiotics and IMMUNE PLUS yoghurt: It consists of the combination of probiotics and IMMUNE PLUS colostrum.

Q19 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B. $3.49/650g	I would not choose any of these products
	Conventional	Immune plus	Neither

I would choose	○	○	○

Q20 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B. $3.84/650	I would not choose any of these products
	Conventional	Immune plus	Neither
I would choose	○	○	○

Q21 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B. $5.24/650g	I would not choose any of these products
	Conventional	Immune plus	Neither
I would choose	○	○	○

Q22 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B. $4.19/650g	I would not choose any of these products
	Conventional	Immune plus	Neither
I would choose	○	○	○

Q23 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B. $3.84/650g	I would not choose any of these products
	Probiotics	Immune plus and probiotics	Neither
I would choose	○	○	○

Q24 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B.$5.24/650g	I would not choose any of these products
	Probiotics	Immune plus and probiotics	Neither
I would choose	○	○	○

Q25 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A.$3.49/650g	Yoghurt B. $4.19/650g	I would not choose any of these products
	Probiotics	Immune plus and probiotics	Neither
I would choose	○	○	○

Q26 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $5.24/650g	Yoghurt B. $3.49/650g	I would not choose any of these products

	Immune plus and probiotics	Immune plus	Neither
I would choose	○	○	○

Q27 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.84/650g	Yoghurt B. $3.49/650g	I would not choose any of these products
	Immune plus and probiotics	Immune plus	Neither
I would choose	○	○	○

Q28 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B. $3.49/650g	I would not choose any of these products
	Probiotics	Immune plus	Neither
I would choose	○	○	○

Q29 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B. $3.84/650g	I would not choose any of these products
	Probiotics	Immune plus	Neither
I would choose	○	○	○

Q30 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B.$5.24/650g	I would not choose any of these products
	Probiotics	Immune plus	Neither

I would choose	○	○	○

Q31 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B.$5.24/650g	I would not choose any of these products
	Probiotics	Immune plus	Neither
I would choose	○	○	○

Q32 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B. $4.19/650g	I would not choose any of these products
	Probiotics	Immune plus	Neither
I would choose	○	○	○

Q33 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A.$3.49/650g	Yoghurt B. $3.98/650g	I would not choose any of these products
	Conventional	Immune plus and probiotics	Neither

I would choose   ○   ○   ○

Q34 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B. $5.24/650g	I would not choose any of these products
	Conventional	Immune plus and probiotics	Neither
I would choose	○	○	○

Q35 Suppose you learn different immune boosting yoghurts are being sold in the stores near you, which product, if any, would you purchase?

	Yoghurt A. $3.49/650g	Yoghurt B. $4.19/650g	I would not choose any of these products
	Conventional	Immune plus and probiotics	Neither
I would choose	○	○	○

Q36 Nutraceuticals are products that are generally sold in medicinal forms and are not usually associated with food but are demonstrated to have health benefits. Examples of nutraceuticals are Multivitamins and fish oil pills.

Please indicate how much you agree with the following about Nutraceuticals.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
It is completely safe to eat them	○	○	○	○	○
They can help to improve my health	○	○	○	○	○
I would buy more if they were affordable	○	○	○	○	○
I consume them to boost my immunity	○	○	○	○	○
I can compromise on the taste if they are healthy	○	○	○	○	○
They can have some side effects if consumed in excess	○	○	○	○	○
I don't like products that feel like medicine	○	○	○	○	○

IMMUNE PLUS dairy products are produced from the colostrum and early milk of dairy animals, which test high in immune responsiveness. Colostrum from dairy cows is the milk secreted after the birth of a new calf within the first few days, which has high levels of protein and immune enhancing components that support health. Although, colostrum and early milk are generally high in several immune boosting properties, IMMUNE PLUS dairy products contain a higher level of those properties.
In order for you to access these immune benefits from colostrum, it will be delivered to you in dry pill form.
Even though IMMUNE PLUS colostrum pills are not yet on the market, we would like you to answer the next set of questions as if you were actually making this choice with the product available.

Q37 Would you take an IMMUNE PLUS colostrum pill?

◯ Definitely will

◯ Probably will

◯ Might or might not

◯ Probably will not

◯ Definitely will not

Q38 What reason(s) would prevent you from taking it? (Please, select all that apply)

☐ Health

☐ Vegan

☐ Dietary restrictions

☐ Lactose intolerant

☐ Taste preference

☐ Cost

☐ I don't know enough about the product

☐ Personal preference

☐ Other (please specify)

Q39 If there were other alternatives, which of the following would you choose? (please, select all that apply)

☐ Milk

☐ Cheese

☐ Gummies

☐ Powder

☐ Flavored drink

☐ Yoghurt

Q40 Rank the top five factors you would consider if you were to purchase IMMUNE PLUS dairy products (1 is the most important and 5 is the fifth most important).

To rank the factors below, please fill the associated boxes.

_____ Nutritional benefits
_____ Taste
_____ Brand
_____ Cost
_____ Convenience
_____ Safe for kids to consume
_____ Availability
_____ Recommended by family or friends
_____ Recommended by a physician
_____ Approved by the government

Choice Experiment

Again, we would like to ask you questions about some of the factors that might influence your decision to purchase IMMUNE PLUS colostrum pills. In each package you will encounter below, there are 90 pills. Whether or not you currently take immune boosting pills, we would appreciate that you complete the following choice comparisons below.

Although the purchase decision in this part of survey is hypothetical, we would like you to answer the following set of questions like you would if you were to make an actual purchase decision involving a real cash payment. Also, we would like you to keep in mind your interest in this product, how much you would normally pay for such a product and how much you generally spend on food.

In order to answer the following questions accurately, please carefully read the following definitions.

IMMUNE PLUS colostrum pill: It contains IMMUNE PLUS colostrum, which has a higher concentration of components that strengthen the body's immune system.
Colostrum pill: It is made up of colostrum, which is demonstrated to strengthen the body's immune system.
Conventional pill: It is an immune boosting pill that does not contain colostrum, but it is demonstrated to strengthen the body's immune system.

Q41 Suppose you learn that different immune boosting pills are being sold in the stores near you, which product, if any, would you purchase?

	Pill A. $59.56/90 pills $0.66/pill	Pill B. 119.12/90 pills $1.32/pill	I would not choose any of these products
	Colostrum	Immune plus colostrum	Neither
I would choose	○	○	○

Q42 Suppose you learn that different immune boosting pills are being sold in the stores near you, which product, if any, would you purchase?

	Pill A. $59.56/90 pills $0.66/pill	Pill B. $65.52/90 pills $0.72/pill	I would not choose any of these products
	Colostrum	Immune plus colostrum	Neither
I would choose	○	○	○

Q43 Suppose you learn that different immune boosting pills are being sold in the stores near you, which product, if any, would you purchase?

	Pill A. $59.56/90 pills $0.66/pill	Pill B. $71.47/90 pills $0.79/pill	I would not choose any of these products
	Colostrum	Immune plus colostrum	Neither
I would choose	○	○	○

Q44 Suppose you learn that different immune boosting pills are being sold in the stores near you, which product, if any, would you purchase?

	Pill A. 23.31/90 pills $0.25/pill	Pill B. $34.97/90 pills $0.38/pill	I would not choose any of these products
	Conventional	Immune plus colostrum	Neither
I would choose	○	○	○

Q45 Suppose you learn that different immune boosting pills are being sold in the stores near you, which product, if any, would you purchase?

	Pill A. $59.59/90 pills $0.66/pill	Pill B. $89.34/90 pills $0.99/pill	I would not choose any of these products
	Colostrum	Immune plus colostrum	Neither
I would choose	○	○	○

Q46 Suppose you learn that different immune boosting pills are being sold in the stores near you, which product, if any, would you purchase?

	Pill A. $23.31/90 pills $0.25/pill	Pill B. 46.62/90 pills $0.51/pill	I would not choose any of these products
	Conventional	Immune plus colostrum	Neither
I would choose	○	○	○

Q47 Suppose you learn that different immune boosting pills are being sold in the stores near you, which product, if any, would you purchase?

	Pill A. $23.31/90 pills $0.25/pill	Pill B. $27.98/90 pills $0.31/pill	I would not choose any of these products
	Conventional	Immune plus colostrum	Neither
I would choose	○	○	○

Q48 Suppose you learn that different immune boosting pills are being sold in the stores near you, which product, if any, would you purchase?

	Pill A. 23.31/90 pills $0.25/pill	Pill B. $25.64/90 pills $0.28/pill	I would not choose any of these products
	Conventional	Immune plus colostrum	Neither
I would choose	○	○	○

Q49 Are you a parent?

○ Yes

○ No

Q50 Specify the age range of the child/children living with you, who is/are under the age of 18 years. (Please, select all that apply)

- [ ] 0 - 4 years?

- [ ] 5 - 9 years

- [ ] 10 - 14 years

- [ ] 15+

Q51 Would you also introduce IMMUNE PLUS dairy products to your child/children?

- ○ Definitely will

- ○ Probably will

- ○ Might or might not

- ○ Probably will not

- ○ Definitely will not

Q52 Which of the following forms would your child/children prefer? (please, select all that apply)

- [ ] Cheese

- [ ] Ice cream

- [ ] Milk

- [ ] Pills

- [ ] Flavored drinks

- [ ] Yoghurt

Q53 Which of the following forms would you prefer for your child/children? (please, select all that apply)

- [ ] Cheese

- [ ] Ice-cream

☐ Milk

☐ Pills

☐ Flavored drinks

☐ Yoghurt

Q54 How often do you look at the nutrition information on the products you purchase?

○ Always

○ Most of the time

○ About half the time

○ Rarely

○ Never

Q55 How often do you look at the ingredient list on the products you purchase?

○ Always

○ Most of the time

○ About half the time

○ Rarely

○ Never

Q56 Which do you most often see/are most familiar on the products you purchase? (select all that apply)

☐ Best before dates

☐ Sell by dates

☐ Expiry dates

☐ Taste guaranteed until

☐   Packaged on

☐   Prepared on

☐   Freeze by

☐   Manufactured on

☐   None

Q57 Are expiration dates the same as best before dates?

○ Yes

○ Maybe

○ No

Q58 Do you plan on reducing your animal protein consumption in the next six months?

○ Significantly (50%>)

○ Somewhat significantly

○ Very little

○ Not at all (0%)

Q59 Do you usually check flyers when shopping?

○ Yes

○ No

Q60 Where do you check flyers?

☐ In-store

☐ Mailers

☐ Phone apps (Online)

☐ Other

Q61 Please identify the choice that best describes you:

○ Vegan

○ Vegetarian

○ Pescatarian

○ Meat minimalist

○ Flexitarian

○ Omnivore

○ Don't know

Q62 Please, rank the following reasons for eliminating meat from your diet as they apply to you:

_____ Animal welfare
_____ Environmental impact
_____ Health/Nutrition
_____ Religious
_____ Personal preference
_____ Others

Q63 Information about income is very important to understand. Would you please give your best guess? Please indicate the answer that includes your entire household income in (previous year) before taxes.

○ Less than $25,000

○ $25,000 to $49,999

○ $50,000 to $74,999

○ $75,000 to $99,999

○ $100,000 to $124,999

○ $125,000 or more