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To cite this article: N S S B M J Seriger *et al* 2022 *IOP Conf. Ser.: Earth Environ. Sci.* **1102** 012057

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Consumption pattern of dairy products in Sabah, Malaysia during Covid-19

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Abstract. Dairy production has a considerable effect on climate change due to emissions of greenhouse gases, but dairy products are meals that are well-known for their pleasant taste and nutritional value. During the Covid-19 outbreak, there were shortages of dairy goods on the shelves of grocery stores. This study investigated the consumption patterns of dairy products in Sabah. Using a pre-tested questionnaire, data were collected through online survey during Covid-19 outbreaks from 64 households comprising 16 from rural, 25 from town and 23 from city areas. The surveyed households were classified into 5 groups based on monthly household income: (i) ≤RM2000, (ii) RM2001-RM3000, (iii) RM3001-RM4000 and (iv) >RM4000. Among the participated households, 75% of respondents were female and 25% were male. There was a significant relationship among household income groups for fresh milk consumption. Regardless of areas and household incomes, the average monthly consumption for evaporated milk, fresh milk, condensed milk, powder milk, sweetmeats, yogurt, butter and ice cream per household were 1018g, 1425ml, 978g, 815g, 527g, 468g, 522g, and 650g, respectively. 28% of respondents monthly consumed 0.5-1.0 L fresh milk per household. 42%, 39%, 39%, 63%, 58%, 64% and 50% of respondents-- respectively-- monthly consumed evaporated milk, condensed milk, powder milk, sweetmeats, yogurt, butter and ice cream, where the amount of each component was not more than 500g per household. Results showed that 38% of respondents liked more on butter followed by cheese (30%), yogurt (20%), cream (9%) and condensed milk (3%). The 25% and 45% of respondents had reduced their consumption and expenditure behaviour, respectively. Results indicated that individual of city areas consumed more dairy products. Although cows add methane to our environment, organic dairy farming and husbandry methods can significantly reduce greenhouse gas emission.

1. Introduction

The eating and purchasing behaviour of people who consume milk and dairy products are influenced by a variety of circumstances, including the income of family members, the location of the family, natural calamities and infectious diseases, and economic needs [1, 2]. A major element influencing the consumption and purchase of milk and dairy products is the household income. Households add more dairy products to their diets when their income rises [1]. As a result of religious, cultural, and ethnic diversity, the intake of milk and dairy products may not be always balanced across the board for all Sabahans, because food selection among people can be influenced by the religious, cultural and ethnic



diversity [3]. It can be observed that some individuals who live in remote areas of the interior do not consume milk as part of their daily diet, instead relying on forest and river goods instead. Additionally, there are Sabahans that live far away from the island and rely solely on ocean resources for their daily sustenance and nutrition (personal communication).

Malaysian Government is focusing on increasing self-sufficiency level by growing domestic dairy industry. To achieve, the dairy industry must focus not only on increasing production capacity, but also on developing a consumer-focused value chain [4]. There have been a few studies on consumer behaviour in relation to dairy product consumption in Sabah, Malaysia [2]. Therefore, the aim of this study was to identify the pattern of milk and dairy product consumption across different household incomes in different locations, namely rural, town and city areas when the Covid-19 pandemic hit. Dairy farm businesses will benefit from this study because it will provide them with information on the current situation of milk consumption in the state of Sabah. With this, it will be possible to boost the production of milk and dairy products in order to meet the demands and aspirations of consumers.

2. Methodology

2.1. Study site and experimental design

Keeping in view with the objectives of this study, a questionnaire was prepared to record the desired information from the consumers. A total of 64 consumers were participated in this survey, and this survey was conducted online via social media channels in September-November 2021. The sample technique used in an online survey was random sampling technique. Respondents were required to be familiar with their household's food shopping and purchasing behaviour. The potential respondents were at least 18 years of old and head of household. A quantitative and qualitative research strategy was employed to collect data regarding consumer's purchasing behaviour and preferences for milk and dairy products from respondents. The independent variable was the income level groups (\leq RM2000, RM2001-RM3000, RM3001-RM4000 and $>$ RM4000), as well as the geographic locations (rural area vs. town area vs. City area). Consumption patterns of milk and dairy products such as liquid milk, fresh milk, condensed milk, powder/formula milk, sweetmeats, yoghurt, butter and ice cream were the independent variables. Distribution of 64 participants according to areas and income levels is shown in Table 1. The original questionnaire was written in English, and then was translated to Bahasa Melayu to be understandable to respondents. The questions in the questionnaire were based upon our theoretical framework and divided into few dimensions: demographic characteristics, consumption and purchasing behaviour.

Table 1. Distribution of participants according to areas and income levels.

Income group	Area			Total
	Rural	Town	City	
1. \leq 2000	10	12	11	33
2. 2001 – 3000	3	6	6	15
3. 3001 – 4000	3	3	3	9
4. $>$ 4000	-	4	3	7
Total	16	25	23	64

2.2. Data analysis

The values of mean and percentage for each parameter were calculated, as well as standard deviation (SD) was determined using SPSS. Analysis of variance was performed to find significant difference among the different income levels. Mean comparisons were conducted using the Duncan Multiple Range Test at $p < 0.05$.

3. Results and discussion

3.1. Demographics of respondents

Results from this survey represent that 75% of the respondents were female and 25% were male. Females were more likely than males to respond to online surveys, because it is customary in Sabah for women to purchase household necessities and they are aware of which dairy products their family members consume on a monthly basis. Male may answer back to web-based surveys in higher proportions than female, according to some studies [5], whereas other studies reported that women respond in greater proportions than men [6]. Table 1 shows that 39.1%, 35.9% and 25% of respondents in this survey lived in the town, city and rural areas, respectively. About 52% of respondents had less than or equal to RM2000 income followed by RM2001-RM3000 (23%), RM3001-RM4000 (14%) and more than RM 4000 (11%). Average resident of Sabah can only earn a subsistence level of income and limited buying behaviour among the people due to low family income. Increasing household income, according to the findings, is associated with a higher likelihood of fresh milk consumption. The findings of previous studies demonstrated that income is a significant factor in determining whether or not to purchase fresh milk [7]. About 51% of respondents had an educational level in Bachelor’s degree and/or higher education followed by 30% in SPM, 11% in diploma, 3% in UPSR and 5% in other levels of education.

Household size ranged from 2 to “more than 20” family members per household, though the vast majority (86%) fell in the range of 6 to 20 members. Having said that, 11% of respondents reported a household size of “more than 20.” The variation in household sizes depended on the village and compound.

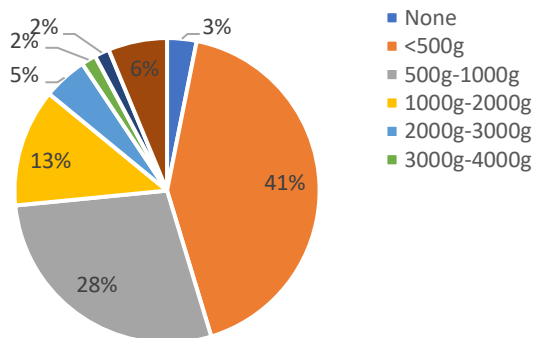


Figure 1. Percentage of respondents who monthly consumed evaporated milk.

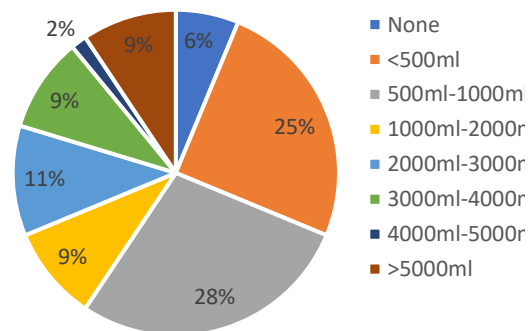


Figure 2. Percentage of respondents who monthly consumed fresh milk.

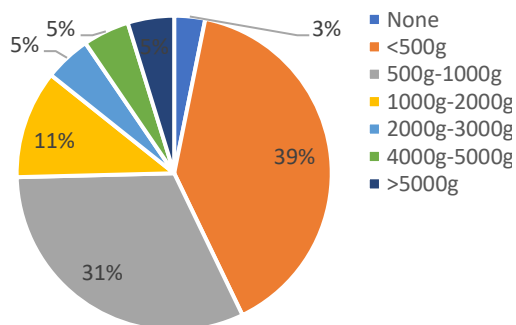


Figure 3. Percentage of respondents that monthly consumed condensed milk.

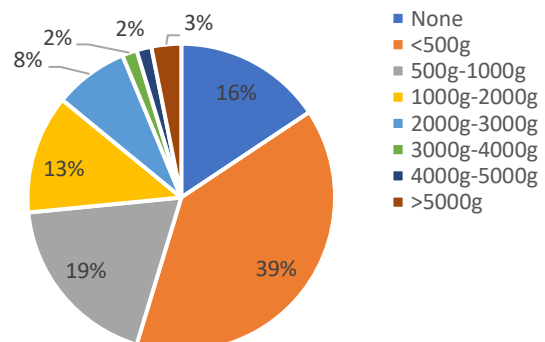


Figure 4. Percentage of respondents that monthly consumed powder milk.

3.2. Consumption pattern of milk and dairy products

Figure 1 shows the monthly consumption of evaporated milk. It was found that 3% of respondents did not consume evaporated milk. According to the information gathered from the survey, the people of Sabah consumed less evaporated milk than the rest of the world. As shown in Figure 2, 28% of respondents monthly consumed 0.5-1.0L of fresh milk followed by <0.5L (25%), 2.0-3.0L (11%), 1.0-2.0L (9%), 3.0-4.0L (9%) and >5.0L (9%). Only 2% of respondents monthly consumed 4.0-5.0L fresh milk, while 6% of respondents did not consumed fresh milk.

As shown in Figure 3, only 3% of respondents did not consume condensed milk. Condensed milk is frequently chosen by the people of Malaysia as a sugar alternative in the production of beverages such as tea, juice, and coffee [8]. Since powder milk is expensive in the market, some people who live in poverty and whose breast milk supply is diminishing utilise condensed milk as a substitute for breast milk. Sugar-sweetened condensed milk should not be given to young children (1-3 years old) if the goal is to promote their growth and development [9], because it has minimal nutritional value with high sugar concentration. 16% of respondents did not consume powder milk (Figure 4). Many parents often buy powder milk based on popularity and affordability, without considering the benefits inherent in it [10].

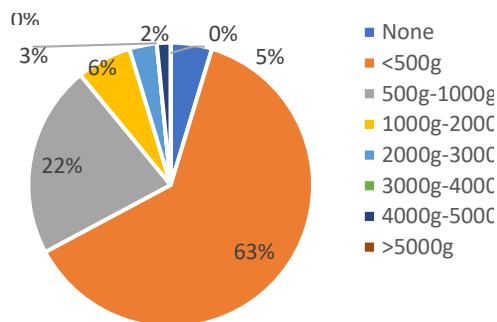


Figure 5. Amount of monthly sweetmeats consumption by respondents (%).

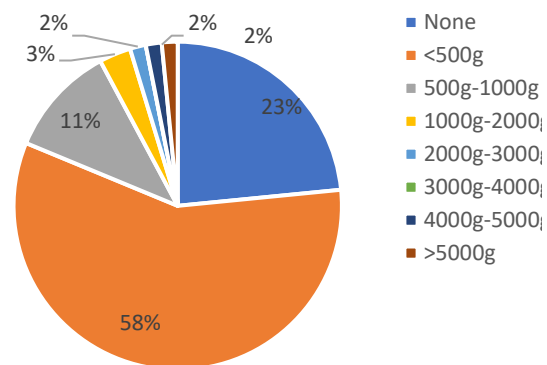


Figure 6. Amount of monthly yoghurt consumption by respondents (%).

Figure 5 shows that 5% of respondents did not consume sweetmeats. The use of sweets is less of a concern for some Sabahans due to rumours that believe that eating a lot of sweets can cause diabetes. It is really uncommon to find someone who does not enjoy sweetmeats, as they are foods that are high in sugar and often contain milk [11]. 23% of respondents did not consume yogurt (Figure 6), which indicates that many respondents consume less or do not consume yoghurt, despite the fact that numerous media outlets promote the advantages of yogurt and that many new products have been introduced by producers. Some parents believe that yogurt is just a nutritious food for children; nevertheless, when adults consume it, they receive a significant amount of nutrients. Adult yogurt drinkers had lower weight, body mass index, and waist circumference than non-consumers, and yoghurt intake was found to be substantially linked with reduced chances of being overweight or obese, as well as lower odds of having an increased waist circumference, when compared to non-consumers [12].

As shown in Figure 7, about 5% of respondents did not consume butter. Findings of this study showed that the people of Sabah use less butter in their cooking because they are overly reliant on the cooking oil accessible on the market. Furthermore, the cost of butter is costly. This study also shows that 9% of respondents did not consume ice cream for their household members (Figure 8). The consumption of ice cream has decreased as a consequence of weather elements that vary according to the yearly season; yet, ice cream is frequently the preferred dessert of the people of Sabah during the summer.

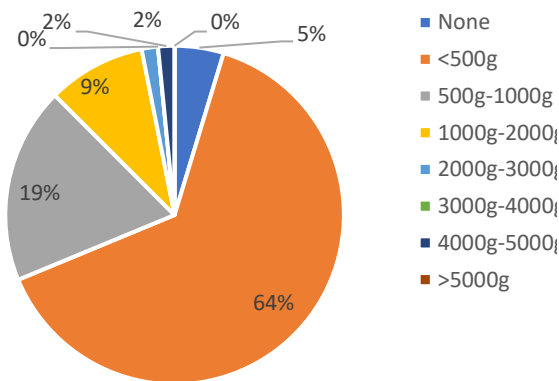


Figure 7. Amount of monthly butter consumption.

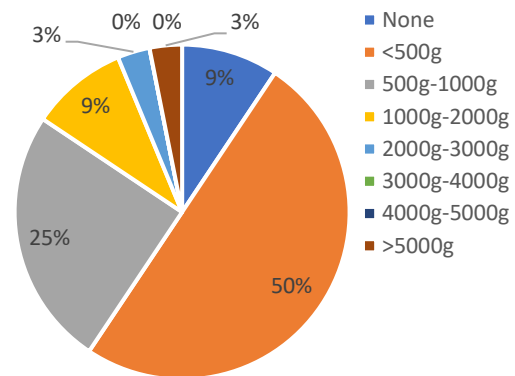


Figure 8. Amount of monthly ice cream consumption.

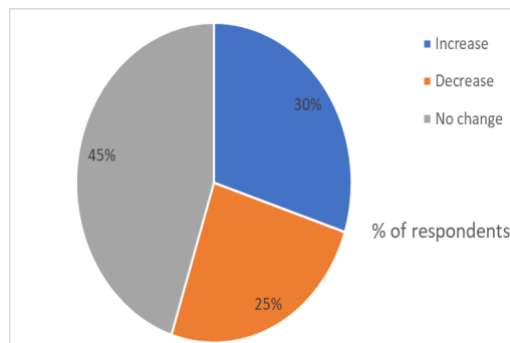


Figure 9. Changes in consumption of milk and dairy products in the last 2 years.

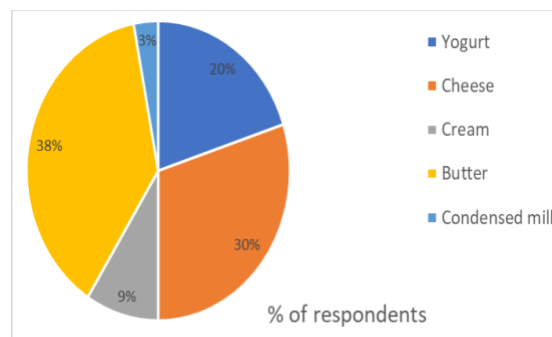


Figure 10. Percentage of dairy products that the respondent's family really likes to use.

3.3. Consumption behaviour during COVID-19 pandemic

Only 45% of respondents reported that there were no changes in consumption of milk and dairy products in the last two years, while 30% of respondents mentioned in increasing intake of milk and dairy products and 25% of respondents who reduced their milk and dairy product consumption (Figure 9). This demonstrates that even after the COVID-19 pandemic struck the country, half of the respondents in this survey continued to consume milk and dairy products on a regular basis in their normal lives. Respondents who increased their milk consumption during the COVID-19 pandemic, because everyone in the family stayed at home and carried out a lot of activities in the kitchen such as baking and cooking foods that included dairy products. Xu et al. [13] observed that covid-19 had resulted in a decrease in the overall consumption of dairy products in China. Figure 10 shows that most of the respondents (38%) liked butter followed by cheese (30%), yoghurt (20%), cream (9%) and condensed milk (3%). Lordan [14] reported that nutritional trends in western societies indicated that full-fat dairy product consumption is decreasing, whereas low-fat dairy product consumption is increasing in general.

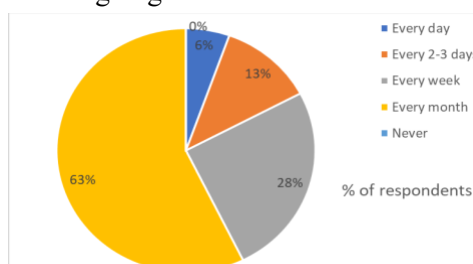


Figure 11. Percentage of purchasing frequency on milk and dairy products by respondents (%).

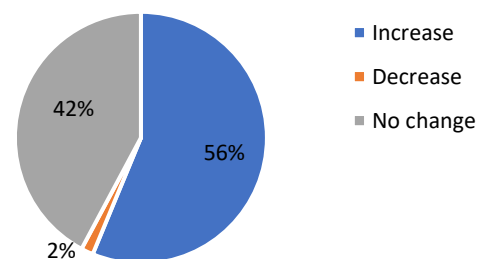


Figure 12. Percentage of changes in price on milk and dairy products during the Covid-19.

Figure 11 shows that 53%, 28%, 13% and 6% of respondents purchased milk and dairy products once a month, once a week, once for every 2-3 days and every day, respectively. 56% of respondents indicated that they anticipate an increase in price of milk and dairy products, and 42% of respondents anticipate a steady price, and 2% of respondents anticipate a decrease in price during the covid-19 outbreaks (Figure 12). During Covid-19 outbreaks, the raising of price might be caused by the closing of entrance and departure points between foreign nations, which resulted in a lack of dairy goods on the market, which led in a price increase. Aside from that, grocery shops near the houses of respondents who live in the rural are offering more costly dairy goods as a result of the higher expenses of transportation to move supplies from the city centre to the countryside.

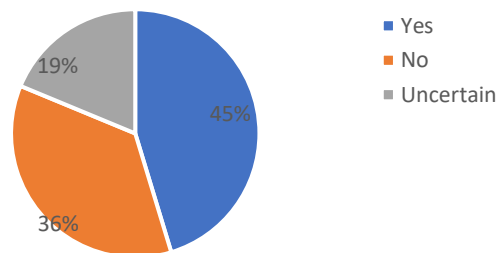


Figure 13. Percentage of respondents who reduced, did not reduce or were uncertain in their milk and dairy product purchase budgets during the Covid-19 outbreaks.

Almost half of those who answered the question mentioned that they cut down on their dairy product spending (Figure 13). This might be related to the fact that when covid-19 epidemic occurs, Sabah residents were frugal with their funds since the majority of Sabah people are self-employed. Because of the movement control orders issued during the Covid-19 epidemic, many Sabah people were unable to earn an income. As a result, this issue had an impact on the behaviours of respondents, who reduced their budget for the purchase of dairy products.

Table 2. Mean of the consumption of dairy products based on different income levels.

Parameter	Income level (mean \pm standard deviation)				Average	p-value
	\leq RM2000	RM2001- RM3000	>RM3001 – RM4000	>RM4000		
Evaporated milk (g)	1153 ^{ab} \pm 1236	571 ^a \pm 719	481 ^a \pm 237	1850 ^b \pm 2192	1018 \pm 1250	0.076
Fresh milk (ml)	1398 ^a \pm 1408	1160.71 ^a \pm 1333	750 ^a \pm 955	2864.29 ^b \pm 2270	1425 \pm 1527	0.038
Condensed milk (g)	1048 \pm 1345	907 \pm 1004	512 \pm 248	1307 \pm 1734	978 \pm 1233	0.626
Powder milk (g)	905 \pm 1286	675 \pm 597	500 \pm 621	1007 \pm 1103	815 \pm 1073	0.714
Sweetmeats (g)	576 \pm 679	578 \pm 496	271 \pm 116	478 \pm 328	527 \pm 567	0.572
Yogurt (g)	382 \pm 387	832 \pm 1574	271 \pm 116	392 \pm 304	468 \pm 801	0.284
Butter (g)	461 \pm 337	732 \pm 976	356 \pm 182	600 \pm 483	522 \pm 547	0.346
Ice cream (g)	670 ^{ab} \pm 844	532 ^{ab} \pm 484	281 ^a \pm 190	1207 ^b \pm 1716	650 \pm 879	0.215

^{ab} Means with different superscripts in a row differ significantly ($p < 0.05$).

As shown in Table 2, the average monthly consumption of evaporated milk, fresh milk, condensed milk, powder milk, sweetmeats, yogurt, butter and ice cream of various household incomes were 1018g, 1425ml, 978g, 815g, 527g, 468g, 522g, and 650g, respectively. Table 3 shows the highest monthly consumption of milk and dairy products was in city followed by town and rural areas. The mean monthly consumption of evaporated milk, fresh milk, condensed milk, powder milk,

sweetmeats, yogurt, butter and ice cream in the city areas were estimated at 1491g, 1576ml, 1485g, 1130g, 730g, 730g, 609g and 785g, respectively.

Table 3. Monthly consumption of milk and dairy products by respondents' household among different areas.

Parameter	Area (mean \pm standard deviation)			Average	p-value
	Rural	Town	City		
Evaporated milk (g)	675 \pm 558	802 \pm 788	1491 \pm 1792	1018 \pm 1250	0.070
Fresh milk (ml)	844 \pm 9123	1659 \pm 1686	1576 \pm 1638	1425 \pm 1527	0.212
Condensed milk (g)	738 ^a \pm 1162	668 ^a \pm 504	1485 ^b \pm 1656	978 \pm 1233	0.046
Powder milk (g)	378 \pm 258	806 \pm 896	1130 \pm 1461	815 \pm 1073	0.097
Sweetmeats (g)	365 \pm 159	446 \pm 269	730 \pm 870	527 \pm 567	0.091
Yogurt (g)	234 \pm 174	376 \pm 407	730 \pm 1230	468 \pm 801	0.124
Butter (g)	413 \pm 153	498 \pm 428	609 \pm 798	522 \pm 547	0.545
Ice cream (g)	434 \pm 257	664 \pm 962	785 \pm 1051	650 \pm 879	0.477

^{ab} Means with different superscripts in a row differ significantly ($p < 0.05$).

4. Conclusion

The major allocation of expenditure was devoted to powdered milk followed by ice cream, fresh milk and other dairy products. Only 25% and 45% of respondents had reduced their consumption and expenditure behavioural during Covid-19 outbreaks. Additionally, this study indicates that individual of the city areas consumed more milk and dairy products. As for the policy, it seems that the government should practice school milk programme which in turn are likely to help increase the dairy industry development in the country. The first limitation of this study is that this study was done only in the small population of Sabah. Expanding the study to include other cities and rural areas may present a more representative overview of the factors influencing change in Malaysian consumers' consumption of dairy products. Dairy animals add methane to our environment, but organic dairy farming and husbandry methods (e.g., effective manure management and rotational grazing) can significantly reduce methane production.

Acknowledgement

This research work was supported by internal grant (R/C19/A0700/0157A/002/2020/00776) of Universiti Malaysia Kelantan.

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