

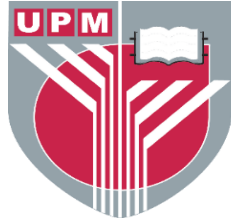


UNIVERSITI PUTRA MALAYSIA

***INFLUENCE OF MENU LABELLING ON THE CALORIES ORDERED
AMONG MALAYSIAN PUBLIC UNIVERSITY STUDENTS IN KLANG
VALLEY AND ITS ASSOCIATED FACTORS***

NURIN ADLYN BINTI AHMAD ROSLI

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FACULTY OF MEDICINE AND HEALTH SCIENCES UNIVERSITI

PUTRA MALAYSIA

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BY

NURIN ADLYN BINTI AHMAD ROSLI

A project submitted as a partial fulfilment of the requirement for the degree of Bachelor
of Science in Dietetics with Honours from the Faculty of Medicine and Health Sciences,
Universiti Putra Malaysia

This project entitled “Influence of Menu Labelling on the Calories Ordered Among Malaysian Public University Students in Klang Valley and its Associated Factors” was prepared by Nurin Adlyn binti Ahmad Rosli and submitted to the Faculty of Medicine and Health Sciences as a partial fulfilment of the requirement for the degree of Bachelor of Science in Dietetics with Honours from the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia



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ABSTRACT

INFLUENCE OF MENU LABELLING ON THE CALORIES ORDERED AMONG MALAYSIAN PUBLIC UNIVERSITY STUDENTS IN KLANG VALLEY AND ITS ASSOCIATED FACTORS

NURIN ADLYN BINTI AHMAD ROSLI

The prevalence of obesity and overweight among Malaysian university is increasing, which was proven to be associated with the habit of eating out. One way to help consumer choose healthier options is by providing menu labelling which is a list of calories and/or other nutritional information. The Malaysian government plans to enact a nationwide menu labelling law in 2025. Thus, this study was aimed to investigate the influence of menu labelling on the calories ordered among Malaysian public university students in Klang Valley and its associated factors. An online self-reported questionnaire via Google Form was used to collect the data. Study variables include socio demographic factors, BMI, health consciousness, attitude towards menu labelling, and calories ordered. Simple random sampling method was used where the participants answered either one of questionnaire with the calorie labelled menu or the non-calorie labelled menu. Participants were required to choose a lunch meal based on the menu provided. The calorie chosen was subtracted with their individual calorie needs to get the total calories ordered (calories difference). Total participants were 200 in which majority of them were Malay, female, normal weight, belonged to the M40 household income group, had good health consciousness (5.11 ± 1.16), and positive attitude towards menu labelling (5.83 ± 1.01). To conclude, there were no significant association for calories ordered between those exposed to a calorie labelled menu and those exposed to a non-calorie labelled menu. However, there was a significant association for BMI with calories ordered ($p < 0.001$). Even though more than half of them ate out every day in a week, majority reported never or rarely in using menu labelling. More research is required to assess effectiveness of menu labelling in curbing obesity, the readiness, and knowledge of the consumer to use menu labelling prior to the nationwide law.

ABSTRAK

PENGARUH PELABELAN MENU TERHADAP KALORI YANG DIPESAN DALAM KALANGAN PELAJAR UNIVERSITI AWAM MALAYSIA DI LEMBAH KLANG SERTA FAKTOR-FAKTOR YANG BERKAITAN DENGANNYA

NURIN ADLYN BINTI AHMAD ROSLI

Kadar obesiti dan berat badan berlebihan dalam kalangan pelajar universiti di Malaysia sedang meningkat, dan ia terbukti berkait rapat dengan tabiat makan di luar. Salah satu cara untuk membantu dalam memilih makanan yang lebih sihat adalah dengan menyediakan pelabelan menu yang merupakan senarai kalori dan/atau maklumat pemakanan. Tambahan lagi, kerajaan Malaysia merancang untuk menggubal akta pelabelan menu yang akan berkuat kuasa pada 2025. Kajian ini bertujuan untuk mengkaji pengaruh pelabelan menu terhadap kalori yang dipesan dalam kalangan pelajar universiti awam Malaysia di Lembah Klang serta faktor-faktor yang berkaitan dengannya. Soal-selidik sendiri 'Google Form' digunakan untuk mengumpul data. Pemboleh ubah kajian termasuk faktor sosio-demografi, BMI, tahap kesedaran kesihatan, sikap terhadap pelabelan menu, dan kalori yang dipesan. Responden menjawab secara rawak sama ada soal selidik menu berlabel kalori atau soal selidik menu tidak berlabel kalori. Responden juga dikehendaki memilih hidangan tengah hari berdasarkan menu yang disediakan. Kalori yang dipilih telah ditolak dengan keperluan kalori individu setiap responden untuk mendapatkan perbezaan kalori. Jumlah responden adalah seramai 200 orang di mana majoriti daripada mereka adalah Melayu, perempuan, berat badan normal, tergolong dalam kumpulan pendapatan isi rumah M40, dan mempunyai kesedaran kesihatan yang baik (5.11 ± 1.16), dan sikap positif terhadap pelabelan menu (5.83 ± 1.01). Sebagai kesimpulan, tiada perkaitan yang signifikan untuk kalori yang dipesan antara kumpulan menu berlabel kalori dan kumpulan menu tidak berlabel kalori. Terdapat perkaitan yang signifikan untuk BMI dengan kalori yang dipesan ($p < 0.001$). Lebih separuh daripada mereka makan di luar setiap hari dalam seminggu tetapi majoriti melaporkan tidak pernah atau jarang menggunakan pelabelan menu apabila disediakan. Penyelidikan yang lebih meluas diperlukan untuk menilai dengan lebih jauh keberkesanan pelabelan menu di Malaysia dalam mengurangkan masalah obesiti serta kesediaan dan pengetahuan pengguna untuk menggunakan pelabelan menu sebelum undang-undang dikuatkuasakan di seluruh negara.

CHAPTER 1: INTRODUCTION

This chapter summarizes the background as well as the problem statement regarding this study and the justification in conducting it. The operational definition, research hypotheses, objectives, and conceptual framework is also included.

1.1 Background of the study

Overweight and obesity refer to individuals who have a body mass index (BMI) of more than 25 kg/m² and 30 kg/m² respectively. Both of these health issues have been described as a global health problem (World Health Organization, [WHO], 2021). Worldwide, obesity and overweight had caused 3.4 million deaths, approximately 3.9% of years of life lost and 3.8% of disability-adjusted life-years (DALYs) (Ng et al., 2014). Meanwhile, according to the National Health and Morbidity Survey (NHMS) 2019, 50.1% of adults in Malaysia are overweight or obese (Ministry of Health Malaysia, [MOH], 2020). This national epidemic has grown and became common over the decades to the point that as of 2019, Malaysia is the fattest nation in Asia (WHO, 2019). To add, among Malaysian university students, it was found out that 21.2% are overweight and 16.3% are obese (Wan Mohamed Radzi et al., 2019).

Several studies have determined that eating out is positively associated with overweight and obesity (Bezerra & Sichieri, 2009; Cao et al., 2014). One of the reasons

behind this is probably due to ingredients used in the restaurants. Compared to home cooked meals, eateries and restaurants used ingredients that are higher in calories (Hua et al., 2021). Besides, it is not surprising that the culture of eating-out is very common in Malaysia. The evolution in lifestyle has also prompted more numbers of the urban population to eat outside (Ali & Abdullah, 2017). Meanwhile, for university students, convenience and the nature of their hostel's living conditions is the factor for them to practice eating out for most of their meals (Llanaj et al., 2018). Evidently, the practice of dining outside or eating meals prepared by restaurants or eateries is a factor linked to the occurrence and prevalence of obesity and overweight among the general population and specifically for this study, university students.

In order to solve this issue, there are several strategies proposed to help consumers in choosing food when eating out. One of the strategies is by providing menu labelling. Generally, menu labelling refers to calories and/or other nutritional information such as carbohydrate, protein, fat, and sodium as well as daily calorie intake recommendations posted on the menus or menu boards. Menu labelling that is used in various countries consists of numerous formats. One of it is the Health Star Rating (HSR) labelled menu (Niven et al., 2019). Another format is the Rank-Ordered Calories in which the calorie labels is ordered from low to high calories (Liu et al., 2012a). The menu labelling which consists of information on the equivalent physical activity duration required to burn off the calories of the item is also widely used (Platkin et al. 2014). In Malaysia, the most commonly used format of menu labelling is the calorie information format where total calories of the item will be provided, with or without the Recommended Nutrient Intake (RNI) and estimated daily calorie requirement for adults and children. Currently, major fast-food restaurants such as Kentucky Fried Chicken (KFC) and McDonald's voluntarily provided this format of menu labelling. To add, McDonald's

provided the calories and nutrient information on their pamphlets, food wrappers, tray placemats, and on the official restaurant website (Azlina et al., 2011).

Providing menu labelling helps consumer choose healthier options when eating out (Finkelstein et al., 2011). Another study also stated that providing menu labelling will reduce the rates of obesity and its comorbidities (Radwan et al., 2017). In the United States of America (USA), menu labelling has been implemented by the government through the Patient Protection and Affordable Care Act of 2010. Through this act, certain types of foodservice operations are required to post calorie information on their menus and drive-through signs (Bollinger et al., 2011). Besides, under the Ontario Healthy Menu Choices Act, Canada also mandated a provincewide menu labelling legislation for chain restaurants to put calorie levels for foods offered on their menu (Scourboutakos et al., 2019). In Malaysia, one of the policies involving food and labelling is the compulsory posting of calorie and nutrition information on packaged food under the Food Regulations 1985 act (Ministry of Health Malaysia, 1985). However, no menu labelling policy is currently being implemented in Malaysia despite the fact that the Malaysian government plans to enact a nationwide menu labelling law by the year of 2025. According to the Nutrition Action Plan 2016-2025, this law will require certain foodservice operations to provide menu labelling to their consumers (Ministry of Health, 2016). Hence, this study was centred on examining the influence of menu labelling usage among Malaysian public university students.

1.2 Operational definition

Below is the list of terminology used in this study:

1. Menu labelling: Menu with amount of calories per item, and the recommended calorie intake for a moderately active Malaysian adult.

2. Calorie needs: Participants' individual calorie needs based on Basal Metabolic Rate (BMR) and physical activity level.
3. Calories chosen: Participants' total calorie that they chose based on the menu provided to them (calorie labelled menu or non-calorie labelled menu).
4. Calories ordered (calories difference): Difference in total calorie needs and total calorie chosen

The relationship between calorie needs, calorie chosen, and calories ordered (calories difference) in this study is simplified in the figure below.

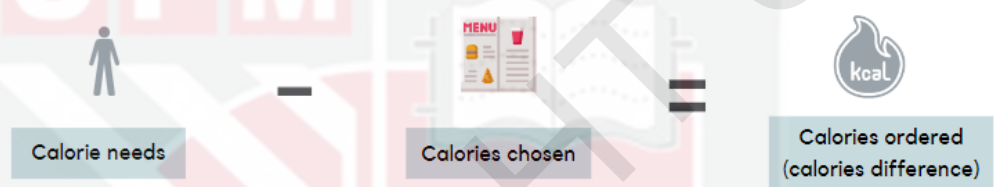


Figure 1: Relationship between calorie needs, calories chosen, and calories ordered (calories difference)

1.3 Problem statement

Overweight and obesity is the risk factors for non-communicable diseases (NCDs) such as type 2 diabetes mellitus, cardiovascular diseases, and several cancers such as breast, pancreas, large intestine, and kidney cancers. It is also alarming that obesity increases the risks of type 2 diabetes mellitus by sevenfold in men and 12-fold in women, compared to normal-weight individuals (Wilding, 2014).

Aforementioned, overweight and obesity is associated with high recurrence of eating out (Bezerra & Sichieri, 2009; Cao et al., 2014). The severity of this issue is amplified even further since the occurrence of COVID-19 pandemic where the practice of eating out through the means of take-away or delivery is commonly practiced among Malaysians. Majority of Malaysians (78%) especially millennials, stated that they

regularly use food delivery services and make orders from food services establishments at least once every week (Malaysian Census Data and Internet Data, 2020).

Hence, menu labelling policy should be implemented in order to help consumers make better choices when eating out. It has been proven in various countries that the usage of menu labelling has a positive influence and will lead to better food choices when eating out. In the present of menu labelling, individuals tend to select lower-calorie options (Roberto et al., 2010). Besides, in California, the obesity rates have been found to decrease significantly after mandating the menu labelling law in 2008 (Craig et al., 2020).

However, there are also a few contradictory findings on the issue of menu labelling implementation. Mandatory provincewide menu labelling legislation in Ontario, Canada resulted in inconclusive impact (Scourboutakos et al., 2019). Several studies in the United States also concluded that calorie information format of menu labelling alone was not an effective way to reduce the calories consumed by customers, and that there was no significant difference in the calories ordered between the group that ordered from a calorie labelled menu and a non-calorie labelled menu (Berry et al., 2019; Swartz et al., 2011). Hence, it can be concluded that the findings in regards of the effect of menu labelling on consumers behaviour is undetermined. These inconclusive findings may be due to the fact that most of the studies did not take into consideration the individual's energy requirement per day, which differs in every individual according to their age, weight, height and physical activity level. For example, according to the Recommended Nutrient Intakes for Malaysia (RNI), a sedentary female Malaysian adult might need lower calories per day compared to a physically active female. Hence, in order to ensure greater reliability of the results obtained, this study took into consideration the individual

calorie needs when comparing and examining the effect and influence of using menu labelling on consumers behaviour.

Additionally, previous studies in Malaysia only assessed the intention to use menu labelling, not the effectiveness, which can be measured through customers' food choices, or the amount of calories ordered. An example of the study done to assess the intention to use menu labelling is by Delvarani et al. in 2013 among adult population in Klang Valley. In this study, it was found out that attitude, subjective norms, and perceived behavioural control was significantly associated with the intention to use menu labelling. Also, another study by Azlina et al. in 2011 found that fast food consumers positively perceive newly remodelled icon-based menu labels which they felt were easier to understand, and a good effort toward a healthy lifestyle. To add, there is also no study done to find the prevalence of the use of menu labelling in Malaysia, which may be due to the fact that menu labelling itself is not widely used, with exceptions on few major fast-food restaurants or certain food establishments that voluntarily provide it. Considering that by the year of 2025, the Malaysian government intends to enact a nationwide menu labelling law, it is undoubtedly important to examine the effectiveness of menu labelling.

Numerous studies have been conducted to observe the effect of menu labelling on the total calories ordered by university students. However, these studies are mostly done in the western and/or developed countries in which menu labelling policy has been implemented (Liu et al., 2012; Platkin et al. 2014; Roberto et al., 2010; Roseman et al., 2017). Hence, since there is a scarcity in the studies of effectiveness of menu labelling among university students in Malaysia, this study is aimed in filling this gap.

1.4 Significance of the study / study rationale

This study will be able to fill in the research gaps highlighted in the problem statement previously. Besides, the findings of this study can also contribute to the existing body of knowledge regarding menu labelling and calories ordered. Additionally, the findings obtained can also generate new knowledge on the effectiveness of menu labelling among university students and can also be used as baseline data for future research in Malaysia, especially due to the fact that the menu labelling policy is expected to be implemented in Malaysia by the year 2025. Finally, this research can provide insight on whether menu labelling could be used as part of a nutrition intervention programme in Malaysia, particularly among university students.

1.5 Research questions

1. Does calorie labelled menu influence Malaysian public university students in Klang Valley to order lower calorie meals than their needs as compared to non-calorie labelled menus?
2. Do sociodemographic factors and health consciousness influence Malaysian public university students in Klang Valley to order lower calorie meals than their needs from calorie labelled menus as compared to those who ordered using non-calorie labelled menus?

1.6 Research objectives and hypotheses

1.6.1 General objectives

To investigate the relationship of sociodemographic characteristics, BMI, participants' characteristics, health consciousness, and attitude towards menu labelling

with the calories ordered among Malaysian public university students in Klang Valley that were exposed to a calorie labelled menu or a non-calorie labelled menu.

1.6.2 Specific objectives

1. To determine the sociodemographic characteristics, BMI, participants' characteristics, health consciousness and attitude towards menu labelling among Malaysian public university students in Klang Valley.
2. To compare the differences in the calories ordered by Malaysian public university students between those that were exposed to a calorie labelled menu or a non-calorie labelled menu.
3. To examine the associations between age, BMI, health consciousness, and attitude towards menu labelling on the calories ordered among Malaysian public university students in Klang Valley that were exposed to calorie labelled menu.
4. To compare the means between sex, ethnicity, and monthly household income on the calories ordered among Malaysian public university students in Klang Valley that were exposed to calorie labelled menu.

1.6.3 Hypotheses

1. The presence of a calorie labelled menu decreases the calories ordered by Malaysian public university students.
2. There is a significant association between age, BMI, health consciousness, and attitude towards menu labelling with the calories ordered among Malaysian public university students in Klang Valley that were exposed to a calorie labelled menu.
3. There is a significant means difference between sex, ethnicity, and monthly household income with the calories ordered among Malaysian public university students in Klang Valley that were exposed to calorie labelled menu.

1.7 Conceptual framework

Figure 2 shows the conceptual framework of this study. The independent variables include socio-demographic factors (age, sex, ethnicity, and monthly household income), BMI, health consciousness, and attitude towards menu labelling. In this study, the dependent variable is calories ordered, in which it will be obtained from the participants through a calorie labelled menu or a non-calorie labelled menu. The independent variables will be analysed only for the participants with calorie labelled menu.

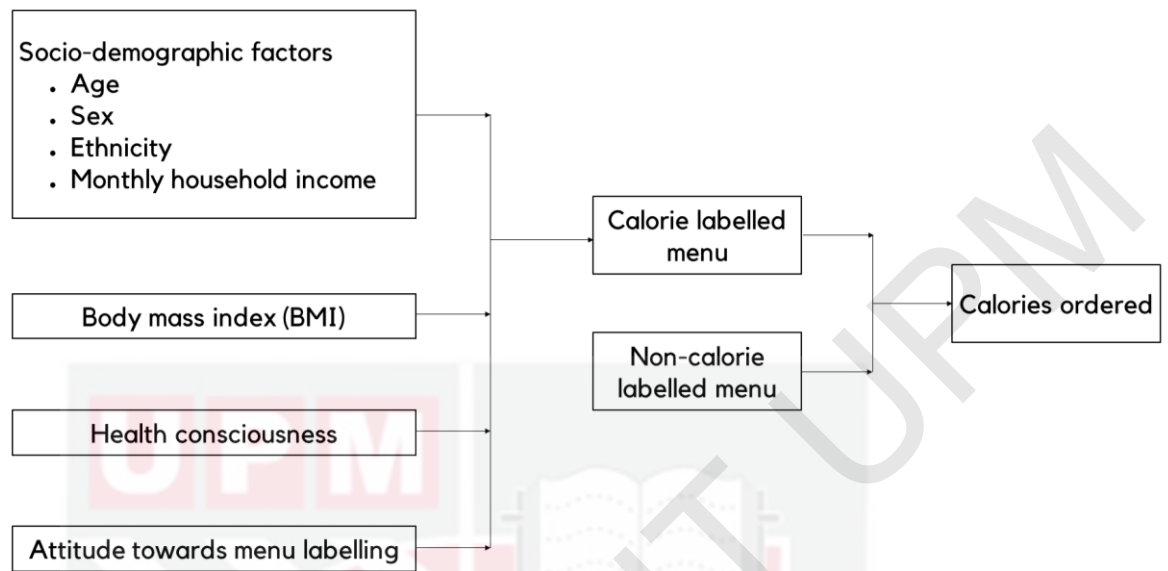


Figure 2: Conceptual framework

CHAPTER 2: LITERATURE REVIEW

2.1 Overview of menu labelling

People have been referring to nutritional information on packaged food and drink for years. However, when it comes to nutritional information in restaurant establishments, it was generally not made available, with the exception of some multinational food companies such as McDonald's or Kentucky Fried Chicken. McDonald's, for example, started to label their menu with calories information in September 2012 (Petimar et al., 2019). The act of providing a menu with calories information is also known as menu labelling. According to the United States Food and Drug Administration (FDA), menu labelling is a listing of nutritional information such as calorie for menu items in restaurants or retail food establishments. In 2010, the Food & Drug and Cosmetic Act was amended in which it requires that chain restaurants or similar retail food establishments to post calorie information on menus and menu boards for all standard menu items, disclose calorie information on signs adjacent to foods on display and self-service foods that are standard menu items, include a succinct statement concerning suggested daily caloric intake and a statement of availability for written nutrition information on menus and menu boards, and have required written nutrition information available on the premises of the chain restaurant or similar retail food establishment upon request (U. S. Food and Drug Administration, 2019).

However, only a few countries have been making the initiative to make menu labelling mandatory for restaurant establishments. In May 2018, the United States was the first country to enact a mandatory national menu labelling law in which restaurant chains with 20 or more locations in the United States was mandated to label their menus with calorie information, in line with the Patient Protection and Affordable Care Act (Food and Drug Administration, HHS, 2016). In South Korea, calorie and nutrient information are required to be provided for children's meals under the Special Act on Safety Management of Children's Dietary Life. (Ahn et al., 2015). Aside from that, other countries such as Australia, Canada, and the United Arab Emirates have also implemented the menu labelling policy, ranging from national, state, provincial or territorial levels (Rincón-Gallardo P et al., 2020).

In Malaysia, the government is planning on mandating menu labelling. Initially, the implementation was gazetted only for fast food chains and was voluntarily for other food services chains (MOH, 2016). Now, the policy was included in the National Plan of Action for Nutrition 2016-2025 in which guidelines will be established and mandatory display of nutrition information on menu at food outlets will be implemented by 2025. To conclude, menu labelling policy is in the process of being implemented in Malaysia. Thus, further studies need to be done in order to assess the readiness of the consumers as well as the effect of menu labelling among Malaysians.

2.2 Willingness to use menu labelling

Since some countries have implemented or are in the process of implementing the menu labelling policy, the willingness and readiness of the customers to use menu labelling must be reviewed as well. According to a research review on consumer behaviour from 2008 to 2012, consumers have been showing a strong interest in having

nutrition information, particularly calorie information (Krieger & Saelens, 2013). Around 68% of Americans favoured the government mandating chain restaurants to post calorie information on menus at the point of purchase according to a phone survey by Bleich & Pollack in 2010. In Malaysia, there has been a scarcity of studies evaluating the willingness of consumers to use menu labelling. The study by Rahamat & Arendt in 2020 concluded that more than 60% of individuals reported noticing menu labelling but only 33.6% mentioned that they used it while making food purchases.

Based on a study conducted in cafeterias at University Malaysia Terengganu (UMT) in which 85.8% of the participants were aged 18 – 24 years old, 43.9% of the participants strongly agree and 45.8% agree that nutrition menu labelling is useful for them. To add, 45.8% of the participants strongly agree that they appreciate having menu labels at the cafeterias (Marina et al., 2020). To conclude, Malaysians are showing good interest towards the implementation of menu labelling. However, further research is needed to examine whether menu labelling influences the difference between total calories ordered and total calorie needs.

2.3 Age

There has been a mixed finding in terms of age factor when it comes to the usage of menu labelling. According to a study done with 1,382 participants aged 19 to 70 years old, older adults and adults with good diet-quality perception were significant predictors of food label use for both men and women (Stran & Knol, 2013). Similar findings were also reported by Satia et al. in 2005 where nutrition label use was significantly higher among older participants. However, a study was done in McDonald's restaurants to determine whether the usage of calorie labelling had an effect on purchases among adults, adolescents and children. It was found out that calorie labelling at McDonald's

was not associated with changes in neither of the age groups' food purchases. It was also found out that calorie labelling generally increased the predicted probability of noticing calorie information, however, it did not improve the estimation of the calories purchased (Petimar et al., 2019). Hence, there has been a mixed finding in terms of age factor on the usage of menu labelling and this research will further investigate the effect of age on the difference in total calories ordered and total calories needed, and whether the usage of menu labelling had an influence on it.

2.4 Sex

In terms of gender, most of the studies in this field of knowledge found similar results in which females are more prone and willing to use menu labelling. Compared to men, women were stronger in favour of having nutritional information on a menu and having healthy alternatives (Heathcote & Baic, 2011). This statement is also supported by a study conducted in Brazil where it was concluded that women make healthier food choices when they eat out of home (Bezerra & Sichieri, 2009). Similarly, in 2018, Krešić et al. reported that females were more interested in nutrition label information and food energy value, and their food choices were more influenced by food label information compared to males. It was also reported that women more frequently read food labels compared to men. However, the same study also found out that men were more confident in their ability to interpret nutritional information displayed on menus. To add, another study also finds out that women check and use food label components more often and thoroughly compared to men (Stran & Knol, 2013) and that women choose lower calorie meals and lower priced meals when calorie information was provided than when it was not, while on the other hand men's selections were unaffected (Gerend, 2009). However, it is also to be noted that the usage of menu labels to limit calories was related to binge eating among women (Larson et al., 2018). To add, one study reported that in the

presence of menu labelling, women were more influenced to consume fewer calories (Sinclair et al., 2014). Hence, it can be concluded that women were more influenced by the presence of menu labelling than men when comparing their difference in total calories ordered and total calories needed. Given that, this study was aimed to further examine the effect of menu labelling in terms of sex, and how it influences the difference between total calories ordered and total calories needed.

2.5 Ethnicity

There has been a mixed finding in terms of the influence of ethnicity in the usage of menu labelling and subsequently, the calories ordered. In a study involving 3132 residents in Washington, White had greater odds of using calorie information (Chen et al., 2015). However, another study found out that Blacks and Hispanics use menu labels more than Whites in sit-down restaurants, but Whites saw and used menu labels more in other settings (Feng & Fox, 2018) in which is similar with the findings of a study among 100,141 adults where the prevalence of menu labelling use is higher in participants who is non-White (Lee-Kwan et al., 2016). Mexican-American and other Hispanic groups check and use the food label more frequently than non-Hispanic white men (Stran & Knol, 2013). On the other hand, a study reported that race have no influence on calories purchased in regards to using menu labelling (Elbel et al., 2009). To the best of our knowledge, there is a scarcity of studies in Malaysia in terms of evaluating the ethnicity factor in the presence of menu labelling to evaluate the difference between total calories ordered and total calories needed. Only one study reported that Malays were 2.47 times more likely to read food labels, Indians by 1.59 times and other Bumiputras by 1.45 times as compared to the Chinese ethnicity (Ambak et al., 2014). Hence, this study was aimed to further investigate the influence of menu labelling on the difference between total calories ordered and total calorie needs based on different ethnicity groups in Malaysia.

2.6 Monthly household income

In terms of monthly household income, it was reported that higher income patrons were more likely to order low-calorie diners compared to lower income patrons (Ellison et al., 2013). A study in the United States involving 7,309 participants also reported that higher income participants were more likely to use menu labelling. Similar result was found in another study in which lower household income has been consistently associated with poorer diet quality (French et al., 2019). Meanwhile, in regards to using calorie information or calorie labels, one study reported that higher income participants had twice the probability of noticing calorie labels ($p=0.029$) and thrice the probability of using it ($p=0.004$), compared to lower income participants. Hence, it can be concluded that the usage of calorie information on menu labelling and its subsequent effect on calories ordered were more prevalent among higher income individuals.

2.7 Body Mass Index (BMI)

There are mixed findings in terms of BMI when it comes to using menu labelling and its effect on the calories ordered. A study in the United States reported that there is no association between BMI and calories among participants who ordered from a calorie menu (Brochu & Davidio, 2014). However, in 2018, Bao et al. concluded that obese individuals have higher purchase of unhealthy foods. Another study reported that even though obese participants have higher probability to ignore healthier food options, a health-focused prompt increases the consideration of healthier food options, across all BMI categories (Gustafson et al., 2021).

2.8 Health consciousness

Health consciousness is defined as a school of thought that disposes consumers to engage in behaviours that improve or maintain their health (Kraft and Goodell, 1993;

Wardle and Steptoe, 2003). There is also ample research that proves that health consciousness is a substantial driver of healthy eating as individuals with high levels of health consciousness tend to follow dietary recommendations (Thorogood et al., 1990).

This is in line with the research findings that suggests that health consciousness has a significant positive effect on the intention to consume healthy food which led to a significant positive effect on the consumption of healthy food among Malaysian young adults (Al Mamun et al. 2020).

This is fortunate as it is typically known that people who are more concerned about their health are known to utilize tools like menu labelling to assist them in the decision-making process when deciding on meal options (Arendt et al., 2018). This is further supported by an article whereby Physical Activity Calorie Equivalent (PACE) labelling was used on respondents and it was discovered that the PACE label was found to be not effective among less health focused people to decrease discretionary snack food consumption. However, this research article had only a small sample size of 97 participants and a large portion of the participants were female (35% males and 65% female) which may have impacted on the data. Women have been found to be more health focused than males historically.

However, there are some studies that suggested health consciousness had an inverse relationship with the usage of menu labelling. In a study done in Oklahoma, calorie labels in restaurants affect customers with lower levels of health consciousness more compared to high conscious customers. Nevertheless, they further found out that the addition of traffic light symbols to the calorie information further reduces the amount of calories ordered even among the high conscious customers (Ellison et al., 2013). Hence, this study was aimed in finding out the influence of health consciousness on the difference of total calories ordered and total calorie needs.

2.9 Attitude towards menu labelling

Based on a study conducted in Malaysia, attitude towards menu labelling has positive significant relationship with healthy food choices (Marina et al., 2020). The same study reported that the attitude of most of the participants (87.1%) were mainly positive towards nutrition menu labelling. Another study also found out that 93% among 693 respondents reported calorie information as 'important' and 86% thought that calorie information should be posted in restaurants menu boards (Piron et al., 2010). Meanwhile, a study in UAE concluded that among 2020 participants, majority of them preferred the obligation to post calorie information on restaurant menus and half of them stated higher probability of re-visiting restaurants with labelled menu. Hence, it can be concluded that a positive attitude towards menu labelling might result in better food choices.

2.10 Calories ordered (calories difference)

Several studies have shown that participants chose fewer calories when presented with calorie-information (Green et al., 2015; Gustafson & Zeballos, 2020; Roberto et al., 2010). However, these studies did not take into consideration the participants' calorie needs. Hence, compared to other studies that only uses the total calories chosen as the dependent variable, this study instead focused on the calories ordered (calories difference) which is the difference in total calories chosen and calorie needs, due to the fact that every human has different calorie needs, thus it would be biased to just examine the total calories chosen, considering that those with higher calorie needs will choose more calories from the provided menu than those with lower calorie needs.

In this study, the sociodemographic factors (age, sex, ethnicity, and monthly household income), BMI, health consciousness, and attitude towards menu labelling of

the participants were evaluated to determine the effect of it on calories ordered (calories difference) of each participant, when exposed to calorie labelled menus and non-calorie labelled menus.

The calorie needs of the participant were calculated using the Harris-Benedict Formula, in which it requires the participants' age, sex, weight, and height to get the basal metabolic rate (BMR). Next, the BMR were multiplied with the physical activity level of the participants, in order to obtain the total calorie needs daily.

Nonetheless, limited studies have investigated the effect of sociodemographic factors (age, sex, ethnicity, and monthly household income), BMI, health consciousness, and attitude towards menu labelling of the participants on the calories ordered (calories difference) when exposed to calorie labelled menus and non-calorie labelled menus. Hence, this study was aimed in filling in the aforementioned research gap.

CHAPTER 3: METHODOLOGY

3.1 Study design

This is a quasi-experimental, quantitative study aimed in determining the influence of menu labelling on the calories ordered among Malaysian public university students in Klang Valley and its associated factor. The variables included in this study are sociodemographic characteristics (sex, age, ethnicity, and monthly household income), BMI, participants' characteristics (frequency of eating out in a week and frequency of using menu labelling when provided), health consciousness, and attitude towards menu labelling.

3.2 Study location

This study was conducted in public universities in the Klang Valley area which is an urban conglomeration that covers five major areas which are the Federal Territory of Kuala Lumpur, Gombak, Hulu Langat, Klang and Petaling. There are a total of 6 public universities in this area, in which 3 were randomly selected which are Universiti Putra Malaysia (UPM), Universiti Malaya (UM), and Universiti Kebangsaan Malaysia (UKM).

3.3 Study population

The participants in this study were university students from Universiti Putra Malaysia (UPM), University of Malaya (UM), and Universiti Kebangsaan Malaysia (UKM).

Students who met the study criteria were invited to participate in the study. The selection of the participants was based on the inclusion and exclusion criteria as shown in the table below. All of the criteria were asked in the first part of the questionnaire and those not eligible to answer were not able to fill in the questionnaire.

3.4 Subject criteria

The inclusion criteria for this study includes being at least 18 years old, Malaysians, undergraduate university students, and literate individuals. Meanwhile, the exclusion criteria include international students, being diagnosed with diet related non-communicable diseases (NCDs), pregnant or lactating women, being under strict dietary restriction due to chronic disease or surgery, and being severely handicapped or with a physical disability.

3.5 Sample size estimation

Table 1: Mean and standard deviation of calorie labelled menu and non-calorie labelled menu

	Non-calorie labelled menu	Calorie labelled menu
Mean	734.91	827.87
Standard deviation	243.07	243.11

Effect size, d

= Mean difference between the two groups ÷ standard deviation of one of the groups

= $(827.87 - 734.91) \div 243.07$

= $92.96 \div 243.07$

=0.38

The sample size was calculated using G*Power software v3.1. Total sample size calculated using the software was 174. Assuming a 10% non-response rate, $174 \div 0.9 = 194$ total respondents. Hence, a total of at least 194 participants were required in this study.

3.6 Sampling method and subject recruitment

Figure 3 shows the flow chart of sampling design for this study in which simple random sampling was used.

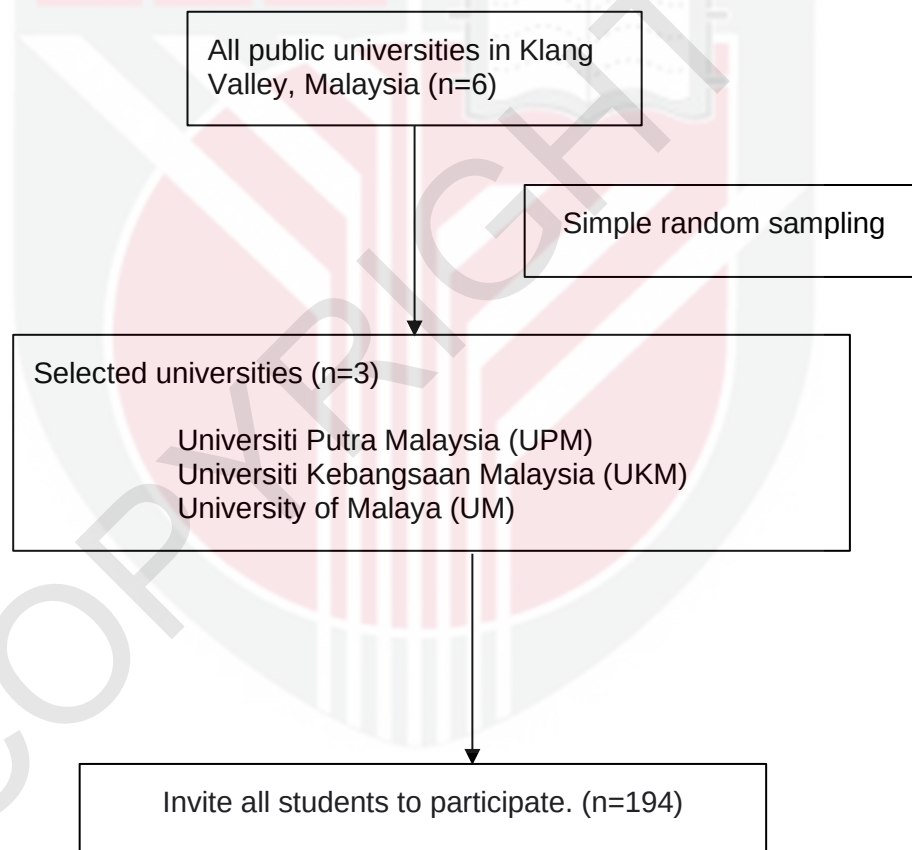


Figure 3: Flow chart of sampling design

This study employed a simple random sampling method to select the universities of the participants of this survey. All universities that were selected are located in the

Klang Valley area in Selangor, Malaysia. In total, there are 3 universities partaking in this study (refer to Figure 3). All university students from the participating universities were invited to participate in this study as long as the selection criteria are met.

3.7 Research tools/instruments

Primary data was collected for this research. All instruments used in this study were included in a self-administered questionnaire through Google Form. There were two different questionnaires; the calorie labelled menu and non-calorie labelled menu. Every participant randomly received either one of these questionnaires.

The questionnaire was distributed through 2 methods which is through student email of each university and also through online messaging platforms such as WhatsApp and Telegram. The languages used are both English and Bahasa Malaysia for the menus and the questionnaires. The questionnaire consisted of 5 parts. Further details regarding it may be referred in Appendix 1.

3.7.1 Sociodemographic characteristics, weight, height and participants' characteristics (frequency of eating out and frequency of using menu labelling when provided)

a) Sociodemographic characteristics

Sociodemographic characteristics such as age, sex, ethnicity, and monthly household income were self-reported by the respondents after they have been qualified to answer the form and after they have read the study consent.

b) Height and weight

The height and weight in metres and kilograms respectively were self-reported by the respondents in the questionnaire. Then, using the information obtained, the

respective respondent's body mass index (BMI) was calculated using the formula: $BMI = \text{kg/m}^2$.

c) Participants' characteristics

Participants' frequency of eating out in a week and frequency of using the calorie information on the menu if provided were self-reported. Participants were also asked on whether they are following any kind of diet regimen.

3.7.2 Menu (calorie labelled or non-calorie labelled)

Two types of questionnaires were distributed; one with calorie labelled menu and another one with non-calorie labelled menu. All participants received only either one of the questionnaires. Participants were required to choose their desired lunch meal based on cafeteria menu. The difference between the two types of menus is the calorie labelled menu contained the recommended energy requirement and the calorie for each of the dish selection aside from the dishes its selves. Meanwhile, the non-calorie labelled menu contained the dishes only.

3.7.3 International Physical Activity Questionnaire (IPAQ)

Physical activity status for the last seven days was assessed using the International Physical Activity Questionnaire (IPAQ) Short Form. The Metabolic Equivalent of Task (MET) of walking is 3.3, moderate activity is 4.0, and vigorous activity is 8.0. MET minutes a week (MET-min/week) is calculated using the equation: MET level x minutes of activity x events per week. Finally, the individual can be categorised by MET-minutes/week according to official guideline criteria as follows;

Table 2: IPAQ categorization and criteria

Category	Criteria
Low active (PAL 1.4)	Those individuals who do not meet the criteria for Categories 2 or 3 are considered to have a 'low' physical activity level.
Moderately active (PAL 1.6)	Any one of the following 3 criteria: a) or more days of vigorous-intensity activity of at least 20 min per day b) 5 or more days of moderate-intensity activity and/or walking of at least 30 min per day c) 5 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum total physical activity of at least 600 MET-minutes/week.
Active (PAL 1.8)	Any one of the following 2 criteria: a) vigorous-intensity activity on at least 3 days achieving a minimum total physical activity of at least 1500 MET-minutes/week b) 7 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum total physical activity of at least 3000 MET-minutes/week.

The reliability of IPAQ was satisfactory, by which Cronbach's alpha coefficient was 0.91 (Badicu et al., 2020). IPAQ-SF is valid and has been used in a recent study in Malaysia (Ahmad et al., 2018). Each IPAQ category of classification is given a Physical Activity Levels (PAL) range (Ohkawara et al., 2011) so that it can be used as a multiplying factor with an individual's basal metabolic rate, which was calculated by using the Harris Benedict formula, to determine the individual's total energy expenditure. Participants were categorized into low active (PAL 1.4), moderately active (PAL 1.6), or active (PAL 1.8) which is according to the Malaysian Recommended Nutrient Intake (RNI) (NCCFN, 2017).

3.7.4 Health consciousness questionnaire

The health consciousness questionnaire consisted of 6 items which was assessed using a 7-point Likert scale, ranging from 1 for 'strongly disagree' to 7 for 'strongly agree'. The questionnaire has a Cronbach alpha score of 0.89, and it has been used in recent study in a local setting (Mamun et al., 2020). Examples of the questions are "I choose food carefully to ensure good health" and "I consider myself a health-conscious consumer".

3.7.5 Attitude towards menu labelling questionnaire

The attitude towards menu labelling questionnaire consisted of 7 items was assessed using a 7-point semantic scale. For example, 1 for 'harmful' and 7 for 'beneficial'. The questionnaire has a Cronbach alpha score of 0.84. Examples of the questions are "Using posted calorie information to make a meal decision is..."

3.8 Data collection

Prior to the study, a pre-testing was conducted among 10 undergraduate students from Universiti Putra Malaysia who were selected based on similar characteristics with the sample of interest (Roseman et al., 2017). These respondents were not included in the actual data collection. The clarity, understanding and time taken to complete the questionnaire were assessed. Further improvements were done based on the feedback given by the pre-testing respondents. This research was approved by the Ethics Committee for Research Involving Human Subjects (JKEUPM). The data collection process lasted for 1 month, from May 2022 to June 2022.

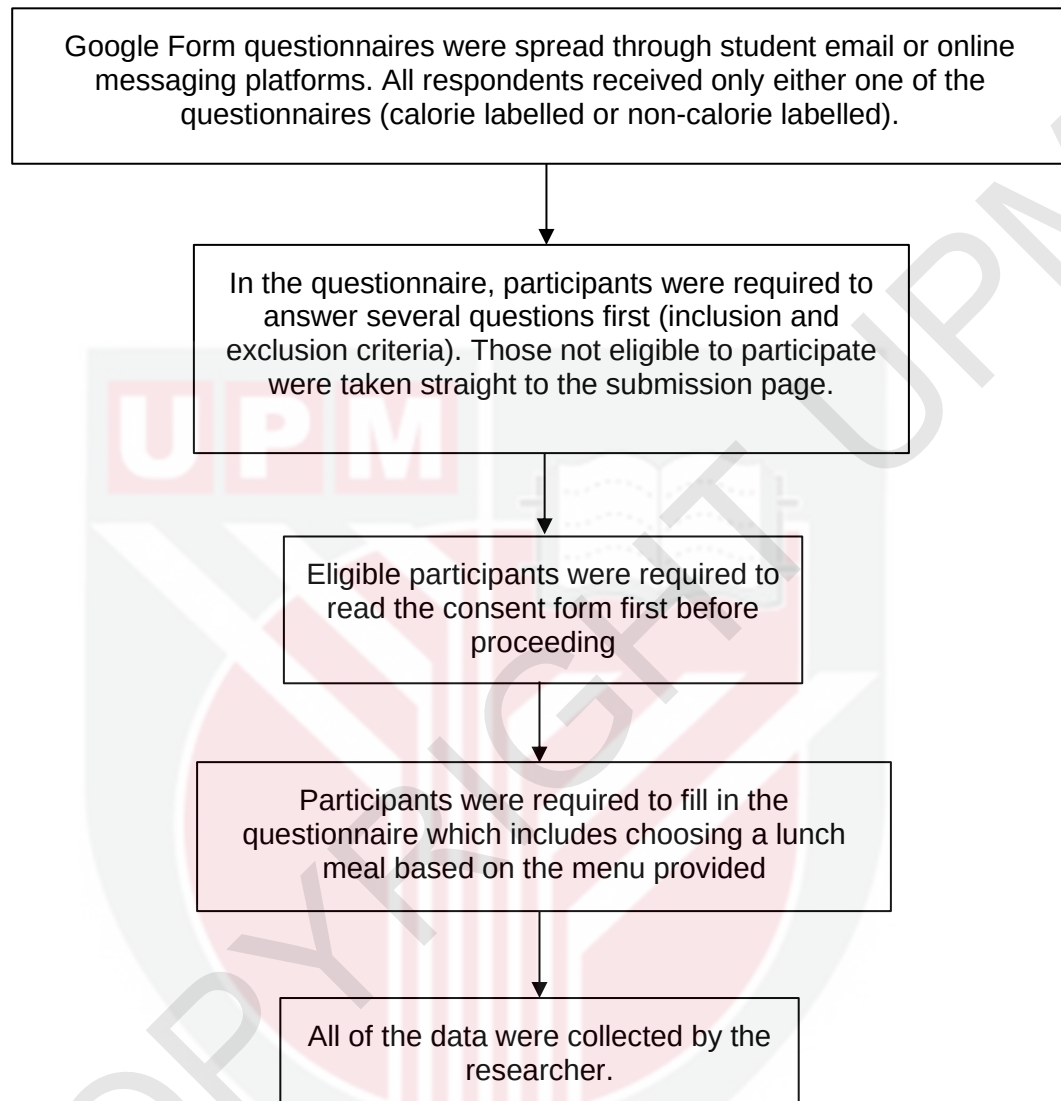


Figure 4: Data collection flowchart

3.9 Data analysis

Upon completing the data collection process, the data was viewed in the form of spreadsheet. Then, any outliers, invalid data, and data that did not fulfil the inclusion criteria was removed. The minimum required respondents were 194. However, total respondents collected after filtering any missing data or incorrect responses were 200, which was 100 responses for calorie labelled menu, and another 100 responses for non-calorie labelled menu. Next, the data analysis was conducted using IBM SPSS Statistics version 26 with the statistical significance level set at $p < 0.05$. Normality of each variable was determined using the skewness test (± 2), Kolmogorov-Smirnova test ($p > 0.05$), and Shapiro-Wilk test ($p > 0.05$), in which all of the variables passed the normality test.

Descriptive statistics was analysed using univariate analysis. The result for categorical variables was presented in frequency (n) and percentage (%), meanwhile the result for continuous variables was presented as mean and standard deviation.

For bivariate analysis, independent t-test was used to test the difference in the calories ordered between calorie labelled menu and non-calorie labelled menu. In order to obtain the calories ordered (calories difference), the calorie needs are first calculated based on the Harris-Benedict equation to obtain the basal metabolic rate (BMR) of the participant, which is then multiplied with physical activity level of either 1.4, 1.6. or 1.8 physical activity level (PAL). The formula for Harris-Benedict equation is as follows:

Resting Metabolic Rate (RMR): Harris-Benedict Formula

Men: $(10 \times \text{weight in kg}) + (6.25 \times \text{height in cm}) - (5 \times \text{age in years}) + 5$

Women: $(10 \times \text{weight in kg}) + (6.25 \times \text{height in cm}) - (5 \times \text{age in years}) - 161$

Then, only 30.5% of the calorie needs was counted, which is the median percentage of energy intake for lunch by Malaysian adults (Zalilah et al., 2008). Next, calories chosen which is the participants' total calorie that they chose based on the menu provided to them will be subtracted from the 30.5% of the calorie needs in order to obtain the calories ordered (calories difference). A higher value of calories ordered (calories difference) indicated that more calories consumed compared to calorie needs, while a lower value of calories ordered (calories difference) indicated that less calories

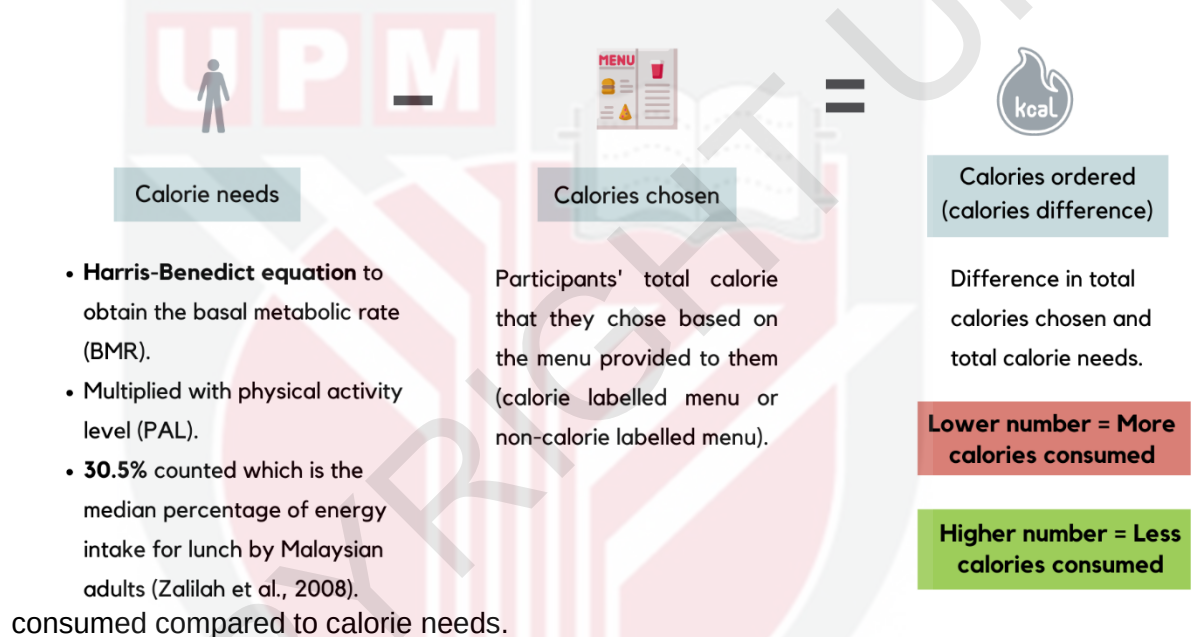


Figure 5: Relationship between calorie needs, calories chosen, and calories ordered (calories difference)

Furthermore, Pearson correlation test was used to find the association between normally distributed data (age, BMI, health consciousness, and attitude towards menu labelling) with the calories ordered among those exposed to a calorie labelled menu. Lastly, One Way Analyses of Variance (ANOVA) was used to compare the means between variables (sex, ethnicity, and monthly household income) with the calories ordered among those exposed to a calorie labelled menu.

CHAPTER 4: RESULT AND DISCUSSION

This chapter includes the result and discussion of this study, in which the sociodemographic characteristics, BMI, participants' characteristics, health consciousness, and attitude towards menu labelling of 200 participants were recorded. Besides, the calories ordered between the calorie labelled menu group and the non-calorie labelled menu group was compared. The association between calories ordered and age, sex, ethnicity, household income, BMI, health consciousness, and attitude towards menu labelling was also analysed. The results are then compared or contrasted with findings from other studies.

4.1 Sociodemographic characteristics

Table 3 shows the sociodemographic characteristics for all of the participants, which includes age, sex, ethnicity, and household income.

Table 3: Sociodemographic characteristics of participants (n=200)

Variables	n (%)	Mean $\pm$ SD
Age (years)		21.91 $\pm$ 1.33
Sex		
Male	60 (30.0)	
Female	140 (70.0)	
Ethnicity		
Malay	156 (78.0)	
Chinese	25 (12.5)	
Indian	10 (5.0)	
Bumiputera Sabah/Sarawak	5 (2.5)	
Others	4 (2.0)	
Household income		
B40	66 (33.0)	
M40	82 (41.0)	
T20	52 (26.0)	

Based on Table 3, the mean age of participants is 21.91 $\pm$ 1.33. A majority of the participants were female, which was 70% as compared to male, 30%. This finding could be explained due to the fact that 8 out of 20 public universities in Malaysia have double the amount of female undergraduate students compared to male (Tienxhi, 2017). Next, most of the participants were Malay (78%), followed by Chinese (12.5%), Indian (5%), Bumiputera Sabah/Sarawak (2.5%), and Others (2%). This finding is similar with result from another study where majority of undergraduate students in Malaysia is Malay, followed by Chinese and Indian (Granhemat & Abdullah, 2017). In terms of household income, majority of the participants belonged to the M40 group (41%), followed by B40 (33%), and T20 (26%) which is similar with result from another study (Yee et al., 2021).

4.2 Body mass index (BMI)

Table 4 shows the BMI of the participants.

Table 4: BMI of participants (n=200)

Variables	n (%)	Mean $\pm$ SD
BMI (kg/m²)		22.37 $\pm$ 4.469
Underweight	44 (22.0)	
Normal weight	106 (53.0)	
Overweight	36 (18.0)	
Obese	14 (7.0)	

Based on Table 4, the mean BMI of the participants were 22.37 $\pm$ 4.469 in which a majority of them belonged to the normal weight category (53%), followed by underweight (22%), overweight (18%), and obese (7%). This finding is similar with a study conducted among 1000 Malaysian public universities students where a majority of them (53.4%) belonged in the normal weight category (Wan Mohamed Radzi et al., 2019).

4.3 Participants' characteristics

Table 5 shows the participants' characteristics which includes the frequency of eating out in a week and the frequency of using calorie information when provided.

Table 5: Participants' frequency of eating out in a week and frequency of using calorie information when provided (n=200)

Variables	n (%)
Frequency of eating out in a week	
Once	31 (15.5)
2 times	27 (13.5)
3 times	27 (13.5)
4 times	24 (12.0)
5 times	19 (9.5)
6 times	14 (7.0)
7 times (every day)	58 (29.0)
Frequency of using calorie information when provided	
Never	65 (32.5)
Rarely	63 (31.5)
Sometimes	45 (22.5)
Often	27 (13.5)

Based on Table 5, 58% of the participants eat out every day in a week. To summarize, a total of 115 participants (57.5%) eat out 4 times or more in a week. This finding is similar to several studies where it was reported that eating out practices is common among university students (Llanaj et al., 2018). Next, more than half of the participants reported Never (32.5%) and Rarely (31.5%) in terms of the frequency in using calorie information when provided. This finding may be attributed to the fact that in Malaysia, the menu labelling implementation was only gazetted on fast food outlets and voluntarily for other food services (Ministry of Health, 2016).

4.4 Health consciousness

Table 6 shows the health consciousness of all participants.

Table 6: Participants' health consciousness (n=200)

Variables	Mean $\pm$ SD
Health consciousness	5.11 $\pm$ 1.16

According to Table 6, it can be concluded that most of the participants are health conscious since the mean score is 5.11 ± 1.16 in which the highest score possible is 6. This finding contradicts with a study done in a university in Kuantan where majority of the respondents had low nutrition knowledge level (Hazali, 2013). This difference in findings may be due to the location of the study (Klang Valley) since students living in urban area prioritized a healthy or balanced diet (Jeinie et al., 2021).

4.5 Attitude towards menu labelling

Table 7 shows the participants' attitude towards menu labelling.

Table 7: Participants' attitude towards menu labelling (n=200)

Variables	Mean $\pm$ SD
Attitude towards menu labelling	5.83 $\pm$ 1.01

Based on Table 7, most of the participants have positive attitude towards menu labelling as the mean score is 5.83 ± 1.01 in which the highest score possible is 7. This finding is similar with result from a study conducted among 300 university students in Selangor, Malaysia where 80.3% of them had good attitude towards healthy eating (Hassan et al., 2015).

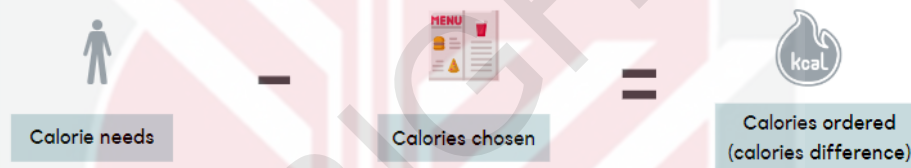
4.6 Hypothesis testing

4.6.1 Calories ordered between calorie labelled menu or non-calorie

labelled menu

Table 8 shows the difference in calories ordered between participants exposed to a calorie labelled menu or a non-calorie labelled menu. Independent *t*-test was conducted in order to analyse the mean differences.

As mentioned previously in data analysis part, calories ordered or the calories difference was obtained by subtracting the 30.5% of calorie needs, which is the median percentage of energy intake for lunch by Malaysian adults, with the calories chosen by the participants based on the menu provided.



A higher value of calories ordered (calories difference) indicated that more calories consumed compared to calorie needs, while a lower value of calories ordered (calories difference) indicated that less calories consumed compared to calorie needs.

Table 8: Independent *t*-test result on calories difference between participants that were exposed to a calorie labelled menu or a non-calorie labelled menu (n=200)

Variable	Mean	SD	<i>t</i> -value	<i>p</i> -value
Exposure to menu labelling			1.728	0.086
Calorie labelled	-233.74	240.46		
Non-calorie labelled	-293.54	248.91		

Based on Table 8, there is no significant difference in calories ordered between participants exposed to calorie labelled menu and participants not exposed to calorie labelled menu (*t* = 1.728, *p* = 0.086). All of the participants have negative value for

calories ordered which means they ordered more calories compared to their needs, regardless of exposure to calorie labelled menu or non-calorie labelled menu. For participants exposed to a calorie labelled menu, on average, they ordered 233.74 kcal higher compared to their calorie needs. On the other hand, for participants exposed to non-calorie labelled menu, they ordered 293.54 kcal higher compared to their calorie needs. To conclude, those exposed to non-calorie labelled menu ordered higher calories compared to calorie labelled menu, although this finding is not significant.

Several studies in the United States have found out that participants ordered fewer calories when presented with calorie-information (Green et al., 2015; Gustafon & Zeballos, 2020; Roberto et al., 2010), which contradicts with the finding from this study since the participants exposed to calorie labelled menu still order higher calories compared to their needs. However, the studies mentioned did not take into consideration the calorie needs, which varies individually. An individual with higher calorie needs may order more in order to fulfill their requirement. Besides, in the United States, restaurants with 20 or more establishments are required to provide nutritional information on menus (Lee-Kwan et al., 2016). As for Malaysia, the nutritional information on menus implementation has been gazetted on fast food outlets only and voluntarily for other food services (MOH, 2016). To add, as previously mentioned, this study found out that more than half of the participants reported Never (32.5%) and Rarely (31.5%) in terms of using calorie information when provided. Hence, it may be concluded that most Malaysians are not yet aware or familiar with the usage of menu labelling, which may explain the result of this finding in which both groups of participants still ordered more calories than their needs, regardless of exposure to calorie labelled menu or non-calorie labelled menu.

Furthermore, this study also found out that most of the participants had good health consciousness and positive attitude towards menu labelling as mentioned

previously. Thus, this finding is similar with a study conducted among university students in Selangor about healthy eating where the prevalence of good knowledge was 74.0%, good attitude was 80.3%, but good practice was only 22.0% (Hassan et al., 2015).

4.6.2 Association between age, BMI, health consciousness, and attitude towards menu labelling on the calories ordered among participants that were exposed to a calorie labelled menu

Table 9 shows the Pearson correlation between age, BMI, health consciousness, and attitude towards menu labelling on the calories difference among participants that were exposed to a calorie labelled menu.

Table 9: Pearson correlation between age, BMI, health consciousness, and attitude towards menu labelling on the calories difference among participants that were exposed to a calorie labelled menu (n=100)

Variable	1	2	3	4	5
1. Age	-				
2. BMI	0.109	-			
3. Health consciousness	0.069	0.156	-		
4. Attitude towards menu labelling	0.107	0.193	0.266**	-	
5. Calories difference	-0.010	0.365**	0.077	-0.039	-

** Correlation is significant at the 0.01 level (2-tailed)

Based on Table 9, there is a moderate, positive correlation between BMI and calories ordered, which was statistically significant ($r=0.365$, $p<0.001$). This result indicated that the higher the BMI, the lesser calories consumed due to higher calories difference between calories chosen and calorie needs. This finding contradicts with studies where it was found out that obese individuals have higher purchase of unhealthy foods. However, two studies reported that high BMI is associated with significant under-estimation of food intake (Livingstone, 2003; Wehling & Lusher, 2019). Thus, the

participants with higher BMI might try to appeal healthier or favourable, which explains the positive correlation with the calories ordered (calories difference). The correlation between age, health consciousness, and attitude towards menu labelling with calories difference was not statistically significant. Meanwhile, there was a moderate, positive correlation between attitude towards menu labelling and health consciousness ($r=0.266$, $p<0.001$). This result is similar to a study in Selangor regarding healthy eating where the prevalence of good attitude and good knowledge was 80.3% and 74.0% respectively (Hassan et al., 2015).

4.6.3 Means difference between sex, ethnicity, and monthly household income on the calories ordered among participants that were exposed to a calorie labelled menu

Table 10 shows the independent t -test result on calories difference between sexes among participants that were exposed to a calorie labelled menu or a non-calorie labelled menu.

Table 10: Independent t -test result on calories difference between sexes among participants that were exposed to a calorie labelled menu or a non-calorie labelled menu ($n=100$)

Variable	Mean	SD	t -value	p -value
Sex			-0.276	0.784
Female	-238.30	219.58		
Male	-220.74	296.55		

Based on Table 10, there is no significant difference in calories difference between male and female participants ($t=-0.276$, $p=0.784$). On average, both male and female participants had negative value for the mean score of calories ordered (calories difference) which means both groups chose more calorie compared to their calorie needs. To add, female participants purchased more calories than their calorie needs compared

to males, although both of these findings are not significant. These findings contradict with other studies where women chose lower calorie meal (Bezerra & Sichieri, 2009; Gerend, 2009). However, it was similar to result from a study where it was found out that there is no significant difference in calorie intake among gender (Saghir & Omar, 2013).

Table 11: One-Way-Analyses of Variance (ANOVA) result on calories difference between ethnicities and monthly household income among participants that were exposed to a calorie labelled menu (n=100)

Variables	Mean	SD	F	p-value
Ethnicity			1.029	0.396
Malay	-220.33	245.67		
Chinese	-382.00	203.52		
Indian	-352.35	214.60		
Sabah/Sarawak	-174.63	.		
Others	-163.40	101.25		
Monthly household income			0.477	0.622
B40	-254.36	220.35		
M40	-236.00	266.94		
T20	-184.89	204.41		

Based on Table 11, there was no statistically significant difference between ethnicity and calories ordered (calories difference) ($p=0.396$). This finding is similar to a study where there is no significant difference in terms of calories purchased with regards to ethnicity (Elbel et al., 2009). Furthermore, there was also no statistically significant difference between monthly household income and calories ordered ($p=0.622$). Although, it can be concluded that on average, the B40 group income chose more calories than their calorie needs when compared to M40 or T20 group, which lead to a smaller value of calories ordered (-254.36). This result can be attributed to findings from other study in which lower household income is associated with unhealthy food purchase (French et al., 2019).

CHAPTER 5: CONCLUSION, LIMITATION, AND RECOMMENDATION

This chapter comprises of the conclusion of the study. Besides, the limitation of the study is also included such as the presence of some confounding factors and the study setting as well as the recommendation for further studies.

5.1 Conclusion

A total of 200 Malaysian public university students participated in this study, with mean age of 21.91 ± 1.33 . Majority of them were female, Malay, belonged to the M40 household income group and were categorized as normal weight. More than half of them eat out every day in a week, and majority of them never or rarely use menu labelling when provided. Besides, the participants had good health consciousness and positive attitude towards menu labelling.

The study showed no significant association for calories ordered between participants exposed to calorie labelled menu and participants exposed to non-calorie labelled menu. There were also no significant association for the rest as well except for BMI with calories ordered. Thus, more studies are required prior to the nationwide menu labelling policy in 2025 to make sure the benefits of menu labelling can be utilised properly.

5.2 Limitation and Future Recommendation

One of the limitations of this study was the usage of household income groupings in order to determine the participants' household income. Considering that the participants were university students, amount of pocket money monthly should be asked instead, since this will better reflect the financial status of the participants. Besides, in regards to the frequency of eating out question, participants' details on whether they are staying at college or their own residence should be asked. This is because the participants might become confused on whether the food they ate at the college is considered outside food or not. Hence, further clarification was needed for this part.

The next limitation is there was no price restriction set for the participants when they chose the lunch menu, which might lead to overestimation. This is because price is one of the most important factors of food choice for students (Al-Aklabi et al., 2016; Sulaiman & Yong, 2011; Tam et al., 2017). Setting a price restriction or labelling each of the meal with price might give a better portrayal of the participants' actual meal chosen when they purchase food in real life. Next, the calories chosen by the participants through the menu was compared with 30.5% of calorie needs which is the median percentage of energy intake for lunch by Malaysian adults (Zalilah et al., 2008). Some participants might eat more or less during other meal time.

Another limitation was the presence of a cofounding factor. In this study, the knowledge of the participants regarding calorie information and menu labelling was not assessed. Next, the study was conducted online, thus, it was prone to bias in which the participants might not choose their usual intake food in order to appear healthier or favourable. Besides, since this study was considered as hypothetically, the participants might not finish all of the food that they chose.

One of the future recommendations for this study is to set a price restriction for the food selection part. Besides, participants knowledge regarding menu labelling and calorie information should be assessed beforehand in order to eliminate any confounding factor. Next, include other meals of the day (e.g., breakfast & dinner) for the participants to choose in order to compare it with the total calorie needs per day. Lastly, conduct the study in real life setting (e.g., restaurant & cafeteria) in order to reduce any bias and to create a similar scenario to a real-life setting.



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Appendices

Appendix 1: Questionnaire

Participants' eligibility to answer questionnaire	Are you Malaysian? / Adakah anda warganegara Malaysia? [] Yes [] No
	Are you 18 years old and above this year? / Adakah anda berumur 18 dan ke atas pada tahun ini? [] Yes [] No
	Are you under strict dietary restriction due to chronic disease or surgery? / Adakah anda sedang menjalani sekatan pemakanan yang ketat atas sebab penyakit kronik atau pembedahan? [] Yes [] No If yes, please specify. / Jika ya, sila nyatakan. _____
	Are you a pregnant or lactating woman? / Adakah anda wanita yang sedang hamil atau menyusu? [] Yes [] No
	Are you severely handicapped or have a physical disability? / Adakah anda seorang yang kelainan upaya atau mempunyai ketidakupayaan fizikal? [] Yes [] No If yes, please specify. / Jika ya, sila nyatakan. _____
	Do you have any non-communicable diseases? / Adakah anda menghidap penyakit tidak berjangkit?

	[] No
Participants' sociodemographic	Age / Umur _____
	Sex / Jantina [] Male / Lelaki [] Female / Perempuan
	Ethnicity / Etnik [] Malay [] Chinese [] Indian [] Bumiputera Sabah/Sarawak [] Others: _____
	Monthly household income group / Kumpulan pendapatan isi rumah bulanan [] B40 (Less than RM2500 - RM4849) / B40 (Kurang daripada RM2500 - RM4849) [] M40 (RM4850 - RM10959) / M40 (RM4850 - RM10959) [] T20 (RM10960 - More than RM15039) / T20 (RM10960 - Lebih daripada RM15039)
BMI	Current body weight (kg) / Berat badan semasa (kg) _____
	Current body height (m) / Ketinggian badan semasa (m) _____
Participants' characteristics	How often do you eat outside in a week? / Berapa kerapkah anda makan di luar dalam masa seminggu?

	[] 1 time a week / Sekali seminggu [] 2 times a week / 2 kali seminggu [] 3 times a week / 3 kali seminggu [] 4 times a week / 4 kali seminggu [] 5 times a week / 5 kali seminggu [] 6 times a week / 4 kali seminggu [] 7 times a week (every day) / 5 kali seminggu (setiap hari)
	Whenever you eat outside, how often do you use the calorie information on the menu, if provided? / Apabila anda makan di luar, berapa kerapkah anda menggunakan maklumat kalori pada menu, jika disediakan? [] Often / Kerap [] Sometimes / Kadang-kadang [] Rarely / Jarang [] Never / Tidak pernah
	Are you currently following any kind of diet regimen? / Adakah anda sedang mengikuti apa-apa jenis diet? [] Yes [] No If yes, please state the type of the diet regiment (e.g., vegetarian, ketogenic). / Jika ya, sila nyatakan jenis diet tersebut (contoh: vegetarian, ketogenik) _____
	Currently, on a scale of 1-7, how hungry are you? / Sekarang, daripada skala 1-7, seberapa laparkah anda? _____
Menu selection	In this section, you will be given a sample MENU for you to choose your dishes. Do make your dish selections according

to the given menu as if you are in a cafeteria (as shown in the picture below) during lunch time.

Pada bahagian berikutnya, anda akan diberikan sampel MENU untuk anda memilih hidangan makanan yang dikehendaki. Sila pilih hidangan anda berdasarkan menu yang diberi seolah-olah anda berada di kafeteria (seperti gambar di bawah) ketika waktu makan tengah hari.

Image of restaurant in which the menu is served. / Gambaran restoran bagi menu-menu yang disediakan.



Example of calorie information on restaurant menu / Contoh maklumat kalori pada menu restoran



CALORIE LABELLED MENU

MENU (LUNCH) | MENU (MAKANAN TENGAH HARI)

Energy requirements
for moderately active
adults in a day:

Male: 2240 kcal
Female: 1840 kcal

Keperluan tenaga orang
dewasa yang sederhana
aktif dalam sehari:

Lelaki: 2240 kcal
Perempuan: 1840 kcal

RICE | NASI

White rice | Nasi putih

	2 level scoops 2 senduk rata 150 kcal
	3 level scoops 3 senduk rata 225 kcal
	4 level scoops 4 senduk rata 300 kcal
	5 level scoops 5 senduk rata 375 kcal

National Coordinating Committee on Food and Nutrition. (2017). Recommended nutrient intakes for Malaysia: A report of the technical working group on nutritional guidelines. Ministry of Health Malaysia.

MENU (LUNCH) | MENU (MAKANAN TENGAH HARI)

SIDE DISH | LAUK

	Fried chicken Ayam goreng 1 large piece (drumstick) 1 ketul besar ('drumstick') 436 kcal
	Chicken curry Kari ayam 1 piece + 4 tablespoon gravy 1 ketul + 4 sudu besar kuah 263 kcal
	Catfish fried in chili Ikan keli goreng berlada 1 whole 1 ekor 227 kcal
	Fried Spanish mackerel Ikan tenggiri goreng 1 piece 1 keping 177 kcal
	Black pepper beef Daging masak lada hitam 3 pieces (matchbox size) 3 ketul (saiz kotak mancis) 207 kcal

Shahar, S., Saifi, N. S., Murali, Z. A., Haron, H. (2015). Atlas of food exchanges & portion sizes. (2nd edn). MDC Publishers Sdn Bhd. Ministry of Health Malaysia. (2018). General Kajian Bagi Makanan dan Minuman. http://healthdata.moh.gov.my/app/content/ajukan/201802/food_kajian%20data%20bagi%20makanan.pdf

MENU (LUNCH) | MENU (MAKANAN TENGAH HARI)

SIDE DISH | LAUK

	Omelette Telur dadar 1 whole 1 biji 136 kcal
	Egg tofu soup Sup tofu telur 4 pieces 4 keping 136 kcal
	Stir fried mixed vegetables Sayur campur goreng 1/2 cup 1/2 cawan 39 kcal
	Traditional Malaysian salad Ulam 1 cup 1 cawan 4 kcal
	Cabbage cooked in coconut gravy Sayur kobis masak lemak 1/2 cup 1/2 cawan 60 kcal

Shahar, S., Saifi, N. S., Murali, Z. A., Haron, H. (2015). Atlas of food exchanges & portion sizes. (2nd edn). MDC Publishers Sdn Bhd.

MENU (LUNCH) | MENU (MAKANAN TENGAH HARI)

BEVERAGES | MINUMAN

	Water Air kosong 250 ml 250 ml 0 kcal
	Tea with condensed milk Teh tarik 200 ml 200 ml 130 kcal
	Iced coffee Kopi ais 300 ml 300 ml 160 kcal
	Iced tea Teh O ais 250 ml 250 ml 80 kcal

Ministry of Health Malaysia. (2015). Kajian Survei Kebiasaan Berasap. (2nd edn). Ministry of Health Malaysia.

NON-CALORIE LABELLED MENU

MENU (LUNCH) MENU (MAKANAN TENGAH HARI)	MENU (LUNCH) MENU (MAKANAN TENGAH HARI)
SIDE DISH LAUK	SIDE DISH LAUK
 White rice Nasi putih 2 level scoops 2 senduk rata  3 level scoops 3 senduk rata  4 level scoops 4 senduk rata  5 level scoops 5 senduk rata	 Fried chicken Ayam goreng 1 large piece (drumstick) 1 ketul besar ('drumstick')  Chicken curry Kari ayam 1 piece + 4 tablespoon gravy 1 ketul + 4 sudu besar kuah  Catfish fried in chili Ikan keli goreng berlada 1 whole 1 ekor  Fried Spanish mackerel Ikan tenggiri goreng 1 piece 1 keping  Black pepper beef Daging masak lada hitam 3 pieces (matchbox size) 3 ketul (saiz kotak mancis)
National Coordinating Committee on Food and Nutrition (NCCFN). Recommended nutrient intakes for Malaysia. A report of the technical working group on nutritional guidelines, Ministry of Health, Malaysia.	Sulaiman, L., Sufri, N. S., Yusoff, Z. A., Harun, R. (2019). Atlas of food exchanges & portion sizes (3rd ed.). NCC Publishers Sdn Bhd. Ministry of Health Malaysia. (2019). Servings, Units, Weights and Measures. http://health.gov.my/wp-content/uploads/2019/05/BBG%20Kualiti%20Makanan%20Berat%20dan%20Ukuran.pdf

MENU (LUNCH) | MENU (MAKANAN TENGAH HARI)

SIDE DISH | LAUK



Omelette | Telur dadar
1 whole | 1 biji



Egg tofu soup | Sup tofu telur
4 pieces | 4 keping



Stir fried mixed vegetables | Sayur campur goreng
1/2 cup | 1/2 cawan



Traditional Malaysian salad | Ulam
1 cup | 1 cawan



Cabbage cooked in coconut gravy | Sayur kobis masak lemak
1/2 cup | 1/2 cawan

Shahar, S., Saifi, N. S., Manol, Z. A., Horish, H. (2015). Atlas of food exchanges & portions sizes. (3rd ed.). MDC Publishers Sdn Bhd.

MENU (LUNCH) | MENU (MAKANAN TENGAH HARI)

BEVERAGES | MINUMAN



Water | Air kosong
250 ml | 250 ml



Tea with condensed milk | Teh tarik
200 ml | 200 ml



Iced coffee | Kopi ais
300 ml | 300 ml



Iced tea | Teh O ais
250 ml | 250 ml

Nutritionist (2016). Saiz makanan (portion sizes) (Brochure). Ministry of Health Malaysia.

Menu selection

Rice (choose one only) / Nasi (pilih satu sahaja) *

Please choose one option based on the menu above according to your USUAL INTAKE
/ Sila pilih satu berdasarkan menu di atas mengikut PENGAMBILAN BIASA anda.

- ☐ White rice (2 level scoops) / Nasi putih (2 senduk rata) [150 kcal]
- ☐ White rice (3 level scoops) / Nasi putih (3 senduk rata) [225 kcal]
- ☐ White rice (4 level scoops) / Nasi putih (4 senduk rata) [300 kcal]
- ☐ White rice (5 level scoops) / Nasi putih (5 senduk rata) [375 kcal]

	Side dish (choose at least one) / Lauk (pilih sekurang-kurangnya satu) * Please choose at least one option based on the menu above according to your USUAL INTAKE. / Sila pilih sekurang-kurangnya satu berdasarkan menu di atas mengikut PENGAMBILAN BIASA anda. ☐ Fried chicken / Ayam goreng [436 kcal] ☐ Chicken curry / Kari ayam [263 kcal] ☐ Catfish fried in chili / Ikan keli goreng berlada [227 kcal] ☐ Fried Spanish mackerel / Ikan tenggiri goreng [177 kcal] ☐ Black pepper beef / Daging masak lada hitam [207 kcal] ☐ Omelette / Telur dadar [136 kcal] ☐ Egg tofu soup / Sup tofu telur [136 kcal] ☐ Stir fried mixed vegetables / Sayur campur goreng [39 kcal] ☐ Traditional Malaysian salad / Ulam [4 kcal] ☐ Cabbage cooked in coconut gravy / Sayur kobis masak lemak [60 kcal] Choose drinks (choose one only) / Pilih minuman (pilih satu sahaja) * Please choose one option based on the menu above according to your USUAL INTAKE / Sila pilih satu berdasarkan menu di atas mengikut PENGAMBILAN BIASA anda. ☐ Water / Air kosong [0 kcal] ☐ Tea with condensed milk / Teh tarik [130 kcal] ☐ Iced coffee / Kopi ais [160 kcal] ☐ Iced tea / Teh O ais [80 kcal]
IPAQ	The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Soalan-soalan berikut akan menyoal anda tentang jumlah masa yang anda gunakan untuk berada dalam keadaan aktif secara fizikal dalam tempoh 7 hari yang lepas ini. Sila jawab soalan-soalan ini walaupun anda berpendapat bahawa anda bukanlah seorang yang aktif. Think about all the vigorous activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at

a time. / Fikirkan tentang semua aktiviti fizikal berat yang anda telah lakukan dalam tempoh 7 hari yang lepas ini. Aktiviti fizikal berat adalah aktiviti yang menggunakan daya tenaga fizikal yang kuat dan membuat anda bernafas jauh lebih kuat daripada biasa. Fikirkan hanya tentang aktiviti-aktiviti fizikal yang anda telah lakukan selama sekurang-kurangnya 10 minit pada sesuatu masa. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling? / Dalam tempoh 7 hari yang lepas ini, berapa harikah anda telah melakukan aktiviti fizikal berat, contohnya mengangkat barang berat, mencangkul, senaman aerobik atau berbasikal laju? _____ days per week. If there is none, please put 0. / _____ hari seminggu. Jika tiada, sila tulis 0. _____ How much time did you usually spend doing vigorous physical activities on one of those days? / Berapakah masa yang anda biasa gunakan untuk melakukan aktiviti fizikal berat pada salah satu daripada hari berkenaan? _____ minutes per day. If there is none, please put 0. / _____ minit sehari. Jika tiada, sila tulis 0. _____
Think about all the moderate activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breath somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time. / Fikirkan tentang semua aktiviti fizikal sederhana yang anda telah lakukan dalam tempoh 7 hari yang lepas ini. Aktiviti fizikal sederhana adalah aktiviti yang menggunakan daya tenaga fizikal yang sederhana dan membuatkan anda bernafas agak lebih kuat daripada biasa. Fikirkan hanya tentang aktiviti-aktiviti fizikal yang anda telah lakukan selama sekurang-kurangnya 10 minit pada sesuatu masa. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking. / Dalam tempoh 7 hari yang lepas ini, berapa harikah anda telah melakukan aktiviti

fizikal sederhana, contohnya mengangkat muatan ringan, mengelap lantai, berbasikal pada kelajuan biasa, atau bermain badminton beregu? Ini tidak termasuk berjalan kaki.

_____ days per week. If there is none, please put 0. / _____ hari seminggu. Jika tiada, sila tulis 0.

How much time did you usually spend doing moderate physical activities on one of those days? / Berapakah masa yang anda biasa gunakan untuk melakukan aktiviti fizikal sederhana pada salah satu daripada hari berkenaan?

_____ minutes per day. If there is none, please put 0. / _____ minit sehari. Jika tiada, sila tulis 0.

Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure. / Fikirkan tentang masa yang anda telah gunakan untuk berjalan kaki dalam tempoh 7 hari yang lepas ini. Masa ini merangkumi berjalan kaki di tempat kerja dan di rumah, berjalan kaki dari satu tempat ke tempat yang lain, dan berjalan kaki semata-mata untuk rekreasi, bersukan, bersenam atau pada masa lapang.

During the last 7 days, on how many days did you walk for at least 10 minutes at a time? / Dalam tempoh 7 hari yang lepas ini, berapa harikah anda telah berjalan kaki selama sekurang-kurangnya 10 minit pada sesuatu masa?

_____ days per week. If there is none, please put 0. / _____ hari seminggu. Jika tiada, sila tulis 0.

How much time did you usually spend walking on one of those days? / Berapakah masa yang anda biasa gunakan untuk berjalan kaki pada salah satu daripada hari berkenaan?

	_____ minutes per day. If there is none, please put 0. / _____ minit sehari. Jika tiada, sila tulis 0. _____ The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television. / Soalan terakhir ini adalah berkaitan masa yang anda telah gunakan untuk duduk pada hari-hari bekerja dalam tempoh 7 hari yang lepas ini. Masukkan masa yang dihabiskan duduk di tempat kerja, di rumah, sewaktu belajar dan di masa lapang. Masa ini juga merangkumi waktu yang dihabiskan duduk di meja, menziarahi kawan-kawan, membaca, atau duduk atau baring sambil menonton televisyen. During the last 7 days, how much time did you spend sitting on a week day? / Dalam tempoh 7 hari yang lepas ini, berapakah masa yang anda telah gunakan untuk duduk pada sesuatu hari bekerja? Please state answer in _____ hours and _____ minutes per day (e.g., 6 hours 30 minutes per day). / Sila nyatakan jawapan dalam _____ jam dan _____ minit sehari (cth., 6 jam 30 minit sehari). _____
Health consciousness	The following questions are to assess your level of health consciousness. Please select the higher number if you agree with the statement and vice versa. There are no right or wrong answers. All of your responses are confidential. Soal selidik berikut adalah untuk menilai tahap kesedaran kesihatan anda. Sila pilih jawapan mengikut skala yang disediakan sama ada anda setuju atau tidak setuju dengan pernyataan yang diberi. Tiada jawapan betul atau salah. Semua jawapan anda adalah sulit. 1 - Strongly disagree; 2 - Disagree; 3 - Slightly disagree; 4 - Neutral; 5 - Slightly agree; 6 - Agree; 7 - Strongly agree 1 - Sangat tidak setuju; 2 - Tidak setuju; 3 - Agak tidak setuju; 4 - Neutral; 5 - Agak setuju; 6 - Setuju; 7 - Sangat setuju

	I choose food carefully to ensure good health. / Saya memilih makanan dengan berhati-hati untuk memastikan kesihatan yang baik. _____
	I consider myself a health conscious consumer. / Saya menganggap diri saya sebagai seorang yang mementingkan kesihatan. _____
	I often think about health related issues. / Saya sering memikirkan tentang isu-isu berkaitan kesihatan. _____
	I am prepared to do anything that is good to health. / Saya bersedia untuk melakukan apa sahaja yang baik untuk kesihatan. _____
	I often dwell on my health. / Saya sering memikirkan kesihatan saya. _____
	I think that I take health into account a lot in my life. / Saya rasa saya sangat mengambil kira tentang kesihatan dalam hidup saya. _____
Attitude towards menu labelling	Please choose the number that best indicates your feeling towards the given statement. / Sila pilih nombor yang paling tepat menerangkan perasaan anda terhadap pernyataan yang diberi.
	Using posted calorie information to make a meal decision is... / Menggunakan maklumat kalori yang disediakan untuk memilih hidangan adalah... Harmful / Memudaratkan _____ Beneficial / Bermanfaat
	Using posted calorie information to make a meal decision is... / Menggunakan maklumat kalori yang disediakan untuk memilih hidangan adalah... Difficult / Susah _____ Easy / Senang
	Using posted calorie information to make a meal decision is... / Menggunakan maklumat kalori yang disediakan untuk memilih hidangan adalah...

	Worthless / Tidak berguna _____ Useful / Berguna
	Using posted calorie information to make a meal decision is... / Menggunakan maklumat kalori yang disediakan untuk memilih hidangan adalah...
	Inconvenient / Menyusahkan _____ Convenient / Menyenangkan
	Having calorie information posted at full-service restaurants is... / Maklumat kalori yang disediakan di restoran adalah...
	Harmful / Memudaratkan _____ Beneficial / Bermanfaat
	Having calorie information posted at full-service restaurants is... / Maklumat kalori yang disediakan di restoran adalah...
	Bad / Teruk _____ Good / Bagus
	Having calorie information posted at full-service restaurants is... / Maklumat kalori yang disediakan di restoran adalah...
	Worthless / Tidak berguna _____ Useful / Berguna

Appendix 2: Turnitin Report

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6%

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2%

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