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CONSUMER'S KNOWLEDGE, AWARENESS AND WILLINGNESS TO PAY FOR REUSABLE FACE MASKS

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Abstract: Reusable face masks are cost-effective and environmentally friendly alternatives. However, the extent to which people are aware and willing to pay for reusable face masks is unknown. Thus, the research aimed to determine the relationship between consumer knowledge and awareness and their willingness to pay (WTP) for reusable face masks, the factors influencing consumers' WTP for reusable face masks and the average consumers' WTP for reusable face masks in Selangor. A total of 209 respondents were chosen by convenience sampling via an online survey method. Mann-Whitney and Kruskal-Wallis analyses revealed that only the educational level was associated with a significant difference in the WTP for reusable face masks. Furthermore, the Spearman correlation analysis revealed a significant positive relationship between knowledge and awareness of reusable face masks and willingness to pay for them. Additionally, the multiple regression analysis indicated that consumer awareness significantly influenced their willingness to pay for reusable face masks. The mean maximum willingness to pay for reusable face masks in Selangor was RM12.85/USD2.92 per mask piece/person using the open-ended Contingent Valuation Method (CVM). These findings would aid the government in developing effective strategies for promoting reusable face masks and assist manufacturers in producing reusable face masks at a price point that consumers are willing to pay, encouraging wider adoption.

Keywords: Awareness, knowledge, reusable face masks, sustainability, willingness to pay.

Introduction

In December 2019, the world was rocked by the emergence of a novel coronavirus outbreak in Wuhan, China. The World Health Organization classified this novel coronavirus as coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This virus spread swiftly around the globe, including Malaysia. Between January 2020 and January 2022, Malaysia had 2,776,699 confirmed cases of COVID-19 (World Health Organisation, 2022). Thus, authorities obligated individuals to wear face masks as a precautionary measure.

Authorities have now made wearing face masks mandatory to reduce viral transmission and safeguard the public's health. As a result of the increased demand during this COVID-19 pandemic, the manufacture of disposable face masks increased. Increased usage of disposable face masks has resulted in a rise in face mask waste. These wastes cannot be recycled and eventually end up in landfills, taking longer to decompose completely. On pristine beaches in Hong Kong, 70 face mask wastes were discovered along 100 metres of shoreline. The face masks floated like jellyfish in the Mediterranean (Roberts *et al*., 2020). Globally, it is predicted that over 129 billion face masks will be produced each month and the number will continue to grow until the COVID-19 pandemic ends (Adyel, 2020).

In Malaysia, 10 million face masks are dumped daily and the quantity is likely to rise to 15 million in a single day. Disposable face masks are made of non-biodegradable materials derived from non-renewable petroleum sources; they

may have a negative impact on the environment and the decomposition of these face mask wastes can take up to 450 years (Arumugan, 2020). When face mask wastes are disposed of improperly, it will cause problems for humans, animals, and the environment. In addition to endangering individuals, inappropriate disposal of these contaminated face masks exposes solid waste collectors to risks (Arumugan, 2020; Sangkham, 2020).

Face mask waste is a new kind of plastic pollution that emerged during the COVID-19 pandemic. Recent research discovered that face masks were a source of microplastic, a type of plastic that may affect marine and aquatic ecosystems.

According to Yeh (2020), marine creatures will consume these face masks for food, disrupting their food chain. In Malaysia, public attitudes and knowledge about single-use plastics such as face masks are unsatisfactory (Arumugan, 2020). Face mask wastes were dumped in streets, parking lots, and sewers. This incorrect disposal of the face masks may clog waterways, possibly resulting in flooding. Eventually, some face masks will flow into the river and ocean. Therefore, disposable face masks are undoubtedly a new source of plastic pollution in Malaysia.

Thus, reusable face masks should minimise disposable face mask usage and waste. They are a more environmentally friendly alternative to disposable face masks, as they have the potential to reduce overall plastic waste. The general population's adoption of reusable face masks will decrease the usage and demand for disposable face masks (Bedi & Tang, 2021).

Bondaroff and Cooke (2020) proposed that the solution to single-use disposable face mask pollution is for individuals to use reusable face masks made of sustainable materials. Allison *et al*. (2020) classified reusable face masks as those that can be used multiple times. Additionally, Shruti *et al*. (2020) mentioned that reusable face masks were often made of washable fabric or cloth, minimising environmental impact and increasing cost-effectiveness. Goncalves (2020) also stated that reusable and certified cloth face masks were the most sustainable and safest alternative when handled correctly, including thorough cleaning and disposal if not used again.

Thus, to mitigate the future impacts of disposable face masks, the development of reusable face masks is the most environmentally friendly and non-toxic alternative. Consumers' environmental knowledge and awareness contribute to a healthy environment (Subahir, 2014). Additionally, knowledge and awareness play a role in influencing consumers' decision-making, particularly regarding evaluating products and services. However, owing to the recent increase in face mask waste, studies on the degree of awareness and knowledge of reusable face masks remain scarce and ambiguous. Similarly, the relationship between knowledge and awareness of reusable face masks and willingness to pay for them remains unknown.

Currently, countless reusable face masks are manufactured and marketed by local sellers at varying prices. Even though reusable face masks were sold in the market at an average price of RM2.00, their utilisation is minimal. Socio-demographic characteristics of the consumer have a significant role in determining their purchasing intention. Socio-demographic characteristics are associated with consumer behaviour in relation to the procurement of a product (Omar *et al*., 2016). Numerous research has shown that socio-demographic characteristics significantly determine an individual's willingness to pay for a product. As of now, no socio-demographic variable is associated with a substantial variation in willingness to pay for reusable face masks. Similarly, consumer willingness to pay for reusable face masks based on scientifically valid research remains unclear. Thus, the contingent valuation method was employed to ascertain customers' willingness to pay for reusable face masks.

Considering other sustainable products, Nazir and Tian (2022) study the influence of consumers' purchase intention factors on willingness to pay for renewable energy.

The findings demonstrated a substantial and favourable correlation between influential factors (such as exposure to social media, relative advantage, simplicity of use, awareness, and cost) and the intention to purchase renewable energy technology. Liu *et al*. (2017) studied factors influencing consumer willingness to pay for low-carbon products among both suppliers and consumers. The study indicates that consumers' level of awareness regarding low-carbon items and their income have minimal impact on their willingness to pay for green products. Conversely, several aspects distinctly influence consumers' inclination to pay for low-carbon products such as the promptness of product delivery, consumers' level of patience, and their degree of contentment. Schuermann and Woo (2022) studied the consumers' willingness to pay for reusable food containers when ordering delivery food. They found that more than half of the survey respondents are willing to pay an average of KRW2260 (USD1.92) for a reusable food container that has to be returned to a certain facility. It was also found that the WTP increases to USD2.18 if the used container is picked up at the consumer's home again.

Nicolau *et al*. (2022) investigated the willingness of consumers to reuse their reusable coffee cups under the condition of monetary incentives. The research findings showed that 92.61% of consumers were willing to reuse their cups if a discount was offered. The factors influencing their decision were knowledge about disposable coffee cups, involvement in the topic of using disposable cups for takeaway beverages, previous experience regarding the use of disposable cups, and barriers to use them (Nicolau *et al*., 2022). Patreau *et al*. (2023) investigated the willingness to pay for in-bulk products with reusable packaging options in Canada. The findings suggest that the majority of consumers are not inclined to pay a higher price for bulk products that come with reusable packaging, even if they express interest in purchasing more bulk items. They argued that various socio-demographic and attitudinal factors, including age, gender, convenience preferences, and pro-environmental behaviours impact the inclination to purchase and make payments.

Thus, the specific objectives of this study were to determine the relationship between consumer knowledge and awareness and their WTP for reusable face masks in Selangor and to determine the consumer WTP for reusable face masks in Selangor.

To summarise, this research discovered that only the variable of educational level significantly affected willingness to pay for reusable face masks. In terms of the knowledge aspect, the findings indicated that most respondents scored above average for each of the knowledge items except for the item "If reusable face masks were biodegradable" and the statement, "Surgical face masks are more effective at preventing the transmission of viruses than reusable face masks". The overall mean score for the awareness section showed a high awareness of respondents on the usage of reusable face masks. The correlation analysis between the knowledge, awareness, and willingness to pay for reusable face mask variables showed a significant and positive relationship among them. Finally, following the open-ended Contingent Valuation Method (CVM), the formula to calculate the mean value of willingness to pay amounted to RM12.85/ USD2.92 per mask (USD1: RM4.40).

The findings of this research would aid the government in regulating the pricing of reusable face masks and developing initiatives to encourage Malaysians to purchase reusable face masks rather than disposable face masks. This research provided invaluable information to face mask manufacturers to produce high-quality reusable face masks at a price point that customers are willing to pay. In addition, findings on knowledge and awareness would be beneficial in creating awareness among the public on the importance of opting for reusable face masks compared to disposable face masks.

Materials and Methods

Study Area

This research was conducted in the state of Selangor, Malaysia. Selangor state is situated on the right and west coasts of Peninsular Malaysia. It is bounded on the north by Perak, on the east by Pahang, on the south by Negeri Sembilan, and the west by Malacca. Petaling, Klang, Kuala Langat, Hulu Langat, Sepang, Gombak, Kuala Selangor, Hulu Selangor, and Sabak Bernam are the nine districts in Selangor (Figure 1). Selangor state was selected as the research location due to its high population density. The large population will increase the demand for the usage of face masks. According to the Department of Statistics Malaysia (2020), Selangor's total population in 2019 was approximately 6.53 million.

Research Hypothesis

H1: Knowledge – Awareness

H_0: Knowledge has NO significant effect on the awareness towards reusable face masks.

H_a: Knowledge has a significant effect on awareness of reusable face masks.

H2: Knowledge – Willingness to Pay

H_0: Knowledge has NO significant effect on consumers' willingness to pay for reusable face masks.

H_a: Knowledge has a significant effect on consumers' willingness to pay for reusable face masks.

H3: Awareness – Willingness to Pay

H_0: Awareness has NO significant effect on consumers' willingness to pay for reusable face masks.

H_a: Awareness has a significant effect on consumers' willingness to pay for reusable face masks.

Questionnaire Design

The Open-ended Contingent Valuation Method (CVM) elicited consumers' preferences for reusable face masks by creating a hypothetical market. The questionnaires were divided into four (4) sections: A, B, C, and D. Section A

Figure 1: Selangor districts
Source: Google Maps (2021)

addressed the respondents' socio-demographic characteristics. Section B assessed participants' knowledge of reusable face masks. In section B, dichotomous questions were employed, with 1 indicating 'Yes', 2 indicating 'No', and 3 indicating 'Not Sure'. In Section C, the question determined the respondents' awareness of reusable face masks and a 5-point Likert scale with a range of 1 (strongly disagree) to 5 (strongly agree) was employed. Section D was an open-ended CVM in which respondents were asked to indicate the maximum price they would pay for reusable face masks depending on the scenario (as shown in the paragraph below). The questionnaires were written in both Bahasa Malaysia and English and included both open-ended and closed-ended questions. The preliminary studies on the actual sample size were conducted, utilising an online survey to ascertain comprehension, and detect any technical errors or flaws in the questionnaire.

Scenario

Disposable face mask wastes contribute to environmental pollution. They are composed of plastic polypropylene, which has resulted in "enormous" plastic waste pollution. Disposable face masks have been shown to be a source of microplastics in the ocean and negatively affect the aquatic ecosystem. Alternatively, reusable face masks are a sustainable approach to reducing the use of disposable face masks. The reusable face masks are composed of cloth fabric. It can then be reused, therefore minimising the impact of plastic pollution. As a result, reusable face masks are recommended for long-term use due to their affordability and flexibility, which allows them to be rewashed and reused multiple times.

Test of Validity and Reliability

Ten students enrolled in the Bachelor of Environmental Management program at Universiti Putra Malaysia participated in a pretest to ensure that the questionnaire items were clear and easily understood. The results indicated that all questions were comprehensible.

A pilot study was conducted with 10% of the sample size. Thus, the pilot study collected data from 40 respondents to determine the questionnaire's reliability among actual respondents. The pilot study's data were analysed using the SPSS software version 24 and the Kuder-Richardson reliability coefficient (K-R20).

The reliability test for Section B, which assessed knowledge of reusable face masks was conducted using the Kuder-Richardson coefficient of reliability (K-R20). The reliability value for this section was 0.645, which was considered strong according to the Kuder-Richardson coefficient of reliability.

Section C focused on the environmental awareness of reusable face masks. Cronbach's Alpha analysis was used in the SPSS software to conduct the reliability test. Cronbach's Alpha determined the level of reliability. The section's result indicated that Cronbach's Alpha was 0.869 (Table 1), suggesting that the questions were appropriate. These results confirm that the questionnaire is a reliable tool for assessing

Table 1: The reliability level of Cronbach's Alpha

Reliability Coefficient	Level of Reliability
0.90 or more	Very good
0.80 – 0.89	Good
0.60 – 0.79	Normal
0.40 – 0.59	Doubted
0.00 – 0.39	Rejected

Source: Abdullah and Wei (2017)

knowledge and environmental awareness of reusable face masks among the target population.

Validity Test

Expert validators verified the questionnaire prior to completing the pretesting and pilot study. Five experts were selected to verify the questionnaire based on their knowledge and research fields. Three of the five validators are experts in solid waste while the other two are experts in environmental economics. The questionnaire was improved in response to validators' comments, opinions, and recommendations.

Additionally, the Content Validity Index (CVI) analysed the score scales provided by validators to obtain accurate findings. According to Rodrigues *et al*. (2017), the Scale-level-CVI (S-CVI) was calculated using only questions rated as "very relevant". Scales with excellent content validity in the range of 0.7 or higher are recommended for I-CVI. In contrast, scales with excellent content validity in the range of 0.8 or higher are recommended for S-CVI/UA and S-CVI/Ave (Shi *et al*., 2012). If the panel of validators exceeds five individuals, the I-CVI value should be more than 1.00, and not less than 0.78 (Shrotryia & Dhanda, 2019). Additionally, another study argued that the S-CVI/Ave value greater than 0.9 indicated excellent content validity (Rodrigues *et al*., 2017). According to the result of the Content Validity Index (CVI), the S-CVI/Ave of this survey was 1.00, suggesting that it has excellent content validity. If the S-CVI/Ave value was less than 0.8, the questions should be amended or removed to improve validity. After modifications, the final questionnaire was distributed to the respondents for pretesting and pilot study.

Sample Size

The sample size was determined using the Taro Yamane (1967) formula, assuming a confidence level of 95%. Taking the 4.74 million total population (N) in Selangor over the age of 18 in 2019 into consideration (Department of Statistics Malaysia, 2020), the margin of error (e) was 0.05, and the sample size for this research was 400 respondents. Due to limitations encountered during data collection, 209 valid responses were obtained. However, this sample size is still adequate according to the formula provided by Tabachnick and Fidell (2007). This method specifically considers the number of independent variables in the study to determine the required sample size. The formula is generally expressed as:

$$N \geq 50 + 8m$$

where N is the minimum sample size and m is the number of independent variables.

Given the number of independent variables in this study, the calculation indicated that 209 respondents would be sufficient to maintain the integrity of the statistical analysis. Age, gender, education, income, and knowledge and awareness about reusable face masks were all included as independent variables. As a result of the calculation, 98 respondents were required for correlation analysis. Since this research gathered more than the required number of respondents, a total of 209 respondents was deemed valid.

Survey Method

This was a self-administered survey in which respondents answered and completed questionnaires independently. The survey questionnaire was developed on Google Forms and was available in both languages of English and Malay. The survey was conducted entirely online. The online survey employed two primary platforms: Social media (Facebook, Instagram, and Twitter) and WhatsApp. Prior to responding to the questionnaires, respondents must meet specific criteria, including being at least 18 years old, having a monthly income, and residing in Selangor. The respondents then had between 10 and 15 minutes to complete this questionnaire. During the COVID-19 pandemic, this online survey approach proved flexible, convenient, and reliable. Due to the fact that the data were acquired digitally, they were collected promptly (Dell´Olio *et al*., 2017).

Sampling Technique

This research employed a non-probability sampling technique. The population sample was drawn using the convenience sampling technique. Fricker (2016) stated that an online survey was a non-probability sampling technique in which the respondents could not be identified. The survey was posted on the website and the respondents will have the option of participating or not. The advantage of this method revolves around the execution being simple and effective.

Data Analysis

The Statistical Package for Social Science (SPPS) software analysed the data. Descriptive and inferential tools, including Spearman Correlation, the Mann-Whitney test, and the Kruskal-Wallis test were used. The descriptive study analysed the pattern and frequency of demographic characteristics of respondents such as gender, age, education levels, income, and degree of knowledge and awareness. Due to the non-parametric nature of the data, the Mann-Whitney and Kruskal-Wallis tests determined the significant differences between the socioeconomic variable and the WTP for reusable face masks. In this research, the Mann-Whitney test determined the significant difference between two distinct groups of independent variables such as gender.

Furthermore, the Kruskal-Wallis test determined the significant differences between two or more independent variables in this research. Variables included age, educational level, occupation, and gross monthly income. Conversely, the spearmen correlation examined the relationship between consumer knowledge and awareness of reusable face masks and their WTP. Finally, the equation proposed by Honu (2007) determined the mean maximum value of WTP.

Results and Discussion

Socio-demographic of Respondents Frequency and Percentage

Table 2 summarises the socio-demographic characteristics of 209 respondents, including their gender, age, educational level, occupation, gross monthly income, and district. Consumers in Selangor were targeted as respondents. This survey recruited 209 respondents. According to Table 2, Selangor has nine districts, with Petaling having the highest proportion of respondents at 29.7% (62), followed by 19.1% (40) from Hulu Langat, 18.7% (39) from Gombak, 7.2% (15) from Hulu Selangor, 7.2% (15) from Klang, 6.7% (14) from Kuala Selangor, 6.7% (14) from Sepang, and 3.3% (7) from Sabak Bernam.

According to the results in Table 2, about 71.8% (150) of respondents were female while the remaining 28.2% (59) were male. The youngest respondent was 19 years old while the oldest was 64. Most respondents were between the ages of 18 and 25, accounting for 44.5% (93), followed by 26 and 35, accounting for 19.1% (40). Following that, respondents aged 46 to 55 years totalled 16.3% (34), followed by respondents aged 36 to 35 years at 11.5% (24). Meanwhile, just 8.6% (18) of respondents were 56 years or above. As apparent, most respondents in this research were under 18.

Additionally, as seen in Table 2, most respondents possessed academic credentials. 45.5% (95) of respondents have bachelor's degrees, 2.4% (5) hold master's degrees, and 37.3% (78) have finished their studies at the STPM/Diploma/Matriculation/Certified level. Additionally, 14.4% (30) of respondents finished high school while just 0.5% (1) completed primary-level education.

The next item pertained to the respondents' occupations. The results indicated that 55.5% (116) of the respondents worked in the private

sector, followed by 19.1% (40) in the government sector, 9.6% (20) in self-employment, and 2.9% (6) in retirement. However, 12.9% (27) of respondents reported being part-time students. Additionally, the gross monthly income level was a significant determinant in evaluating willingness to pay. The results indicated that 48.3% (101) of respondents earned less than RM2,001.00, 30.1% (63) earned between RM2,001.00 and RM4,000.00, 14.8% (31) earned between RM4,001.00 and RM6,000.00, and 4.3% (9) earned between RM6,001.00 and RM8,000.00. Only 2.4% (5) of respondents earned more than RM8,001.00.

Significant Differences between Socio-demographic Variables and the Willingness to Pay for Reusable Face Masks

The Mann-Whitney and Kruskal Wallis test measured the significant difference between respondents' socio-demographic variables and their willingness to pay for reusable face masks. Table 2 shows the result of the *p*-value of socio-demographic variables with their WTP for reusable face masks.

According to Table 2, the gender *p*-value exceeded 0.05 (p = 0.404). This suggested that there was no significant variance in the willingness of males and females to pay for reusable face masks. Additionally, as indicated in Table 2, the *p*-value for the respondents' age was more than 0.05 (p = 0.684). This also meant that there was no significant variation in the willingness of different age groups to pay for reusable face masks.

According to Table 2, the *p*-value for the educational level was, however, less than 0.05 (p = 0.016). This signified a considerable variation in their willingness to pay for reusable face masks based on their level of education. Thus, this research discovered that the respondents with a higher education level were more willing to pay for reusable face masks in Selangor. In contrast, according to Table 2, the *p*-value for the occupational sector was more than 0.05 (p = 0.361). This indicated no significant variation in terms of willingness by the occupational sector to pay for reusable face masks. Additionally, according to Table 2, the *p*-value for gross monthly income was higher than 0.05 (p = 0.760). This implied no significant variation in the willingness to pay for reusable face masks across the various categories of gross monthly income.

To summarise, this research discovered that only the variable of educational level significantly affected willingness to pay for reusable face masks. Other socio-demographic characteristics such as gender, age, occupational sector, and gross monthly income, did not significantly affect their willingness to pay for reusable face masks.

Respondent's Knowledge Toward Reusable Face Masks

Table 3 shows the respondents' knowledge of reusable face masks. The findings indicated that the majority of respondents (78.5%, n = 164) were aware that the reusable face masks comprised fabric materials while 14.8% (31) were unsure. Rowan and Moral (2021) stated that reusable face masks were non-medical masks composed of a variety of materials. Innovative technology has successfully produced high-quality fabric face masks capable of killing and filtering out viruses (Ihsan, 2021).

Additionally, the majority of respondents (74.2%, n = 155) were aware that reusable face masks were eco-friendly products, whereas 18.2% (38) were unsure. Makki *et al*. (2021) and Prata *et al*. (2021) concluded that reusable face masks were environmentally friendly products and a more sustainable alternative to disposable face masks. Additionally, 54% (113) of respondents were unsure if reusable face masks were biodegradable. Meanwhile, 34% (71) of respondents stated that the reusable face masks were composed of biodegradable materials while the remaining 14% (25) responded otherwise.

Following that, most respondents demonstrated a high level of knowledge of the usage of reusable face masks. 87.6% (183) of respondents were aware that reusable face

Table 2: Demographic profiles of the respondents (n = 209)

Item	Frequency (n)	Percentages (%)	p-value
Gender			
Male	59	28.2	0.404[a]
Female	150	71.8	
Age (years)			
18 – 25	93	44.5	
26 – 35	40	19.1	
36 – 45	24	11.5	0.684 [b]
46 – 55	34	16.3	
56 and above	18	8.6	
Educational Level			
Primary school	1	0.5	
High school	30	14.4	0.016[b]
STPM/Diploma/Matriculation/Certificated	78	37.3	
Bachelor's degree	95	45.5	
Master's degree	5	2.4	
Occupation			
Government sector	40	19.1	
Private sector	116	55.5	
Self-employment	20	9.6	0.361[b]
Retired	6	2.9	
Others	27	12.9	
Individual Gross Monthly Income			
Less than RM2,001.00	101	48.4	
RM2, 001.00 – RM4, 000.00	63	30.1	
RM4, 001.00 – RM6, 000.00	31	14.8	0.760[b]
RM6, 001.00 – RM8, 000.00	9	4.3	
Above RM8, 001.00	5	2.4	
District			
Gombak	39	18.7	
Hulu Langat	40	19.1	
Hulu Selangor	15	7.2	
Klang	15	7.2	
Kuala Langat	3	1.4	
Kuala Selangor	14	6.7	
Petaling	62	29.7	
Sabak Bernam	7	3.3	
Sepang	14	6.7	

[a]Mann-Whitney U test, $\alpha = 0.05$.
[b]Kruskal Wallis test, $\alpha = 0.05$.
p-value is statistically significant at $p \leq 0.05$.

masks could be washed after use. Duong *et al*. (2021) supported such a viewpoint and reported that most of their participants washed their face masks following usage. Meanwhile, only 4.8% (10) of respondents stated that they did not wash it after use and 7.7% (16) indicated that they were unsure. Additionally, 82.8% (173) of respondents were aware that reusable face masks could be used several times. This finding was corroborated by Pramana *et al*. (2021), who found that most respondents indicated that the reusable face masks could be used frequently. After washing, the reusable face masks may be reused several times (Prata *et al*., 2021).

Surgical face masks are more effective at preventing the transmission of viruses than reusable face masks. According to Table 3, 32.5% (68) of respondents agreed with such a statement, 34.9% (73) disagreed, and 32.5% (68) expressed uncertainty. This was consistent with Sikakulya *et al*. (2021), in which most of their respondents provided contradictory responses. Additionally, 66.5% (136) of respondents were aware that reusable face masks might help minimise the risk of viral infection, whereas 24.4% (51) were unsure. The research discovered that surgical face masks were more effective in preventing viral infection than reusable face masks. Nevertheless, the multilayer and high-quality material of reusable face masks should be employed to improve their performance in limiting the transmission of viruses (Prata *et al*., 2021).

Additionally, most respondents, 83.3% (174) of them were aware that reusable face masks must be three-layered for optimal virus prevention, whereas 11.5% (24) were unsure. The World Health Organization (2022) recommended that cloth face masks be constructed in three layers: The inner layer be made of an absorbent material such as cotton, the middle layer be made of a non-woven material such as polypropylene, and the outer layer be made of a non-absorbent material such as polyester or a polyester blend.

Finally, 82.8% (173) of the respondents were aware that the production and usage of reusable face masks had a beneficial effect on the environment. Meanwhile, 14.4% (30) of respondents were unsure and just 2.9% (6) said that reusable face masks did not benefit the environment. The usage of certified reusable face masks is a cost-effective solution that protects society and the environment by preventing 85% of waste output (Allison *et al*., 2020; Odachi, 2020; Voirol *et al*., 2020).

Overall, the data presented in Table 3 emphasised the respondents' comprehension of reusable face masks, particularly in terms of their composition, environmental sustainability, and utilisation. Although most respondents demonstrated comprehension of these aspects, there were misconceptions regarding the effectiveness of reusable masks in comparison to surgical masks.

Considering the transition of COVID-19 from a worldwide crisis to an ongoing health concern, these findings indicated possibilities for policy intervention. The awareness and recognition of the environmentally conscious nature of reusable masks demonstrate a collective affirmation of initiatives aimed at promoting sustainability. One prospective avenue for policymakers to explore is advancing the use of reusable masks, mitigating waste and environmental impacts.

Furthermore, addressing gaps in knowledge and comprehension through public health campaigns could enhance the proper utilisation of reusable masks, thereby mitigating infection risks. Acknowledging the environmental advantages of reusable masks highlights the possibility of implementing policies promoting sustainable alternatives. Hence, in order to effectively address the ongoing COVID-19 challenges and make progress towards sustainability and public health goals, it is imperative to make well-informed decisions and implement targeted interventions.

Table 3: Knowledge of reusable face masks

Item	Frequency (n = 209)			Ranking
	Yes	No	Not Sure	
Knowledge 1	164 (78.5%)	14 (6.7%)	31 (14.8%)	5
Knowledge 2	155 (74.2%)	16 (7.7%)	38 (18.2%)	6
Knowledge 3	71 (34.0%)	25 (12.0%)	113 (54.1%)	9
Knowledge 4	183 (87.6%)	10 (4.8%)	16 (7.7%)	1
Knowledge 5	173 (82.8%)	20 (9.6%)	16 (7.7%)	3
Knowledge 6	73 (34.9%)	68 (32.5%)	68 (32.5%)	8
Knowledge 7	136 (66.5%)	19 (9.1%)	51 (24.4%)	7
Knowledge 8	174 (83.3%)	11 (5.3%)	24 (11.5%)	2
Knowledge 9	173 (82.8%)	6 (2.9%)	30 (14.4%)	4

Note: The ranking ranges from 1 to 9, signifying respondent knowledge of reusable face masks.

Knowledge 1: Reusable face masks are made of fabric.

Knowledge 2: Reusable face masks are eco-friendly products.

Knowledge 3: Reusable face masks are made of biodegradable materials.

Knowledge 4: Reusable face masks need to be washed after use.

Knowledge 5: Reusable face masks can be used multiple times.

Knowledge 6: Reusable face masks are as effective as regular surgical face masks in limiting the spread of viruses.

Knowledge 7: Reusable face masks help reduce the risk of virus infection.

Knowledge 8: Reusable face masks must be three-layer for effective protection against viruses.

Knowledge 9: Reusable face masks have a positive impact on the environment.

Respondent's Environmental Awareness Toward Usage of Reusable Face Masks

Table 4 shows the respondents' environmental awareness regarding the use of reusable face masks. The majority of respondents (49.8%, n = 104) were aware that reusable face masks might benefit the environment. Hartanto and Mayasari (2021) supported this statement and advocated for high-quality reusable face masks composed of environmentally friendly materials. Only 1.9% (4), on the other hand, strongly disagreed with this statement.

Additionally, this research discovered that most respondents (42.1%, n = 88) used reusable face masks out of concern for the environment. Odachi (2020) supports this, stating that the use of reusable face masks is a proactive step toward environmental protection. Individuals who exhibited a high level of environmental awareness were considered responsible citizens. 3.3% (7) of respondents, however, disagreed.

Additionally, the results indicated that most respondents had a high level of knowledge; more than half (54.5%) strongly agreed that using reusable face masks may help reduce pollution of our natural resources. Meanwhile, 11.5% (24) of respondents were neutral on the matter and 4.3% (9) believed that reusable face masks did not reduce the pollution of natural resources. Reusable face masks are a sustainable approach to reduce environmental pollution, particularly microplastic pollutants, which are detrimental to humans and animals (Abbasi *et al*., 2020; Selvaranjan *et al*., 2021). Additionally,

61.7% (129) of respondents strongly agreed that reusable face masks contributed to reducing face masks wasted during the COVID-19 pandemic. According to Hiemstra *et al*. (2021), using reusable face masks is a viable option for reducing PPE litter during this pandemic. However, approximately 1% (2) of respondents strongly disagreed with this statement.

Additionally, the data indicated that 51.7% (108) of respondents strongly agreed that using reusable face masks contributed to reducing environmental destruction. Meanwhile, 13.4% (28) of respondents have a neutral view of this matter. According to Fadare and Okoffo (2020), disposable face masks contribute to aesthetic degradation. Thus, reusable face masks should be promoted in order to limit the quantity of waste generated by face masks dumped in public areas such as grocery parking lots, trails, and hospital districts (Ammendolia *et al*., 2020).

Finally, 45.5% (95%) of respondents strongly agreed that using reusable facemasks would lower the demand for single-use face masks. 6.7% (14) of respondents, however, disagreed. The encouragement of reusable face masks is the best practice because it eliminates the need for and demand for single-use face masks, hence, lowering single-use face mask consumption (Desert, 2020; Bedi & Tang, 2021; Xu & Ren, 2021).

Given the ongoing nature of COVID-19 as a health concern rather than a global crisis, the data presented in Table 4 highlights a significant level of environmental awareness among the participants with regard to the use of reusable face masks. This highlights the significance of promoting sustainability. Policymakers must seize this opportunity and encourage the adoption of reusable masks by offering subsidies and promoting eco-friendly alternatives. In addition, it is imperative to focus on the reduction of pollution and waste through the promotion of responsible disposal practices and the enhancement of reusable mask design. In addition, the implementation of regulations that require the use of masks in specific settings, along with the promotion of public awareness through campaigns can effectively decrease the amount of single-use consumption. By harmonising policies with the prevailing public sentiment, we can foster a society that is more attuned to environmental concerns.

Table 4: Environmental awareness about usages of reusable face masks (n = 209)

Items	Frequency (n = 209)					Mean	Level
	1	2	3	4	5		
Awareness 1	4 (1.9%)	5 (2.4%)	28 (13.4%)	68 (32.5%)	104 (49.8%)	4.26	4
Awareness 2	7 (3.3%)	13 (6.2%)	46 (22.0%)	55 (26.3%)	88 (42.1%)	3.98	3
Awareness 3	1 (0.5%)	9 (4.3%)	24 (11.5%)	61 (29.2%)	114 (54.5%)	4.33	4
Awareness 4	2 (1.0%)	5 (2.4%)	21 (10.0%)	52 (24.9%)	129 (61.7%)	4.44	4
Awareness 5	1 (0.5%)	6 (2.9%)	28 (13.4%)	66 (31.6%)	108 (51.7%)	4.31	4
Awareness 6	2 (1.0%)	14 (6.7%)	41 (19.6%)	57 (27.3%)	95 (45.5%)	4.10	4
Average Mean						**4.23**	

Note: < 2.00 = strongly disagree (1), 2.01–3.00 = disagree (2), 3.01–4.00 = agree (3), 4.01–5.00 = strongly agree (4); adapted from Budiani *et al*. (2018)

Awareness 1: I am aware that reusable face masks reduce the impact on the environment.

Awareness 2: I use reusable face masks because I care about the environment.

Awareness 3: The use of reusable face masks will minimise pollution of our natural resources.

Awareness 4: Reusable face masks help minimise face mask litter during this COVID-19 pandemic.

Awareness 5: Reusable face masks minimise the destruction of the aesthetic view of the environment.

Awareness 6: The use of reusable face masks would reduce the demand for single-use face masks.

Relationship between Consumer's Knowledge and Awareness and their Willingness to Pay for Reusable Face Masks

In this research, the Spearman correlation determined the correlation and coefficient of the continuous variable. Table 6 shows the relationship between consumer knowledge and awareness and their willingness to pay for reusable face masks.

According to the results in Table 6, there was a substantial difference between respondents' knowledge of reusable face masks and their willingness to pay for them. Knowledge has a *p*-value of 0.006 (Table 5), less than 0.01. Correlation analysis also revealed a positive correlation coefficient between knowledge and willingness to pay for reusable face masks; nevertheless, the relationship was weak (Table 5) due to the R-value of 0.189** (Table 6). The findings indicated that those with a higher level of education were more willing to pay for reusable face masks in Selangor. This was supported by Al Mamun *et al*. (2018), who discovered a favourable correlation between respondents' knowledge and their willingness to pay for environmentally friendly products.

Additionally, as shown in Table 6, there was a considerable difference in awareness and willingness to pay for reusable face masks. Awareness has a *p*-value of 0.000 (Table 6), < 0.01. Meanwhile, the result indicated a positive coefficient between awareness and willingness to pay for reusable face masks, despite a moderate relationship (Table 6), as the r value was 0.300** (Table 6). Thus, the study discovered that those with a high level of knowledge were more willing to pay for reusable face masks in Selangor. This was corroborated by prior research, which indicated a positive relationship between environmental knowledge and willingness to pay for environmentally friendly products (Levinson, 2010; Al Mamun *et al*., 2018; Khoiriyah & Toro, 2018). Individuals with a high environmental awareness were more concerned with and prepared to pay for products and services that positively influence the environment.

In conclusion, this research discovered a significant association between knowledge, awareness, and willingness to pay for reusable face masks and a positive relationship between consumer knowledge, awareness, and willingness to pay for reusable face masks in Selangor. Thus, it implied that individuals with a high level of education and concern for the environment were more likely to pay for reusable

Table 5: Correlation coefficient's relative strength by Cohen (1988)

Sign of Correlation Coefficient	Strong	Moderate	Weak	Very Weak and None
+ value Positive relationship	0.5 to 1.0	0.3 to 0.49	0.1 to 0.29	0 to 0.09
- value Negative relationship	-1.0 to -0.5	-0.49 to -0.3	-0.29 to -1.0	-0.09 to 0

Table 6: Spearman correlation between knowledge and awareness with WTP

			WTP	Knowledge	Awareness
Spearman	**WTP**	Correlation coef.	1.000	.189**	.298**
		Sig. (2 tailed)	.	.006	.000
		N	209	209	209
	Knowledge	Correlation coef.	.189**	1.000	.401**
		Sig. (2 tailed)	**.006**	.	.000
		N	209	209	209
	Awareness	Correlation coef.	.298**	.401**	1.000
		Sig. (2 tailed)	**.000**	.000	.
		N	209	209	209

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

face masks in Selangor. Table 8 summarises the outcome of the hypothesis testing in this research.

Table 7 summarises the analysis, which shows statistically significant and positive correlations between the three variables.

Willingness to Pay for Reusable Face Masks

Descriptive Analysis of Willingness to Pay for Reusable Face Masks

The respondents' willingness to pay for reusable face masks is shown in Table 8. The findings indicated that 88.5% (185) of respondents were willing to pay for reusable face masks for a variety of reasons (Table 8).

Table 9 details the reasons respondents were willing to pay for reusable face masks. 35.9% (150) of respondents stated that the primary reason they were willing to pay for reusable face masks was to avoid the expense associated with purchasing disposable face masks several times. Following that, 31.3% (131) of respondents indicated that their willingness to pay for reusable face masks was motivated by a desire to reduce face mask waste.

Additionally, around 30.6% (128) of respondents indicated a readiness to pay for reusable face masks to preserve the environment. Meanwhile, approximately 2.2% (9) of respondents responded that they were willing to pay for reusable face masks because they were more stylish and believed that reusable face masks might enable individuals with limited budgets to purchase them. Additionally, respondents were willing to pay for reusable face masks because they believed they were more secure than disposable face masks.

However, as shown in Table 9, 11.5% (24) of respondents responded that they were unwilling to pay for reusable face masks for a variety of reasons (Table 10). At 84% (21), most

Table 7: Hypotheses testing summary

Hypothesis	Correlation Coefficient	Significant	Results
$H1H_a$: Knowledge has a significant effect on the awareness towards reusable face masks.	0.401	0.000	Accepted
$H2H_a$: Knowledge has a significant effect on consumers' willingness to pay for reusable face masks.	0.189	0.000	Accepted
$H3H_a$: Awareness has a significant effect on consumers' willingness to pay for reusable face masks.	0.298	0.000	Accepted

Table 8: Respondent's willingness to pay for reusable face masks

Items	*n* = 209	
	Frequency	Percentage (%)
Willingness to pay for reusable face masks		
Yes	185	88.5
No	24	11.5

Table 9: Reasons for willingness to pay for reusable face masks

Reasons for Willingness to Pay	*n* = 185	
	Frequency	Percentage (%)
Help to reduce the amount of face mask waste	131	31.3
Help to protect the environment	128	30.6
To save the cost of buying disposable face masks multiple times	150	35.9
Others	9	2.2

Note: The respondents can choose more than one answer.

Table 10: Reason for not unwillingness to pay for reusable face masks

Reasons for Unwillingness to Pay	*n* = 24	
	Frequency	Percentage (%)
Could not afford to buy	2	8
Not safe as disposable face masks	21	84
Others	2	8

Note: The respondents can choose more than one answer.

respondents claimed they were unwilling to pay for reusable face masks because they believed they were not as safe as disposable face masks. Additionally, 8% (2) of respondents reported that they were unwilling to pay for reusable face masks due to financial constraints. Meanwhile, 8% (2) of respondents stated that they would not pay for reusable face masks because they were too reluctant to wash them and because using reusable face masks was unpleasant due to sweat absorption.

Inferential Analysis (Open-ended CVM)

Table 12 reveals that the model fit was deemed significant, as evidenced by the significant F-value. Additionally, the R-squared value was determined to be 13.5%, signifying that the model can account for a mere 13.5% of the variation in the dependent variable. As a result, out of the six variables that were examined, it was determined that only the awareness variable exhibited significance at a confidence level of 99%. With a positive coefficient of .304, it can be inferred that there was a correlation between consumer awareness of reusable face masks and their willingness to pay a higher price.

The perceived benefits associated with reusable face masks in Malaysia may have contributed to their notable impact on the willingness to pay, highlighting the importance of awareness. Hence, individuals with a deep comprehension of the benefits associated with the use of reusable face masks, including long-term financial savings, environmental sustainability, and potentially enhanced effectiveness in disease prevention might display a heightened inclination to acquire them.

In his work, Spennemann (2021) made a compelling case for the impact of a strong environmental consciousness and a dedication to sustainability on the choice of adults to opt for washable and reusable fabric masks, even in the face of higher expenses. Increased awareness surrounding environmental issues and the ecological impact of disposable face masks may have motivated consumers to opt for reusable masks, despite their higher upfront expenses, as a more sustainable option. As a result, the implementation of public awareness campaigns and the promotion of societal norms that endorse the use of reusable masks had a significant impact on consumers' perception of purchasing them as a socially responsible choice. This, in turn, increased their willingness to pay for such masks.

Willingness to Pay for Reusable Face Masks

According to Table 11, 88.5% (185) of respondents were willing to pay for reusable face masks. The results below indicated that the average willingness to pay for reusable face

Table 11: The maximum amount of WTP for reusable face mask

Amount (RM)	***n* = 209**	
	Frequency	**Percentage (%)**
0	24	11.5
1.00 – 5.00	53	25.4
6.00 – 10.00	48	23.0
11.00 – 15.00	26	12.4
16.00 – 20.00	27	13.0
21.00 – 25.00	8	3.8
26.00 – 30.00	12	5.7
31.00 – 35.00	1	0.5
36.00 – 40.00	1	0.5
More than 41.00	9	4.3
Total Amount ($\sum_i^N WTP_i$)	**209**	**100%**
	RM2,686.50	

Table 12: Multiple regression analysis

Variables	**Standardised Coefficients (Beta)**	**t-statistics**	**Significant**
(Constant)	-.085	-.375	.708
Gender	-.066	-.933	.352
Age	-.038	-.518	.605
Income	.032	.441	.660
Education	.032	.463	.644
Knowledge	.083	1.098	.273
Awareness	.304	4.039***	.000
R^2	.135		
F-value	5.273***		

***Significant at 1%.

masks in Selangor was RM12.85/USD2.92 per mask (1 USD: RM4.40) as of 6 April 2023 (https://www.xe.com/currencyconverter/convert/?Amount=12.85&From=MYR&To=USD). The mean of WTP was calculated using the following formula by Honu (2007):

$$Mean\ WTP = \frac{1}{209} (RM2{,}686.50)$$

= RM12.85/USD2.92 piece/person

One of the limitations of this research was the use of online questionnaires. While there had been no other options due to the occurrence of the COVID-19 pandemic, the researcher acknowledged that the face-to-face survey would be more meaningful in acquiring higher-quality responses from the respondents. In addition, efforts were made to make the questionnaire simpler and more precise. Future researchers are strongly recommended to examine other demographic characteristics such as marital status, household size, and residential location that were not examined in this study. These demographic factors may impact the willingness to pay for reusable face masks.

Additionally, the prospective researcher is strongly recommended to expand this work into other relevant areas of study. Individuals living in different geographical locations might have varying preferences. Thus, conducting research of this kind in more locations will be feasible to obtain the most accurate data and results about the willingness to pay for reusable face masks. Thus, the statistics and information pertaining to the willingness to pay for reusable face masks may be expanded. Besides that, future studies may investigate the attitude of consumers toward their preferred face mask's aesthetic attributes if it positively influences the intention to repurchase their preferred face mask. In addition, alternative Contingent Valuation Methods such as the Single Bound CVM and Double Bound CVM could be considered for future research instead of the open-ended CVM employed in this study to ascertain the value individuals are willing to pay for reusable face masks.

Conclusions

In general, the findings indicated that most respondents in Selangor had a high level of knowledge of reusable face masks. Additionally, the findings confirmed a positive correlation between consumer knowledge and willingness to pay for reusable face masks in Selangor. Respondents with high knowledge of reusable face masks were more willing to pay for them. Reusable face masks are environmentally friendly and may have a beneficial effect on the environment. However, it is vital to use certified reusable face masks to guarantee their efficacy against pathogens and viruses.

Additionally, the study discovered that most respondents had a high environmental awareness about using reusable face masks. The Spearman correlation indicated a positive relationship between awareness of reusable face masks and willingness to pay for them. Respondents who demonstrated a higher level of awareness demonstrated a greater willingness to pay for reusable face masks. Most of them utilised reusable face masks because they were aware of the possibility of reducing and minimising face mask waste. Additionally, they were aware that reusable masks might help prevent the pollution of our natural resources. Disposing of face mask waste in public areas, streets, sewers, and other locations might negatively affect the aesthetic view of the environment. As a result, the government should develop a strategy to raise public awareness about using reusable masks in Malaysia.

In addition, based on inferential analysis utilising multiple regression analysis, this research discovered that respondents with high awareness levels exhibited a greater inclination to pay for reusable face masks. The average maximum value of willingness to pay for reusable face masks in Selangor was RM12.85/USD2.92 per mask/piece/person when employing open-ended CVM.

With a dearth of research on individuals' inclination to pay for reusable face masks, this study aimed to provide the government with

ample data to implement a strategy that would promote the adoption of reusable face masks in Malaysia. In addition, it could have aided the decision-makers in regulating the price of reusable face masks based on customer preferences and willingness to pay. This research could have aided manufacturers of reusable face masks in producing premium products at a price point that consumers were willing to pay.

Given the ongoing prevalence of COVID-19, it becomes imperative to grasp the extent to which individuals are willing to invest in reusable face masks. The research presented valuable data for policymakers in Malaysia, enabling them to promote the use of reusable masks as a means of fostering sustainability and minimising waste. In addition, it informed pricing strategies to ensure that high-quality masks were made affordable for consumers and aided manufacturers in producing products that aligned with consumer preferences. In light of the prevailing challenges posed by COVID-19, this study holds great importance in terms of advancing public health and fostering environmental sustainability.

In terms of recommendations, the study suggests that policymakers should launch awareness campaigns highlighting the benefits and certification of reusable face masks, offer financial incentives to make them more affordable, and enforce regulations to ensure only certified masks are available. For end users, selecting certified reusable face masks is vital for safety and sustainability practising responsible disposal of single-use masks will help reduce environmental impact.

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Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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