Parental affordability and willingness to pay for universal masking amongst government school students in Kuching, Sarawak

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ABSTRACT

Introduction: Financial affordability to purchase commodities for disease prevention is an important public health issue. The objective of this paper is to report the financial affordability and willingness to pay amongst the parents of government students for their children's non-medical mask use, using a newly created Household Face Mask Affordability Questionnaire (MAQ).

Materials and Methods: This was a cross-sectional study involving the parents or guardians of 50.6% (44/87) government schools in the whole of Kuching Division of Sarawak. The sampling method was multistage cluster sampling, whereby stage one involved random sampling of 49.2% (30/61) primary schools and 53.8% (14/46) secondary schools in the Kuching Division, followed by stage two cluster sampling of one class per non-examination standard in each randomly sampled school. All students in the sampled classes were asked to bring a face-validated questionnaire (MAQ) back home to be answered by one of their parents or a guardian. A total of 2559 out of 3661 distributed questionnaires were collected, with a response rate of 70%. The data collection period was between April and June of 2022 so as the recall bias of the information collected, especially on the actual spending on the face masks for the school going students, was minimised. The relevant summary statistics for self-perceived face masks characteristics, face mask expenses, affordability and willingness to pay were calculated. We regress separately the monthly affordability and willingness to pay amount against age, occupation, marital status, total number of children, monthly income and monthly saving to build predictive models for affordability and willingness to pay amount per child per month.

Results: The average Scale-level Face Validity Indexes for all aspects of validity (clarity, comprehension, relevancy, representativeness) are high (0.91 to 1.00) for MAQ. Most of the respondents were mothers, married, working as private employees with a mean age of 41 and belonged to the B40 and M40 group. The average monthly saving per family was RM540, which was about 15% of the total income. The average actual monthly spending to purchase face masks for one child is RM24. On average, a family can afford to pay RM23.80 for one child per month to purchase face masks. The willingness to pay for the same was RM25.27. The median affordability, willingness to pay and actual spending for face masks per child was RM16.67 per month. Taking 75th percentile as the reasonable maximum expenses per child for face masks per month, the affordable amount by most parents is RM30, with the willingness to pay at 10% higher. Affordability to purchase a face mask is influenced by the marital status, occupation, income, saving and the number of dependent of the breadwinner of a household. The most important face mask characteristics expected by the parents are better filtration efficiency and easier breathability.

Conclusion: The affordability and willingness to pay the amount to purchase face masks amongst parents of government students in Sarawak were RM30 and RM33 per child per month, respectively.

KEYWORDS:
Affordability, willingness to pay, face mask, universal masking, COVID-19

INTRODUCTION

The COVID-19 pandemic forces the world population to adopt new norms in life, namely social distancing, wearing face masks and frequent sanitising.[1] These new norms are essential and were made compulsory in Malaysia since 1st August 2020 to the general population in an effort to prevent COVID-19 transmission in the country.[2] Amongst these new norms, the requirement to wear face mask imposes financial burden on the population, especially amongst the family with schooling children, because of the shortage in supply and single-use feature of most non-medical masks in the market.[3,4]

The World Health Organization has recommended universal masking, meaning that everyone should wear a mask for COVID-19 source control, rather than protection.[5] Source control means that if everyone is wearing a mask, then the chances of virus transmission from an unknown infected person will be reduced significantly. Hence, Malaysia government has implemented universal masking policy, either disposable or reusable, from 1st August 2020 for 2 years, to control the COVID-19 cases in the country.

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In view of the potential financial burden to the population on the use of single-use disposable mask in compliance with the universal masking policy, the authors have embarked on a study to determine the financial affordability for universal masking amongst the parents of the government school-going students in Kuching, Sarawak, as well as to develop a washable reusable fabric face mask within the determined affordability range for the use of school going students in Sarawak. Although the indoor universal masking policy has been scrapped since 7th September 2022,[6] the finding of this study is still important to serve as the basis for setting price ceiling for face masks and production of affordable reusable face masks in the future.

The objective of this paper is to report results on the affordability and willingness to pay for their children's non-medical mask use amongst the parents of government students in Kuching division of Sarawak, using a newly created Household Face Mask Affordability Questionnaire (MAQ), as there is no similar readily available questionnaire in the market.

MATERIALS AND METHODS

This was a cross-sectional study involving the parents or guardians of 50.6% (44/87) of government schools in the whole of Kuching Division of Sarawak. The sampling method was multistage cluster sampling, whereby stage one involved random sampling of 49.2% (30/61) primary schools and 53.8% (14/46) secondary schools in the Kuching Division, followed by stage two cluster sampling of one class per non-examination standard (namely, Standard 1 to 5, Form 1, 2, 3 and Lower 6) in each randomly sampled school. Following the sampling procedure, 54.5% (24/44) of schools were classified as urban schools and the rest were classified as rural schools. All students in the sampled classes were asked to bring a questionnaire back home to be answered by one of their parents or a guardian. A total of 2559 out of 3661 distributed questionnaires were collected, with a response rate of 70%. The data collection period was between April and June of 2022 so as the recall bias of the information collected, especially on the actual spending on the face masks for the school-going students, was minimised.

The questionnaire on universal masking affordability and willingness to pay, called Household Face Mask Affordability Questionnaire (MAQ), was created by the authors for this study. The MAQ is a brief simple-to-use self-administered questionnaire consisting of two parts: Part 1: Demographic Information and Part 2: Affordability and Willingness to Pay. Part 1 of the questionnaire asks about the respondent's age, occupation, marital status, relationship with the student, total number of children and total number of school-going children. Part 2 of the questionnaire asks about total monthly household income and saving, affordability and willingness to spend for face masks for all children, self-perceived important characteristics of face masks, and the actual monthly spent for face masks during the COVID-19 universal masking period where schools were reopened.

The questionnaire was designed by a Public Health Physician and a parent with school-going children originally in English and underwent forward and backward translation into each Malay and Chinese language. As the MAQ is not a psychological construct questionnaire, we performed face validation on the questionnaire on the following aspects: clarity, comprehension, relevancy and representativeness, for questions in the Part 2 of the questionnaire. The scale of the responses ranges from 1 being 'very vague', 'tough to understand', 'very irrelevant' and 'totally not representing', to 5 being 'very clear', 'very easy to understand', 'very relevant' and 'accurately representing', to the respective question. The face validation test was carried out on 18 conveniently selected parents of variable socio-demographic backgrounds in Kuching before the commencement of the actual affordability study. The Raters in Agreement frequency, Universal Agreement (UA), Item-level Face Validity Index (I-FVI), Scale-level Face Validity Index (S-FVI), average of S-FVI and S-FVI/UA were calculated to determine the face validity of the questionnaire.

The data were entered into Microsoft Excel and analysed using RStudio 2023.03.0+386 "Cherry Blossom" Release for Windows. All continuous data was examined for its distribution, with necessary transformation, if any, and its relationship with categorical variables. The relevant summary statistics for self-perceived face mask characteristics, face mask expenses, affordability and willingness to pay were calculated. We regress separately the monthly affordability and willingness to pay amount against monthly age, occupation, marital status, total number of children, monthly income and monthly saving to build predictive models for affordability and willingness to pay amount per child per month.

The study obtained ethical approval from the Universiti Malaysia Sarawak Medical Ethics Committee (Ethics Reference: FME/21/93) and study approval from the Malaysia Ministry of Education (Approval Reference: KPM.600-3/2/3-eras (11777)). All participating schools were briefed, and written consents were taken from all respondents before the data collection.

RESULTS

Validity of the Household Face Mask Affordability Questionnaire

Table I shows the validity index of the MAQ. The original questionnaire is attached in the Appendix of this paper. The I-FVI for all questions are high, ranging from 0.83 to 1.00 for all aspects of face validity (clarity, comprehension, relevancy and representativeness). Although S-FVI/UA are low for relevancy and representativeness, as some respondents claimed that questions on total income and saving are not crucial, the index is high for clarity and comprehension for all questions. The average S-FVIs for all aspects of validity are high (0.91 to 1.00) for MAQ in general, indicating the face validity of this questionnaire is good.

Socio-demographic Characteristics of the Respondents

Table II reports the socio-demographic characteristics of all respondents. The statistics are calculated based on the valid responses for each variable. Most of the respondents come from families that send their children to urban schools. Most

Table I: The validity indexes of Household Face Mask Affordability Questionnaire

Item	Clarity			Comprehension			Relevancy			Representativeness		
	Na	I-FVI	UA	Na	I-FVI	UA	Na	I-FVI	UA	Na	I-FVI	UA
Q7	18	1.00	1.00	18	1.00	1.00	15	0.83	0.00	17	0.94	0.00
Q8	18	1.00	1.00	18	1.00	1.00	16	0.89	0.00	15	0.83	0.00
Q9	18	1.00	1.00	18	1.00	1.00	18	1.00	1.00	18	1.00	1.00
Q10	16	0.89	0.00	18	1.00	1.00	16	0.89	0.00	17	0.94	0.00
Q11	18	1.00	1.00	18	1.00	1.00	16	0.89	0.00	16	0.89	0.00
Q12	18	1.00	1.00	18	1.00	1.00	17	0.94	0.00	18	1.00	1.00
S-FVI/Ave		0.98			1.00			0.91			0.94	
S-FVI/UA			0.83			1.00			0.17			0.33

Note:
1. Na represents the number of Raters in Agreement, denotes the number of rater scored "1", represents "Yes", corresponding to the scale of 3 to 5 for each aspect of validity (clarity, comprehension, relevancy, representativeness), on a particular question, and "0", represents "No", corresponding to the scale of 1 to 2 for each aspect.
2. I-FVI = Item-level Face Validity Index, is the Raters in Agreement divided by the number of raters.
3. UA = Universal Agreement, indicated by score '1' assigned to the question that achieved 100% raters in agreement in respective to each aspect of validity.
4. S-FVI/Ave = Average Scale-level Face Validity Index, is the sum of I-FVI divided by the total number of questions.

Table II: Socio-demographic characteristics of respondents

Respondent's characteristics	n	%	Mean	SD	p50	p25	p75	Min	Max
Age (years)*									
Respondent	2461	96.17	41.34	7.36	41	36	46	16	79
Spouse	2231	87.18	41.81	7.17	41	37	46	21	76
Relationship to the student (total)	2433	100.00							
Mother	1367	56.19							
Father	963	39.58							
Guardian/relative	103	4.23							
Marital status (total)	2476	100.00							
Married	2235	90.27							
Single parent	223	9.01							
Unmarried	18	0.73							
Occupation (total)	2483	100.00							
Private employee	950	38.26							
Government servant	616	24.81							
Housewife	527	21.22							
Own business	263	10.59							
Others	127	5.11							
No of children*									
Schooling	2469	96.48	3.03	1.36	3	3	2	1	10
Total	2442	95.43	2.38	1.06	2	2	2	1	7
School type (total)	2559	100.00							
Urban	2262	88.39							
Rural	297	11.61							

Note: n = frequency denotes number of respondents contributing to the statistics, with its respective valid percentage against the total of 2559 respondents.

of the respondents were mothers, married and working as private employees, with a mean age of 41. On average, each family had three school-going children to support.

Affordability and Willingness to Pay for Children's Universal Masking

The financial profile of the respondents reflects that most of the families of government students belong to the B40 and M40 income group. The average monthly saving per family was RM540, which was about 15% of the total income. The average actual monthly spending to purchase face masks for one child is RM24. On average, a family can afford to pay RM23.80 for one child per month to purchase face masks. The willingness to pay for the same was RM25.27.

It is undoubtedly that the data in Table III are skewed to the right, which is logical, reflecting the economic status of the respondents. Hence, if we consider the median as the measure of central tendency, the affordability, willingness to pay and actual spending for face masks per child was RM16.67 per month. Logically, if we consider 75th percentile as the reasonable maximum expenses per child for face masks per month, the acceptable amount by most parents is RM30.

Characteristics of Face Mask that Affects Purchasing Decision

The parents' decision to purchase the type of face mask was affected by a face mask's characteristics as shown in Figure 1. The most important face mask's characteristics are 'ability to block the particles' and 'easier to breath'. The median ranking for both 'ability to block particles' and 'easier to breath' is 5 (maximum rank is 5 = 'Extremely important characteristics'), followed by 'cheaper price' and 'comfortable

Table III: Financial profile, affordability and willingness to pay for children's universal masking during COVID-19 pandemic

Variables (RM)	n	%	Mean	SD	p50	p25	p75	Min	Max
Monthly income (I)	2310	90.27	3693.33	2930.78	2542.50	1400	5000	80	12430
Monthly saving (S)	1790	69.95	540.36	566.30	300.00	100	1000	0	2300
I - S1729	67.57	3241.67	2607.59	2400.00	1240	4800	0	12130	
Monthly face mask expenses (E)*	2363	92.34	60.40	45.23	50.00	30	100	0	200
E per child	2290	89.49	24.23	22.09	16.67	10	30	0	200
Total monthly affordability (A)	2439	95.31	58.11	45.70	50.00	24	100	0	210
Total monthly willingness to pay (W)	2439	95.31	58.11	45.70	50.00	30	100	0	210
A per child	2365	92.42	23.80	23.13	16.67	10	30	0	200
W per child	2350	91.83	25.27	24.33	16.67	10	33	0	200

Note: *This is the actual spending for face masks reported by the parents after schools reopened during COVID-19 pandemic where universal masking is still required.

Table IV.:Predictive factors for monthly (a) affordability (b) willingness to pay amount to purchase face masks for one child

Predictors	Coefficient (B)	95% CI for B		p-value
		Lower limit	Upper limit	
(a) Monthly affordability amount				
Intercept	36.8993	32.907	40.8916	<0.001
Occupation				
Others (housewife, others)	1			
Government servant	–3.1937	–6.1279	–0.2594	0.0359
Own business	2.5848	–0.7602	5.9298	0.1298
Private sector employee	–1.0984	–3.4995	1.3026	0.3697
Marital status				
Single parent/guardian	1			
Married	–5.335	–8.4874	–2.1825	0.0009
Monthly income	0.0019	0.0015	0.0024	<0.0001
Monthly saving	0.0064	0.0044	0.0084	<0.0001
Total children	–6.2717	–6.9922	–5.5512	<0.0001
(b) Monthly willingness to pay amount				
Intercept	42.0269	38.3693	45.6846	<0.0001
Marital status				
Single parent/guardian	1			
Married	–5.335	1		
Monthly income	0.0019	–7.7034	–10.9924	–4.4144
Monthly saving	0.0064	0.0012	0.0013	0.0021
Total children	–6.2717	0.0067	0.0047	0.0088

to skin' ranking at 4, and finally 'stylish/good looking' ranking at 2.

Predictive Factors for Affordability and Willingness to Pay

The final predictors retained following multiple linear regression for monthly affordability and willingness to pay amount against monthly age, occupation, marital status, total number of children, monthly income and monthly saving is shown in Table IV. We used backward stepwise analysis for both outcomes and the adjusted R-squared values for affordability and willingness to pay models are 0.2727 and 0.2712, respectively. Diagnostic plots for both models showed the models are adequate, where the residuals versus fitted plot revealed no relationship and all data points in the residuals versus leverage plot are within Cook's distance.

Hence, the final model for monthly affordability amount to pay for the face mask for one child is:

$A = 36.9 – 3.2G – 5.3M + 0.0019I + 0.0064S – 6.3C$

where:

A = Monthly affordability amount to pay for the face mask per child in RM

G = Status as a government servant valued as "1" if yes

M = Marital status valued as "1" if married

I = Total monthly income in RM

S = Total monthly saving in RM

C = Total number of children in round number

The final model for monthly willingness to pay amount for the face mask for one child is:

$W = 42.0 – 5.3M + 0.0019I + 0.0064S – 6.3C$

where:

W = Monthly willingness to pay for the face mask per child in RM

M = Marital status valued as "1" if married

I = Total monthly income in RM

S = Total monthly saving in RM

C = Total number of children in round number

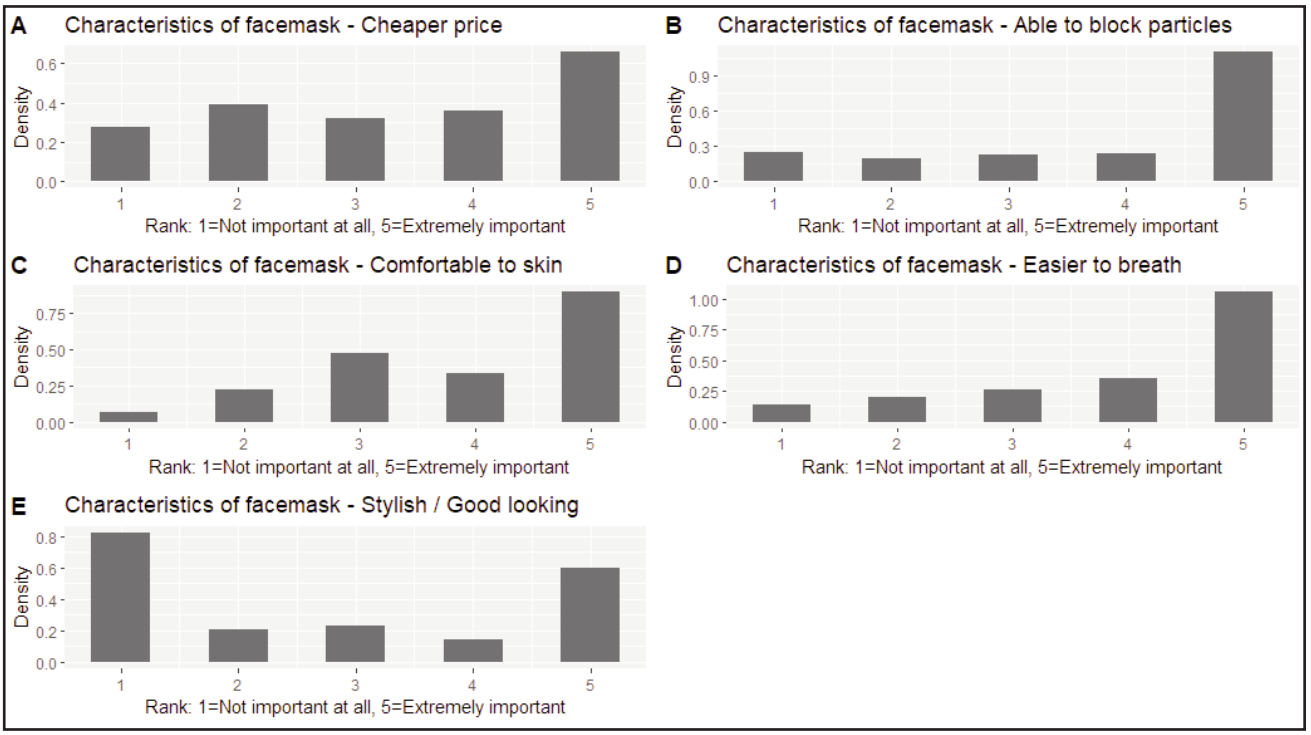

Fig. 1: Characteristics of face mask that affect purchasing decision by the parents.

DISCUSSION

Previous studies on non-medical masks use by the population focussed mainly on determinants of willingness to pay or willingness to wear face masks.[7-9] No study has been focussing on the affordability to purchase non-medical masks amongst the population when universal masking is required. Financial affordability to purchase commodities for disease prevention is an important public health issue. The current study reflects the financial affordability of the parents of government students in Kuching population to purchase face masks under universal masking policy accurately because of the large sample size and random sampling strategy. The findings of this study could be extrapolated to other states with almost similar monthly household incomes, such as Sabah, Pahang, Perak, Kedah and Perlis, where these are the states within RM500 difference of monthly household income of Sarawak (mean = RM5087 in year 2020).[10]

Currently, the retail ceiling price for face mask in Malaysia is RM0.70. It was reduced from the ceiling of RM1.50 before 1st Mac 2020, further down to RM0.70 on 1 November 2020.[11-13] The reduction was likely intuitive based on strong demand from the population. The affordability amount of RM30 per child per month found in this study is equivalent to the expenditure of RM1 per piece of disposable face mask per child per day. The finding shows that the current retail ceiling price set by the government for face masks is reasonable considering the variation in different socio-economic levels of population across the country.

The affordability and willingness to pay models derived in this study can be used to determine the ceiling price of face masks by the government in the future should the universal masking policy is required. Although the models may not be comprehensive as independent variables are limited to those taken, they can readily be used for quick estimation. The affordability model itself indicates that when policymakers want to set the ceiling price for face masks, they must take into account at least the occupation, income, saving, marital status and number of dependents of the breadwinner within a household in the targeted population.

Most studies focused on the health-related factors such as the perceived severity of disease and benefit of masking when it comes to willingness to pay for and wear face mask.[14,15] It is also important to understand the perceived expected characteristics of face mask that would affect the consumer to purchase and use the mask. Our study found that the most important characteristics of the face mask that influence the choice of the parents are filtration efficiency and breathability. This information is important in two aspects, first to the government and the supplier, to ensure that the face masks that are sold legally in the market are of certain acceptable standards of filtration efficiency and breathability. Second, the information reflects the knowledge level of the target population that serves as a benchmark for appropriate health education by public health professionals.

This study also produced the face-validated MAQ, which can be used as a simple and quick questionnaire to determine the affordability level of the target population in this country. The questionnaire was purposely made short and simple to improve the accuracy of reporting. Hence, MAQ can be used by policymakers or market survey professionals for the purpose of policymaking and setting an affordable retail price for face masks.

The findings of this study are useful to various public health stakeholders for comprehensive and timeliness public health response during pandemic. The Ministry of Health should ensure the quality of non-medical masks supplied in the country meeting the population's demand, namely filtration efficiency and breathability. The Ministry of Domestic Trade and Consumer Affairs should ensure the market price of non-medical masks within the affordable level of the population, by continuous close monitoring of its supply and demand and being sensitive to future similar pandemic given the lesson learnt from the COVID-19 pandemic. Non-medical mask manufacturers should focus on the production of efficient and cost-effective masks to meet the population's demand.

A major limitation of this study would be the restriction of study population to Kuching area due to logistic issues. Nevertheless, since there has been no similar study done before, the current findings serve as a baseline for future extrapolation to other states of Malaysia. Another strength of this research is the creation of validated MAQ, which can be used by all researchers in Malaysia for future studies.

CONCLUSION

The affordability level to purchase face masks amongst the parents of government students in Sarawak was RM30 per child per month. The willingness to pay for the same can be expected to increase by 10%. The most important face mask characteristics expected by the parents are better filtration efficiency and easier breathability. Affordability to purchase a face mask is influenced by the marital status, occupation, income, saving, and number of dependents of the breadwinner of a household.

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DISCLOSURE

The Sarawak Research Development Council was not involved in the planning, conduct and analysis of the study. The authors declare no conflict of interest with the grant sponsor in completing this study.

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