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Factors Influencing the Purchase of Face Masks in the USA During the COVID-19 Pandemic

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Abstract: COVID-19, one of the most challenging unprecedented global pandemics of human history, has changed people's work life and social life tremendously. Wearing a face mask is one of the most visible habits that people had to adapt to reduce the transmission of the Coronavirus. The primary purpose of this study was to investigate the impact of respondents' socio-demographic factors and working place on their face mask purchasing behavior during the COVID-19 pandemic in the USA. Secondary cross-sectional data were used in this study. An online survey administered on social media (between 20-30 March 2020) was used to collect data from adult research participants that reside in the United States through Qualtrics. From total of 6602 data, after deducting the missing values, 4949 data were used in this study for further analysis. The binary logistic regression model was used to conduct the study. The study found gender, age, education, and workplace as significant factors that influence people's face mask purchasing behavior. In addition, college education, gender, and workplace are positively associated with face mask purchase. Conversely, young age is negatively associated with respondents' face mask purchases. Though the study has limitations in the case of data representation and uses only a few variables, its findings provide some critical insights to the marketers to restructure their market segmentation. Besides, results could offer essential understandings to the relevant stakeholders, who are working to ensure face cover by people to reduce transmission of Coronavirus.

Keywords: Facemask, COVID-19 Pandemic, Purchasing Behavior

1. Introduction

COVID-19, a disease caused by the latest SARS-CoV-2 Coronavirus, was first reported in December 2019 in Wuhan, China, and has since grown into a global pandemic in 2020, causing one of the most challenging global health outbreaks in world history [1]. People have needed to cope with new rules and restrictions to keep themselves and their families safe and balance their everyday life during this pandemic time. People had to adjust their everyday lifestyles to reduce transmission and death rates [2]. On April 3 of, 2020, the Centers for Diseases Control and Prevention (CDC) of USA proposed that people must wear a face mask in public if they are unable to separate at least six feet from others to help avoid the spread of COVID-19 [3]. The main reason for wearing a face mask is self-protection. Still, it is believed that a face mask provides restraint from infectious disease and reduces the spread of communicable diseases [4]. Wearing a face mask is one of the most visible habits that people must adopt to reduce the transmission of the Coronavirus.

To the degree that masks or face covers are commonly worn, in contrast to alternative interventions, such as compulsory closures of sectors of the economy, they can effectively help boost people's wellbeing at a reasonably low cost [5]. While the significance and effectiveness of wearing a mask to control Coronavirus are very evident, some individuals are still not prepared to wear it [6]. To what extent people are ready to wear a face mask in public may depend on their personal beliefs, gender, age, profession, the region where they live, and community environment. People are more interested in wearing face masks when they believe that it effectively controls the transmission of Coronavirus rather than only doing it as public authorities require [5].

Besides, as older people are more interested in wearing face masks than younger people, age is also an essential factor here [5]. It is reported that women were 50 percent more likely during epidemics and pandemics to participate in non-pharmaceutical safety activities (e.g., mask-wearing) than men [7]. Similarly, the behavior of retail shoppers wearing masks can also differ by location, and those who live outside urban areas are more resistant to wearing masks [8].

The purchase of a face mask is directly related to wearing a face mask because when people want to ensure face-covering in a public place, either they have to purchase a face mask or collect it from other sources. It is seen that after the Centers for Diseases Control and Prevention (CDC) 's announcement on April 3, 2020, in the USA about wearing a mask in a public place, mask-wearing increased by 12 percent among respondents. At the same time, mask buying also increased by 7 percent just within a single day [9]. The previous studies were mainly confined to finding COVID-19 preventive behaviors [2], physical and mental effect of face mask usage [10], the legislative effect on mask-wearing behavior [11], mask-wearing behaviors and beliefs [5], the effectiveness of face mask in reducing Coronavirus transmission [12, 13] and many other issues but face mask purchasing behavior got little attention from researchers.

Out of such existing research gap, this research studied the participants' face mask purchasing behavior during COVID-19 and looked at whether all participants showed the same buying behavior or not. The main objective of this study is to identify the factors that influence the purchase of face masks in the USA during the COVID-19 pandemic. Specifically, the study concentrated on the following research questions to find out the factors that influence face mask purchase behavior:

1. Is there any impact of demographic characteristics of participants (e.g., gender, age, education, type of residence, employment status) on their purchasing behavior of face masks in the USA during the COVID-19 pandemic?
2. How does people's workplace influence their facemask purchasing behavior?

2. Material and Methods

Secondary cross-sectional data was used for the present study. An online survey administered on social media (between 20-30 March 2020) was used to collect data from adult research participants in the United States through Qualtrics. The survey was completed by a total of 6602 respondents, from which, after deducting the missing values, 4949 data were used in this study for further analysis. The original survey questionnaire was created after studying the Health Belief Model of understanding and predicting health behavior and a thorough evaluation of previous survey research on knowledge, attitudes, and practices related to infectious disease epidemics such as H1N1, MERS, SARS, and Ebola. [1].

In this research, authors used participant's gender, age, education, employment status, workplace, and type of residence related data to study U.S. people's facemask purchasing behavior during the COVID-19 pandemic, drawing on Tang and Wong's (2004) research on socio-demographic factors' impact on wearing of facemasks to prevent severe acute respiratory syndrome [14]. The data was organized and handled by using M.S. excel and Gretl was used to analyze it. Both descriptive and econometrics analysis were used to perform the research. Since researchers did not participate in the primary data collection, there is a potential for data biases that go beyond the researchers. However, it should be noted that the original data collectors did all possible to address inconsistencies, for instance, in balancing gender gaps in responses [1].

3. Data Description

Table 1. *Description of all the variables used in the study.*

Variables	Description
Dependent variable	
Purchased a face mask (protective behavior)	If the participant purchased a face mask=1. Otherwise=0
Independent variables	
Gender	If the gender of a participant is male=1, otherwise=0
Education: high school diploma/GED or below	If high school diploma/GED or below=1, otherwise=0
Education: some college	If some college=1, otherwise=0
Education: Bachelor's degree or above	If a Bachelor's degree or above=1, otherwise=0
Age: 18-39 years	If 18-39 years old=1, otherwise=0
Age: 40-59 years	If 40-59 years old=1, otherwise=0
Age more than 60 years	If more than 60 years old=1, otherwise=0
Type of residence: Rural	If Rural=1, otherwise=0
Type of residence: suburban to urban	If suburban to urban=1, otherwise=0
Employment status: Employed	If employed=1, if otherwise=0
Employment status: Unemployed	If unemployed=1, if otherwise=0
Employment status: Student	If student=1, if otherwise=0
Workplace: Healthcare	If work in an environment where respondents come into contact with sick people in a healthcare or clinical setting=1, otherwise=0

Table 2. *Summary Statistics, using observations 1 – 4949.*

Variables	Mean	Std. Dev.	Median
Gender	0.41	0.49	0.00
Healthcare	0.15	0.36	0.00
Age 18-39 years	0.25	0.43	0.00
Age 40-59 years	0.46	0.49	0.00
Age more than 60 years	0.29	0.45	0.00
Rural	0.34	0.47	0.00
Suburban to Urban	0.66	0.47	1.00
High school diploma or GED or below	0.16	0.36	0.00
Some college	0.34	0.47	0.00
Bachelor degree or above	0.50	0.50	1.00
Employed	0.63	0.48	1.00
Unemployed	0.35	0.48	0.00
Student	0.02	0.16	0.00

Source: Online Qualtrics survey in USA, 2020.

It is seen from Table 2, column 2, that 41 percent of respondents were male, and the rest were female. The mean worth of healthcare showed that 15 percent of participants have been working in healthcare or clinical environments and have the possibility to meet the sick. Thirty-four percent were participants who lived in rural areas, and the rest of the participants resided in suburban and urban areas. Fifty percent of participants had bachelor's degrees or above qualifications, while 34 percent had some college education and 16 percent had high school diplomas or below qualifications. Also, percent of the participants were employed, percent were unemployed, and just 2 percent were students.

Test of collinearity: Gretl was used to estimate the degree of association between the independent variables in the collinearity test [15].

Table 3. *Result of the variance inflation factor (VIF).*

Variables	Result of Variance Inflation Factor (VIF)
Gender	1.01
Healthcare	1.02
Age 18-39 years	1.41
Age 40-59 years	1.40
Rural	1.02
High school diploma or GED or below	1.13
Some college	1.12
Employed	1.05
Student	1.05

Source: Online Qualtrics survey in USA, 2020.

The highest VIF value was 1.41 for the 18-39 years dummy variable. (Table 3). The lowest value of the VIF was 1.01 for the gender of the participants (Table 3). The collinearity tests suggested that there was no severe multicollinearity problem among the independent variables used in the model. As for all the explanatory variables used in the model, the value of the VIF was less than ten (Table 3). The variable 'age more than 60 years, 'employed,' 'bachelor's degree or above,' and 'Suburban to Urban' were omitted from the analysis as they showed high multicollinearity.

Correlation matrix: The outcome of the correlation matrix also revealed that there was no strong correlation between any of the independent variables. (Appendix). Since the correlation coefficient value was not closed to plus one or minus one of all exploratory variables, suggesting a clear correlation [16].

Functional Analysis: To identify the factors that influenced the purchase of face masks in the USA during the Corona pandemic time, the Binary Logit Regression Model was used. Since the dependent variable "purchased a face mask" is a categorical variable ("yes" or "no" outcome), the binary logistic regression model was used for this reason. It showed the relationship between respondents' face mask purchase behavior and their socio-demographic characteristics and workplace. It can be said that the face mask purchase behavior is a function of some factors [15].

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots \ldots \ldots \beta_k X_{ki} + e_i \quad (1)$$

Thus, the model specification that was used for this research-

Purchase of face mask= $\beta_0 + \beta_1$ Gender + β_2 Healthcare + β_3 Age 18-39 years + β_4 Age 40-59 years + β_5 Rural + β_6 High school diploma or GED or below + $_{\beta 7}$ Some college + β_8 Employed + β_9 Student + e_i [15].

Table 4. *Estimated values of the coefficient and related statistics of face mask purchase behavior.*

Variables	Coefficient	Std. Error	Z value	p-value	Marginal effect value
Const	−1.59	0.09	−15.96	<0.00 ***	
Gender (X_1)	0.20	0.07	2.67	0.00 ***	0.03
Healthcare (X_2)	0.41	0.09	4.28	<0.00 ***	0.07
Age 18-39 years (X_3)	−0.32	0.10	−3.15	0.00 ***	−0.05
Age 40-59 years (X_4)	−0.13	0.09	−1.47	0.13	−0.02
Rural (X_5)	−0.09	0.08	−1.19	0.23	−0.01
High school diploma or GED or below (X_6)	0.35	0.10	3.32	0.00 ***	0.06
Some college (X_7)	0.18	0.08	2.23	0.02 **	0.03
Employed (X_8)	−0.03	0.08	−0.34	0.73	−0.00
Student (X_9)	0.29	0.22	1.29	0.19	0.05
Mean dependent var	0.184		S.D. dependent var		0.388
McFadden R-squared	0.009		Adjusted R-squared		0.005
Log-likelihood	−2344.796		Akaike criterion		4709.593
Schwarz criterion	4774.662		Hannan-Quinn		4732.410
Number of cases 'correctly predicted' = 4035 (81.5%)					
f(beta'x) at mean of independent vars = 0.388					
Likelihood ratio test: Chi-square (9) = 45.8273 [0.0000]					

Source: Online Qualtrics survey in USA, 2020.

4. Result and Discussion

Gender: It is seen from column (2) of Table 4 that the variable, respondents' gender is positively and substantially correlated (coefficient 0.20, and p=.00) with the purchase of face masks. The related magnitude of the marginal effect (0.03) reveals that male participants were 3% more likely than female participants to buy face masks (Column 6, Table 4). Previously, it was found that females wore masks 7.6%

more than males [9], and mask-wearing behavior is positively related to mask purchase [11]. But their conclusions were contradicted by the latest study findings. The most likely explanation could be that male members are more occupied with outside home activities and shopping than female members of a family, and males purchase face masks for their personal use and family usage.

Age: It can be observed from column (2) of Table 4 that the variable 'Age 18-39 years' of the respondents is negatively but significantly associated (coefficient -0.32, and p=.00) with the purchase of a face mask. The magnitude of the marginal effect of age 18-39 years (−0.05) revealed that participants who belong to this group were 5 percent less likely than their counterparts to buy face masks (column 6, Table 4) which matches with Tang and Wong's (2004) findings where they found people between 19-29 age group are less likely to wear facemask [14]. On the other hand, the variable 'Age 40-59 years' of the participants was also negatively associated with the purchase of face mask behavior (coefficient -0.13), but the relationship was not significant (p=0.13). There are currently not enough peer-reviewed and direct-observational research to describe the face mask purchasing behavior of different aged groups of individuals for making comparisons and giving clear indications about the study findings. But based on this study's findings, it could be said that age did not positively impact the purchasing conduct of the face covering and the young-aged people were less likely to buy a face mask. And the reason behind this might be that the young people have more body resistance to diseases, which is why they are less alert about usage and buying.

Work in healthcare: It can be seen from column (2) of Table 4 that the variable 'healthcare' is positively and significantly correlated (coefficient 0.41, and p < .00) with the purchase of a face mask. The related magnitude of the marginal effect (0.07) indicated that participants who worked in healthcare or clinical settings were 7% more likely to buy face masks (Column 6, Table 4) than those who worked in others. The World Health Organization (WHO) urged the use of face masks and recommended that health staff and other personal protective equipment have to wear a mask/respirator [18]. Since COVID-19 is likely to be transmitted via tiny respiratory droplets and is a highly contagious disease [17], the person working in health care must wear a mask for personal protection. This could be one of the main reasons why participants operating in the clinic and encountering sick people buy more face masks than their counterparts.

Education: The value of coefficient (0.35) of variable 'High school diploma or GED or below' (column 2, table 4) suggested that it had a positive association with the purchase of face mask activity, and it was highly significant (p=0.00). The marginal effect value (.06) indicated that participants with 'High school diploma or GED or below' qualification were 6 percent more likely to purchase face masks than who have Bachelor and above education (column 6, Table 4). Similarly,' some college' education also had a positive and meaningful correlation (coefficient 0.18, p=0.02) with the

face-covering buying activity and the magnitude of marginal effect (0.03) showed that participants were 3 percent more likely to purchase face masks with 'some college' education than who have Bachelor and above education (column 2 & 6, table 4). There is a positive correlation between education and health literacy, and people with higher education (college, bachelor's degree) showed more health preventive behavior than those who had a high school diploma or less education [2, 14]. But from this study, it is found that less educational qualifications had a strong positive influence on face mask buying behavior than higher education which is just opposite of above-mentioned study findings. The reason might be people with higher education are highly involved with desk job, and during COVID-19 pandemic time most of them worked from home. And this could be the reason of purchasing less facemask by people with bachelor or above education than those who have some college and school education.

The variable 'Rural' (coefficient -0.09) and Employed (coefficient -0.03) were negatively related with the face mask purchase decision, where variable' Student' (coefficient 0.29) was positively related, but none of the relationships was not significant (column 2, Table 4).

R-squared value: The McFadden R-squared value of the model was 0.009 which showed the overall goodness of the regression's model fit. And the number of cases correctly predicted 81.5% by all the explanatory variables used in the model.

5. Conclusion

The socio-demographic characteristics (gender, education, age, and place of work) of participants had a significant effect on the purchase of face masks and the participants showed different buying behavior according to their different social characteristics. Among the variables, gender, education, and place of work positively influenced face mask buying. Wearing a face mask is one of the cheapest and accessible preventive measures of COVID-19 transmission. Furthermore, it should be noted that, on an individual level, wearing a facemask is still one of the most efficient measures to avoid getting and transmitting SARS [19]. In this case, relevant stakeholders (who want to ensure the purchase and use of face masks by individuals) need to know about the factors that are responsible for different face cover purchasing behavior of participants. The stakeholders will get some clear indications of the factors from the findings of this study. Besides, the age of participants had a negative association with buying behavior. In this case, more research should be done to analyze why different participants of different age groups were negatively correlated with the purchase of masks, particularly for younger groups who are more outgoing than older. The health and hygiene practice policies need to consider that in following certain hygiene practices age of the population is not always a focal criterion. This study is also important for nutritional and hygiene practice - related policy initiatives and research because it

describes salient features of adopting a particular hygiene practice. Furthermore, it urges policy and development agencies that health related practices need to focus on educating people on the nutritional and hygiene related practices whatever the educational qualifications of the target populations. This study highlights the perspective that when people are aware and understand about the risk of transmitting diseases, they tend to follow the health rules more sincerely that others. So, this implies that health and hygiene policies should be focusing more on making people aware besides implementing direct health or hygiene related programs.

The study has several limitations. One of the biggest concerns is about the representation of the sample. The survey was conducted through online by using social media. In that case, the survey failed to collect data from individuals who did not use social media during survey time. The collected sample might show different face mask purchasing behavior than general population especially, findings about impact of respondent's education level on face mask purchasing behavior is completely different from the existing other research findings. Another limitation is that the study is based on only a few demographic variables, but purchasing behavior is a complex subject to study and is influenced by individuals' psychological, social, health, and so many things.

Despite the imitations, the study provided pertinent information on factors influencing U.S. people's face mask purchasing behavior during the COVID-19 pandemic. Findings could offer significant insights to the relevant stakeholders, who are working to ensure face cover by people to reduce the global spread of the Coronavirus.

Appendix

Table 5. Correlation matrix Correlation coefficients, using the observations 1 – 4949.

Variables	Gender	Healthcare	Working status	Age 18-39 years	Age 40-59 years	Above 60 years	Rural
Gender	1.0000	-0.0939	0.0022	-0.0390	0.0192	0.0158	-0.0207
Healthcare		1.0000	0.0039	0.0313	0.0752	-0.1121	0.0206
Working status			1.0000	-0.0015	-0.0125	0.0152	-0.0085
Age 18-39 years				1.0000	-0.5297	-0.3656	-0.0693
Age 40-59 years					1.0000	-0.5958	0.0241
60 years						1.0000	0.0392
Rural							1.0000
Urban & sub-urban							
Below high school							
College education							
Bachelor							
Employed							
Unemployed							
Student							

Variables	Urban & sub-urban	Below high school	College	Bachelor	Employed	Unemployed	Student
Gender	0.0207	0.0503	0.0114	-0.0475	0.0041	-0.0109	0.0202
Healthcare	-0.0206	-0.0421	0.0312	0.0010	-0.0038	0.0033	0.0018
Working status	0.0085	-0.0082	-0.0014	0.0073	-0.9583	0.8144	0.4802
Age 18-39 years	0.0693	0.0054	-0.0139	0.0093	0.0076	-0.0137	0.0182
Age 40-59 years	-0.0241	0.0073	0.0138	-0.0184	0.0145	-0.0152	0.0016
60 years	-0.0392	-0.0131	-0.0020	0.0114	-0.0231	0.0297	-0.0190
Rural	-1.0000	0.0940	0.0474	-0.1134	0.0208	-0.0326	0.0347
Urban & sub-urban	1.0000	-0.0940	-0.0474	0.1134	-0.0208	0.0326	-0.0347
Below high school		1.0000	-0.3118	-0.4320	0.0037	0.0019	-0.0169
College education			1.0000	-0.7222	0.0058	-0.0102	0.0130
Bachelor				1.0000	-0.0082	0.0083	-0.0000
Employed					1.0000	-0.9462	-0.2096
Unemployed						1.0000	-0.1180
Student							1.0000

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