Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Progress in Disaster Science 13 (2022) 100215

Contents lists available at ScienceDirect

Progress in Disaster Science

journal homepage: www.elsevier.com/locate/pdisas

Regular Article

Public concerns and burdens associated with face mask-wearing: Lessons learned from the COVID-19 pandemic

Pouyan Esmaeilzadeh

Department of Information Systems and Business Analytics, College of Business, Florida International University (FIU), Modesto A. Maidique Campus, 11200 S.W. 8th St, RB 261B, Miami, FL 33199, United States

ARTICLE INFO

Article history:
Received 29 September 2021
Received in revised form 5 January 2022
Accepted 6 January 2022
Available online 12 January 2022

Keywords:
COVID-19 pandemic
Concerns
Misinformation
Face masks
Continuance intention

ABSTRACT

This study attempts to identify and categorize the key concerns of wearing masks. An online survey was used to collect data from 2746 people in the United States. Results show that the mask-wearing concerns can be classified into three categories; discomfort barriers (physical discomfort and communication discomfort), external factors (overstated news about coronavirus threat, political beliefs, and absence of mask-wearing culture), and usability issues (lack of effectiveness, unnecessariness of masks in certain cases, and mask maintenance issues). The findings demonstrate that all mentioned concerns strongly shape people's attitudes toward wearing masks, except for political beliefs and lack of effectiveness.

1. Introduction

COVID-19 has been a significant threat to people's health and countries' healthcare systems and changed their social, economic, and psychological well-being. The COVID-19 crisis has vastly impacted the three pillars of sustainability: society, economy, and environment [1]. For example, a study examines the effects of the COVID-19 pandemic on agricultural activities and the food supply chain [2]. Another array of research uncovers the impact of the COVID-19 pandemic on energy consumption [3]. During the pandemic, the residential sector consumed higher energy with the growing demand for renewable energy since people mostly stayed at home or used work-from-home schemes [4]. A study in Brazil and Portugal shows that the COVID-19 pandemic influences environmental awareness and social responsibility [5]. Sustainable development during the COVID-19 is considered in terms of minimizing the total cost, total pollution, and total human risk at the same time [6]. Companies are also expected to adhere to cleaner production practices during the pandemic [7].

Following guidelines and instructions suggested by the U.S. Centers for Disease Control and Prevention (C.D·C) and state orders during the pandemic, individuals have been informed of using protective measures to prevent virus spread. These preventive measures, such as wearing a face mask and practicing social distancing in public, have added new behaviors and habits to the lifestyle of people around the world. Several academic studies provide enough evidence to prove that wearing a mask can effectively reduce infection and mortality rates if more people follow mask-wearing protocols [8]. Although wearing masks in public has been mandatory in various states in some stages of the pandemic, studies highlight that achieving a goal of widespread mask-wearing adoption in the USA has faced significant challenges even in the presence of federal and state policies [9]. Moreover, the debate of developing a national mask mandate and federal enforcement has not yet been resolved [10].

Individuals against wearing masks may have varying reasons and justifications to oppose it. Previous studies use different methods to address this question. Several questionnaires have been conducted to recognize the exact adoption rate of wearing masks in the USA using dichotomous questions (yes, no) or provide some guidance for wearing masks and their effectiveness [11]. However, these questionnaires did not use probing questions to highlight the root causes of people's concerns and barriers to wearing masks. An anecdotal report also explains why people choose not to wear masks during the pandemic [12]. A study mentioned that previous reports mainly focus on a particular factor (such as personal reasons or public mistrust) to describe why some people refuse to wear face masks during the pandemic [13]. Another research arena is to analyze social media to explore individuals' attitudes toward wearing masks. For example, a study attempts to identify the main topics posted by Twitter users containing personal opinions about wearing masks to discover the rationale of those against mask-wearing [14]. Nevertheless, using platforms such as Twitter for public opinions may not represent the general population because

E-mail address: pesmaeil@fiu.edu.

http://dx.doi.org/10.1016/j.pdisas.2022.100215

they generally reflect a narrower set of the population (more urban, educated, younger, and politically liberal in the case of the USA Twitter users), and largely 80% of content comes from the top 10% of tweeters [15]. Moreover, the nature of these studies is exploratory using qualitative content analysis and lacks theoretical background.

To the best of our knowledge, no study categorizes the key mask-wearing barriers from a comprehensive perspective, develops a conceptual model, and tests the model empirically to predict continuance intention to wear masks regardless of existing mandates. Our research aims to address these essential gaps by investigating the barriers to public mask adoption. More precisely, the objectives of this study are as follows: 1. to identify and categorize the reasons shaping the anti-mask attitude. (2) to develop a comprehensive model using the identified inhibitors to explain and predict individuals' continuous intention to use masks.

This study uses a belief-attitude-intention theoretical foundation to develop a framework and explain possible causal relationships. Analyzing data from a public opinion survey highlights multiple concerns (with some sub-categories) that may discourage people from wearing masks. The findings can also shed more light on developing policies and communication approaches to address the key barriers, promote mask-wearing and support the widespread use of masks as the new normal in public lifestyle during the pandemic. These communication strategies may be useful in changing beliefs, attitudes, and practices and shaping habits and norms around mask-wearing to address these concerns and barriers. Covid-19 strategies can help affect performance only if they first contribute to sustainability [16].

2. Categories of public concerns about mask-wearing

Previous studies on mask-wearing indicate various barriers and concerns. Taking an integrated approach, we identify eight barriers and categorize them into three main categories to develop a parsimonious and comprehensive model. The main logic of categorization is the similarity of themes. The eight barriers are classified around three main themes: 1. Opinions on physical and interactional side effects. 2. Perceptions on socio-cultural determinants, and 3. Perceptions on usefulness and effectiveness of masks. Thus, the key categories are discomfort barriers, external factors, and usability issues. Discomfort barriers refer to physical and communication discomfort experienced as a result of wearing masks in public. External factors consist of all social and political obstacles to wearing masks, root in overstated news about coronavirus threat, political beliefs, and absence of mask-wearing culture. Usability issues are composed of factors related to masks and their usefulness, such as lack of effectiveness, the unnecessariness of masks in certain cases, and mask maintenance issues.

3. Hypotheses development

3.1. Physical discomfort

Previous studies demonstrate that wearing masks may have some physical side effects [17]. For instance, wearing a mask can cause skin issues such as rash and acne. Rashes and redness around the mouth may develop due to sweat and moist vapor between the mask and the skin [18]. A study reports that prolonged face mask use may cause bilateral headaches [19]. People believe that wearing a mask can cause shortness of breath or fainting or would cause damage to the immune system. An experimental study shows that wearing masks can increase negative sensations such as feeling unfit, tight, itchy, and fatigued [20]. Also, face masks may cause people to overheat and disrupt normal breathing, leading to respiratory diseases. Wearing a face mask makes the exhaled air, flow into the eyes and creates an uncomfortable feeling [21].

H1. Physical discomfort negatively affects people attitudes toward mask-wearing.

3.2. Communication discomfort

Covering faces with masks can affect social interactions and people's ability to recognize and identify others [22]. The public believes that wearing face masks could impair verbal communication and make non-verbal communication difficult. Wearing masks can hide facial expressions and emotional states during contact that could generate discomfort. Covering the lower half of the face may limit communal singing and decrease the ability to communicate, interpret, and mimic the expressions of those with whom people interact [23]. Wearing face masks may also weaken face recognition and face cues identification. Moreover, wearing a mask would cause problems with understanding speech during interactions. Misunderstanding language, auditory signals, and gestures in social interactions can obstruct the interpretation of visual signals and facial features. Thus, people may move closer together to understand conversations properly, exacerbating infection risk [17].

H2. Communication discomfort negatively affects people attitudes toward mask-wearing.

3.3. Overstated news about coronavirus threat

One of the key concerns during the COVID-19 pandemic is that many people believe coronavirus is not a serious threat, as mentioned on social media, news, and official reports. Overstated news about coronavirus threat refers to reduced threat perception due to misinformation and disinformation usually spread by social media. A report indicates that some people in the USA deny the reality, effects, depth, and seriousness of COVID-19 [24]. Generally, during the COVID-19 outbreak, some individuals think coronavirus is not as severe as the media suggests. A group of Americans thinks that concerns around public health, safety, and citizens' general welfare during the pandemic have been huge propaganda, and coronavirus is like other common viruses such as flu. They consider that the outbreak of wrong news and distorted evidence in the digital world can create mass panic and cause damaging effects to public health systems [25]. Largely, denial of issues can result in avoidance of the problem. Thus, people engaged in denial may not look for the facts and not follow personal safety measures such as wearing masks in public [10]. Thus, they believe that widespread mask-wearing is an overreaction influenced by the wide publicity in the press, and coronavirus is not as threatening as what news tries to spread.

H3. Overstated news about coronavirus threat negatively affects people attitudes toward mask-wearing.

3.4. Political beliefs

Political beliefs refer to attitudes toward government and state politicians commenting on mask-wearing. The public may believe that mask mandates are manipulation tactics by certain politicians and special interest groups. Previous studies indicate that conflicting and oppositional messages by some politicians and public health departments are an essential factor that can lead to mask-wearing refusal in public places [10]. Conflicting messaging from health officials and state governors could prevent people from realizing educational messages on mask-wearing. Relying on individualism, people in the USA may also believe that mandatory mask-wearing policies have invalidated their personal liberty. A study shows that 40% of the American population report not wearing masks because they believe it is their right to decide whether to wear one [26]. Previous studies report that many American adults may not desire to be forced to wear a mask because doing this could override their constitutional rights and violate their civil liberties [27]. They believe that the mask mandates are politicized, and people are politically forced to wear a mask.

H4. Political beliefs negatively affect people attitudes toward mask-wearing.

3.5. Absence of mask-wearing culture

The absence of mask-wearing culture refers to accepted social norms about wearing masks in public. Since wearing a mask in public has added to people's habits after the COVID-19 pandemic, there was no solid culture to adopt this new behavior. For instance, people may feel that others will think they are infected with coronavirus by wearing masks since cultural norms dictate that only sick people should wear masks. Some people who refuse to wear masks believe that mask-wearing has negative connotations, such as being odd-looking and wired [28]. Also, wearing a mask resembles an unAmerican culture and is reflective of panic and fear [14]. For a group of people, wearing a mask brings to mind a criminal character and causes racial issues. A report shows that African Americans were concerned that covering their faces may result in their arrest [29]. A study shows that one of the top concerns on social media during the COVID-19 pandemic is increased racism, such as prejudiced and xenophobic attacks (*e.g.*, rude comments or dirty looks) [30].

H5. The absence of mask-wearing culture negatively affects people attitudes toward mask-wearing.

3.6. Lack of effectiveness

Several scientific studies describe the effectiveness of wearing masks and other personal protective measures during the COVID-19 pandemic [8]. However, according to previous studies, a group of anti-masks debated that masks gave people a false sense of security, and mask-wearing is not as effective as it claims to protect them against infection [14]. For example, mask-wearing cannot always be effective if not properly worn or accompanied by other hygiene measures [31]. Moreover, it is reported that non-medical face masks (*e.g.*, those made of clothes) may not be useful for COVID-19 [32]. People may also deem that other protective practices are better and more effective alternatives than masks against the spread of coronavirus (such as washing hands or social distancing).

H6. Lack of effectiveness negatively affects people attitudes toward mask-wearing.

3.7. Unnecessariness of masks in certain cases

Face masks are planned to ease the burden of the pandemic; however, they may not be helpful under certain conditions or in some cases. For instance, some studies discuss that children younger than 2 years or individuals who cannot remove the mask themselves or are unconscious are not required to wear masks [32]. The World Health Organization [33] issued an advisory in April 2020 declaring that healthy individuals may not require to wear masks [33]. Healthy individuals are recommended to consider wearing masks in public, mainly when physical distancing is difficult. According to this guideline, people with stable health conditions (no chronic health issues) may not need to wear masks. Another considerable debate about the general use of face masks is that masks may not be necessary outdoors or when social distancing is practiced [14]. Moreover, many people believe that masks are not necessary when the COVID vaccine is secured. Studies report growing optimism that social distancing restrictions and face mask requirements could be alleviated with widespread vaccination [34].

H7. Unnecessariness of masks in certain cases negatively affects people attitudes toward mask-wearing.

3.8. Mask maintenance issues

The maintenance, duration of use, and keeping masks useable are other important concerns regarding wearing masks during the COVID-19 pandemic. Some people believe that masks may not be hygienic because of frequent use [35]. Also, maintaining masks is difficult because it is hard to keep masks clean, and some masks should be changed after use every day. The concern over expenditure on buying masks is another barrier since masks are easy to be lost. Thus, frequent replacement of masks could be challenging and costly [36]. Finally, previous studies mention that used masks, gloves, and other infectious wastes should be separately disposed of to decrease the spread of the Coronavirus [37]. However, disposal of used masks and recognizing when a mask should be thrown away would be another barrier.

H8. Mask maintenance issues negatively affect people attitudes toward mask-wearing.

3.9. Attitude toward mask-wearing

According to Ajzen [38], attitude is defined as a person's positive or negative assessment of a specific behavior. Assessing attitude toward mask-wearing can reveal the public's reactions to mask adoption during the pandemic [14]. Understanding public attitude toward mask-wearing during the pandemic could change regional and national mask-wearing policies and provide an opportunity for future pandemic preparedness planning [39]. Attitude is an important factor in shaping people's decisions on using personal protective equipment (PPE), such as face masks, gloves, and hand sanitizers [36]. We can argue that people with anti-mask attitudes are less likely to wear masks in public. On the other hand, individuals with pro-mask attitudes are more willing to continue wearing masks even in the absence of mandates to protect themselves against the virus. It should be mentioned that the public attitude has shifted over time due to changing CDC guidelines, local mask-wearing policies, and how these policies are practiced. In this study, we examine people's attitudes after releasing the COVID-19 vaccine in the USA.

H9. People attitudes toward mask-wearing positively affect their continuance intention to wear masks.

4. Research model

Based on the mentioned categories of mask-wearing concerns and barriers, this study proposes a research model to address the defined objectives. We bring three categories of concerns associated with mask-wearing together in a theoretical synthesis in which these concepts are seen to interact in ways that help shape public attitude. The linear model suggests three types of concerns (discomfort barriers, external factors, and usability issues) directly influence the general attitudes toward mask-wearing. Discomfort barriers have two key dimensions, physical and communication discomfort. External factors entail three main dimensions, overstated news about coronavirus threat, political beliefs, and absence of mask-wearing culture. Finally, usability issues are reflected by three factors, lack of effectiveness, unnecessariness of masks in certain cases, and mask maintenance issues. The model also proposes that attitude toward mask-wearing is a critical antecedent predicting continuance intention to wear masks. The following research model, which predominantly builds on a linear belief-attitude-intention theoretical foundation, explains several causal relationships [40]. The links begin with discomfort barriers, external factors, and usability issues (beliefs) to public attitude toward mask-wearing (attitude) and continuance intention to use masks (intention). This study measures the dependent variable (*i.e.*, continuous intention to wear a mask) regardless of local, state, or national mandates for mask-wearing. Thus, we control for the possible effects of mask-wearing mandates. Moreover, we control for demographic variables and contextual factors such as age, gender, income, race, education, employment status, health literacy, and perceived health status, which prior research has tested and found to be important factors

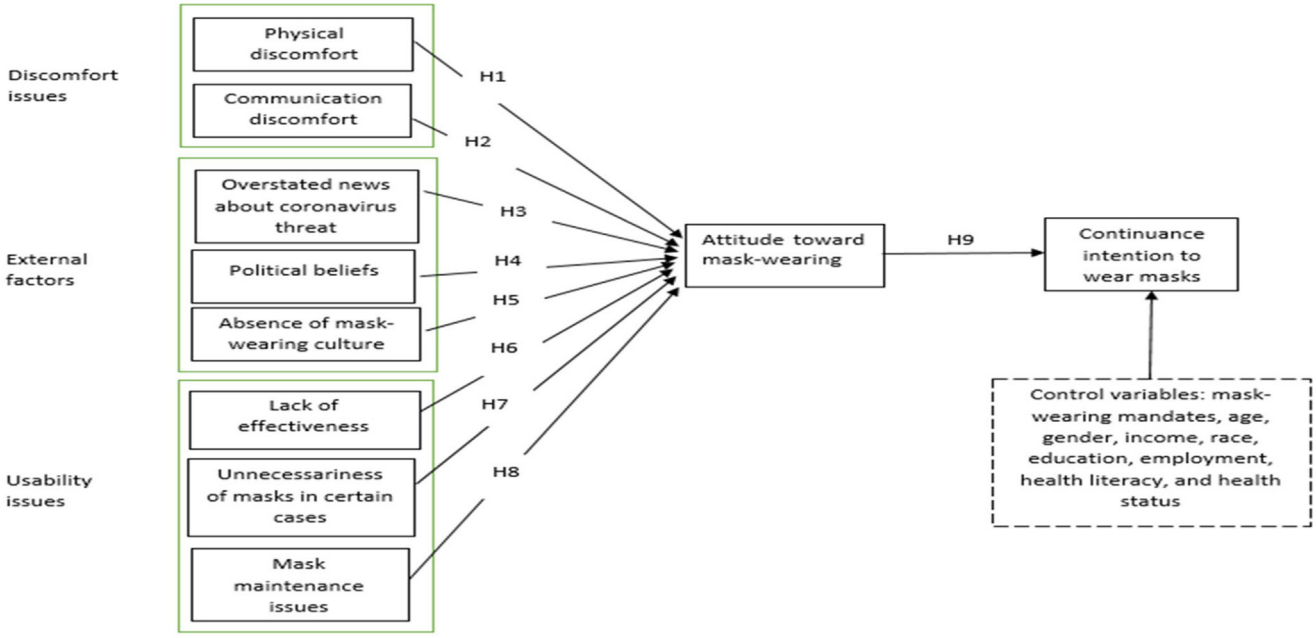

Fig. 1. Research model.

affecting individual intention to perform a behavior. Fig. 1 shows the proposed framework.

5. Methods

5.1. Survey development

We constructed an online survey instrument to collect data on public perceptions about mask-wearing during the COVID-19 pandemic. The questionnaire consisted of five sections. Section 1 provided respondents with a brief description of COVID-19, personal protection measures, and research objectives. Section 2 obtained information on respondents' opinions about concerns and barriers regarding mask-wearing. Section 3 asked questions about respondents' attitudes and continuous intention to wear masks. Section 4 requested information concerning respondents' demographic characteristics. Section 5 defined five mask options (*i.e.*, surgical mask, dust mask, face covering, face visor, respirator with a filter). In this section, we obtained information about respondents' preferences in terms of mask effectiveness. To develop the survey, we adapted items from previous studies and made little changes to fit the context of this study. We drew upon the existing literature to measure the research model's variables. The operational definitions of constructs and measure items for mask-weaning concerns were adopted from studies such as Spitzer [17], Armstrong-Mensah, Tetteh and Tetteh [10], He, He, Reynolds, Bai, Huang, Li, Zheng and Chen [14], and Abd-Alrazaq, Alhuwail, Househ, Hamdi and Shah [30]. The measure items for attitude toward mask-wearing and continuous intention to wear masks were adopted with minor changes from Irfan, Akhtar, Ahmad, Shahzad, Elavarasan, Wu and Yang [36] and Karahanna, Straub and Chervany [41], respectively.

5.2. Pilot test

After developing the initial questionnaire, we consulted five professionals in the COVID-19 and personal preventive measures domain to improve the content validity of our study and finalize the questions used in the survey. According to the experts' suggestions, the terms used to define research objectives were modified, and the descriptions and questions were improved to ensure they were transparent enough and easy to understand. Next, we conducted a face validity with three medical students (studying in a large Southeastern public hospital in the United States) to ensure that the readability and wording of the questions were suitable as per the objectives of our study. Thus, we reworded some ambiguous terms and jargon to exhibit the questions explicitly. Finally, before the main data collection, we conducted a pilot test with 267 graduate students (studying in the business school of the same university) to ensure that the instrument had adequate reliability and validity. The Cronbach's alpha value for each construct was computed (*i.e.*, physical discomfort $\alpha = 0.86$, communication discomfort $\alpha = 0.85$, overstated news about coronavirus threat $\alpha = 0.93$, political beliefs $\alpha = 0.91$, absence of mask-wearing culture $\alpha = 0.91$, lack of effectiveness $\alpha = 0.86$, unnecessariness of mask in certain cases $\alpha = 0.87$, mask maintenance issues $\alpha = 0.88$, attitude toward mask-wearing $\alpha = 0.91$, and continuous intention to wear masks $\alpha = 0.91$). All Cronbach's alpha values were above the threshold value of 0.7, showing that the instrument was internally consistent [42].

5.3. Data collection

This study was reviewed and approved by the Institutional Review Board (I.R.B) of the authors' affiliated university, and the data collection was performed confidentially. We defined the study purpose followed by a written consent form on the first page of the survey. We did not ask respondents to disclose any personal information or unique identifier (such as name, driving license number, social security number, email, and telephone). Individuals who received the online invitation had the option to avoid participating in this study at any time voluntarily. Data were collected in July 2021 through Amazon's Mechanical Turk (MTurk). Previous studies provide enough evidence to show that MTurk is a suitable survey tool to collect individual-level data [43]. According to prior research, subjects recruited using MTurk are more representative of the USA population in terms of age, gender, race, and work experience [44]. We limited the respondents' location to the United States. The online questionnaire was sent to this crowdsourcing website to reach potential subjects (*i.e.*, MTurk workers). After a month, 2825 respondents filled out the survey entirely.

According to previous studies, a key concern in online data collection is that subjects might choose answers randomly or participate with less attention [45]. One solution for identifying careless, rushed, or haphazard answers in behavioral research is using captcha questions [46]. Thus, two attention-check questions were used to detect and eliminate responses of participants who simply picked an answer choice without reading the questions or did not correctly answer reverse-coded filler items [47]. We

dropped responses that failed the response quality questions. After removing unsatisfactory answers (79 data points), the final set of valid and useable responses included 2746 samples.

5.4. Instrument validation

Next, we validated the scale we used to measure constructs. Confirmatory Factor Analysis (C.F.A) was performed using IBM SPSS AMOS (Version 22) to complete convergent validity and discriminant validity. The results of model fit indices for measurement model demonstrated a good fit with goodness of fit indices [$\chi 2/df = 2.17$, Goodness-of-fit index (GFI) = 0.84, Adjusted goodness of fit index (AGFI) = 0.81, Comparative fit index (CFI) = 0.91, Normed-fit index (NFI) = 0.90, Incremental Fit indices (IFI) = 0.92, Standardized RMR (SRMR) = 0.04, and the Root Mean Square Error of Approximation (RMSEA) = 0.03] where all indices meet their respective common acceptance cutoff points. We also used the Variance Inflation Factor (VIF) to check for multicollinearity among variables. The VIF values were between 1.23 and 1.88, below the cutoff value of 5 [42]. Thus, we conclude that multicollinearity is not an issue in this study. Additionally, since using a self-report survey can cause the common method variance issue, we carefully examined the potential for common method bias [48]. We used Harman's one-factor test to check if the common method bias would be a significant problem [49]. All factors together could explain 67.58% of the total variance, while none of the factors accounted for most of the covariance among measures (<20%). Therefore, results demonstrate that common method bias is not a significant threat in our sample.

Consistent with Gefen, Straub and Boudreau [50], we examined the measures such as standardized factor loading, composite reliability, and the AVE (Average Variance Extracted) to determine convergent validity. The results of the convergent validity test are displayed in Table 1. The composite reliability values for all of the constructs in the model were above the cutoff value of 0.7, indicating the adequate reliability of

Table 1
Results of convergent validity.

Construct	Sub-dimensions	Items	Standardized factor loading (>0.7)	Composite reliability (>0.7)	AVE (>0.5)
Discomfort issues	Physical discomfort	PHD1	0.75	0.89	0.61
		PHD2	0.79		
		PHD3	0.77		
		PHD4	0.80		
		PHD5	0.82		
	Communication discomfort	COMD1	0.79	0.90	0.66
		COMD2	0.78		
		COMD3	0.81		
		COMD4	0.85		
		COMD5	0.83		
External factors	Overstated news about coronavirus threat	OVS1	0.87	0.93	0.73
		OVS2	0.89		
		OVS3	0.87		
		OVS4	0.83		
		OVS5	0.83		
	Political beliefs	POL1	0.88	0.91	0.73
		POL2	0.80		
		POL3	0.88		
		POL4	0.86		
	Absence of mask-wearing culture	CUL1	0.79	0.91	0.64
		CUL2	0.80		
		CUL3	0.78		
		CUL4	0.84		
		CUL5	0.80		
		CUL6	0.82		
Usability issues	Lack of effectiveness	LEF1	0.86	0.91	0.69
		LEF2	0.82		
		LEF3	0.84		
		LEF4	0.82		
		LEF5	0.82		
	Unnecessariness of masks in certain cases	UNN1	0.83	0.91	0.68
		UNN2	0.83		
		UNN3	0.81		
		UNN4	0.86		
		UNN5	0.82		
	Mask maintenance issues	MAIN1	0.83	0.94	0.72
		MAIN2	0.84		
		MAIN3	0.83		
		MAIN4	0.85		
		MAIN5	0.89		
		MAIN6	0.87		
Attitude toward mask-wearing	N/A	ATT1	0.84	0.91	0.67
		ATT2	0.82		
		ATT3	0.81		
		ATT4	0.82		
		ATT5	0.83		
Continuance intention to wear masks	N/A	COIN1	0.83	0.91	0.67
		COIN2	0.79		
		COIN3	0.84		
		COIN4	0.82		
		COIN5	0.84		

Table 2
Results of discriminant validity.

Construct	Mean	SD	DI-PHD	DI-COMD	EF-OVS	EF-POL	EF-CUL	UI-LEF	UI-UNN	UI- MAIN	ATT	COIN
DI-PHD	3.11	1.0.02	**0.78**									
DI-COMD	3.54	0.91	0.57	**0.81**								
EF-OVS	3.84	1.23	0.49	0.37	**0.85**							
EF-POL	3.16	1.19	0.46	0.53	0.37	**0.85**						
EF-CUL	3.96	1.09	0.49	0.40	0.55	0.35	**0.80**					
UI-LEF	3.29	0.98	0.32	0.44	0.49	0.51	0.33	**0.83**				
UI-UNN	3.15	1.07	0.41	0.51	0.45	0.49	0.48	0.41	**0.82**			
UI-MAIN	3.21	1.01	0.38	0.54	0.42	0.45	0.36	0.45	0.39	**0.84**		
ATT	3.82	0.97	−0.48	−0.0.06	−0.13	−0.16	−0.04	−0.09	−0.23	−0.02	**0.81**	
COIN	3.82	0.99	−0.11	−0.21	−0.08	−0.17	−0.02	−0.08	−0.25	−0.08	0.73	**0.81**

Table legend: DI-PHD = Discomfort issues – physical discomfort; DI-COMD = Discomfort issues – communication discomfort; EF-OVS = External factor- overstated news about coronavirus threat; EF-POL = External factor- political beliefs; EF-CUL = External factor- absence of mask-wearing culture; UI-LEF = Usability issues - lack of effectiveness; UI-UNN = Usability issues - unnecessariness of masks in certain cases; UI-MAIN = Usability issues - mask maintenance issues; ATT = Attitude toward mask-wearing; COIN = Continuance intention to wear masks.

constructs [51]. According to previous studies, a factor loading of 0.7 or greater is acceptable [52]. The reported standardized factor loadings for all constructs were greater than 0.7. The AVE was determined using the values of standardized factor loading for each of the constructs. All the reported values of AVE were higher than 0.5, which is the minimum acceptable value [53]. These measures highlighted that the convergent validity of the measurement model was acceptable. As the instrument validation results were satisfactory, no items were removed from further analysis.

Next, the discriminant validity of the constructs was examined. In Table 2, the main diagonal elements in bold indicate the square roots of the AVEs, and the off-diagonal values denote the correlation coefficients between the constructs. All diagonal values were higher than 0.7 and also greater than correlations between any pair of constructs [54]. Thus, the model satisfied the discriminant validity requirements. We then confirmed that the model also had adequate discriminant validity.

6. Results

6.1. Respondents' characteristics

Table 3 shows the participants' characteristics. IBM SPSS version 27 was used to perform the descriptive statistics. The demographic data highlights that respondents were fairly distributed by gender, where 51% were male, and 49% were female. Age range and annual household income were normally scattered, with age range between 30 and 39 (34%) years and income between $25,000 and $49,999 (33%) were higher ranges among provided categories. Most of the respondents were white (65%), followed by 15% Hispanics. The majority of respondents had a full-time job (67%). 41% had a bachelor's degree, followed by 22% of respondents with some college degree. The majority of respondents (85%) reported that their health status was either good or excellent, and 70% indicated that they were not suffering from any chronic diseases. Only 9% stated that they wore masks before the COVID-19 pandemic due to a health issue. Around 87% mentioned that their health literacy was either good or excellent. Finally, 39% of respondents in this study had been infected with coronavirus during the pandemic.

The final question of the survey asked respondents to choose their preferred face mask in terms of effectiveness. The main options were surgical masks, dust masks, face-covering (cloth), face visor, and respirator with a filter. Totally, 95% of respondents preferred one of these mask options, and only 5% believed that there was no difference among the options. Fig. 2 displays the percentage of the preferred mask type. Among the options, the surgical mask was considered the most preferred method of exchange (49%), followed by cloth face covering (18%).

6.2. Control variables

Some factors do not reflect this study's core variables (*i.e.*, those included in the proposed model); however, they may impact the interrelationships between the core variables or affect the primary dependent variable. The effects of these variables have been controlled. As mentioned before, we controlled mask-wearing mandates, age, gender, income, race,

Table 3
Sample characteristics.

Variable	Categories	Percentage (%)
Gender	Male	51
	Female	49
Age	Under 20	2
	20–29	24
	30–39	34
	40–49	21
	50–59	12
	65 or older	7
Annual household income	Less than $25,000	14
	$25,000–$49,999	33
	$50,000–$74,999	25
	$75,000–$99,999	17
	$100,000 or more	11
Education	Less than high school	1
	High school graduate	5
	Some college	22
	2-year degree (associate degree)	11
	4-year degree (undergraduate/bachelor's degree)	41
	Masters' degree	19
	Doctorate	1
Employment status	Employed- full time	67
	Employed-part time	20
	Unemployed	8
	Retired	3
	Student	2
Race/ethnicity	White	65
	African American	12
	American Indian/Alaska Native	2
	Asian	5
	Hispanic	15
	Other	1
Health status	Poor	3
	Average	12
	Good	51
	Excellent	34
Suffering from any chronic diseases	Yes	30
	No	70
Health literacy	Poor	1
	Average	12
	Good	57
	Excellent	30
Infected with Coronavirus	Yes	39
	No	61
Wearing masks before the COVID-19 pandemic due to a health issue	Yes	9
	No	91

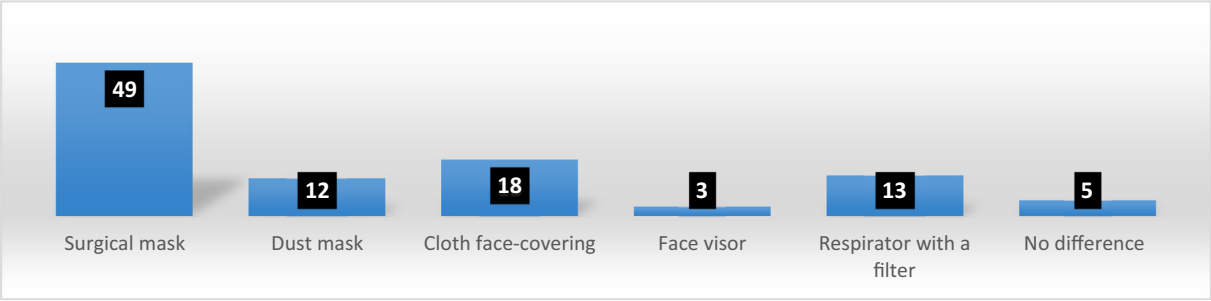

Fig. 2. Preferred mask type (percentage).

education, employment, health literacy, and health status to focus on examining the effects of concerns and barriers associated with mask-wearing. Although the categories of concerns seem to represent individuals' willingness to continue wearing masks during the COVID-19 pandemic, we found that the effects of some control variables were not negligible. Findings show that annual household income (ß = − 0.15, $p < 0.05$), employment status (ß = 0.11, $p < 0.05$), education status (ß = 0.35, $p < 0.001$), health status (ß = − 0.29, $p < 0.01$), and mask-wearing mandates (ß = 0.21, $p < 0.01$) influence continuance intention to wear masks. The findings confirm that enforced local or state mandates significantly affect individuals' intention to continue wearing masks. Moreover, these findings demonstrate that employed individuals who may suffer from chronic health problems, with higher education levels and lower annual household income, may exhibit a higher intention to continue wearing masks during the pandemic. However, no effects of age, gender, race, and health literacy were found on continuance intention to wear masks.

6.3. Structural model

IBM SPSS AMOS (Version 22) was used to perform hypothesis testing within a structural equation modeling (S.E.M) framework. According to Ho [55], the goodness of fit statistics can examine the entire structural model and measure the overall fit. The results highlighted that the normed Chi-square value ($\chi 2$/df) of 2.09 was between the threshold range values of 1 and 3 [56]. The values for CFI = 0.90, NFI = 0.92, RFI = 0.91, and TLI = 0.90 were above 0.9 and the SRMR = 0.05 and RMSEA = 0.04 were below 0.08 [57]. The value of the GFI was 0.91, which was greater than the cutoff of 0.90. All mentioned indices of fit were in the recommended range, and only AGFI = 0.87 was marginal. Consistent with Kline [58], at least four statistical indices should satisfy the minimum threshold values. Findings demonstrated that four indices met the threshold values in our study, supporting a good fit between the hypothesized model and collected data. Fig. 3 displays the standardized path coefficients of the structural model.

Path coefficients are also examined to test the structural model. The results of the hypotheses testing are presented in Table 4. Regarding discomfort issues, the findings support H1 by confirming that physical discomfort negatively influences attitude toward mask-wearing (β = − 0.74 and $p < 0.001$). H2 is also supported where higher communication discomfort significantly activates negative attitudes toward mask-wearing (β = − 0.68 and $p < 0.001$).

With respect to external factors, the results provide enough evidence to support H3, which indicates that overstated news about coronavirus threat significantly reinforces negative attitudes toward mask-wearing (β = − 0.51, $p < 0.01$). Support is not found for H4, which initially proposes that political beliefs negatively change individuals' attitudes toward mask-wearing (β = − 0.33, non-significant path). H5 is supported where the absence of mask-wearing culture can significantly lead to negative attitudes toward mask-wearing (β = − 0.60, $p < 0.01$).

Concerning usability issues, the analysis demonstrates that lack of effeteness of masks would not significantly influence individuals' attitudes toward mask-wearing (β = − 0.27, non-significant path). Thus, H6 is not

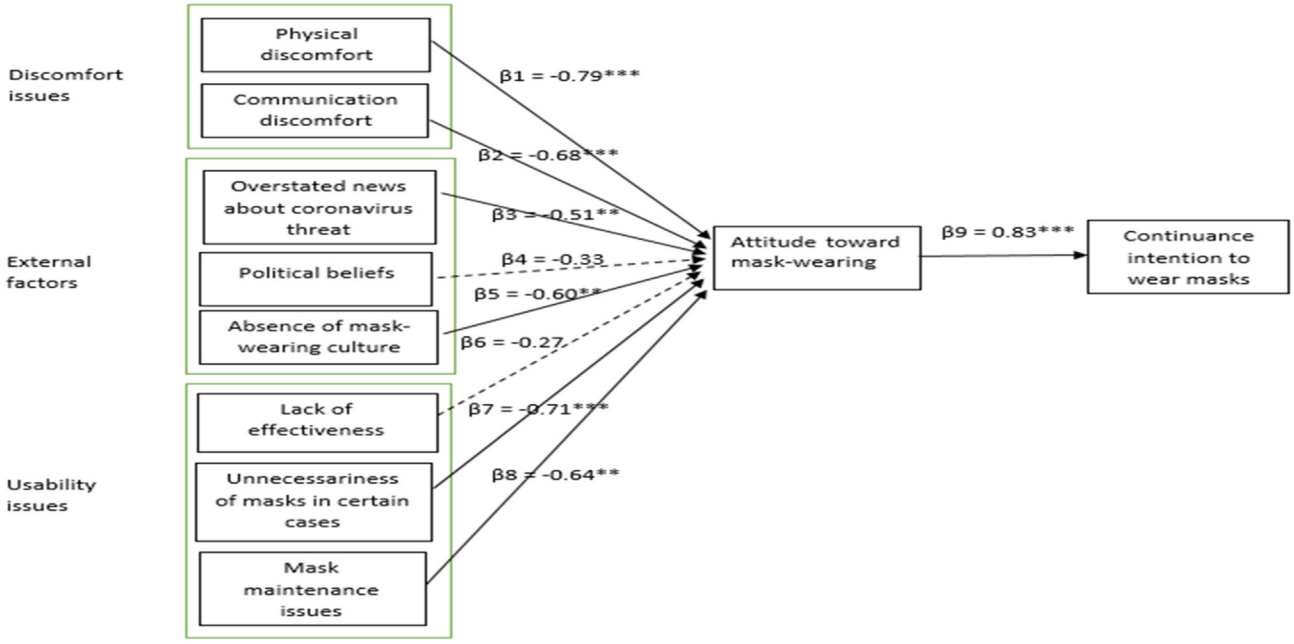

Fig. 3. Model paths $^{**}p < 0.01$, $^{***}p < 0.001$.

Table 4
SEM results.

Hypothesis	Path	Standardized coefficient	Standard error	Critical ratio	Results
H1	PD→ATT	−0.79***	0.36	−2.19	Supported
H2	COMD→ATT	−0.68***	0.22	−3.09	Supported
H3	OVS→ATT	−0.51**	0.22	−2.31	Supported
H4	POL→ATT	−0.33	0.22	−1.5	Not-Supported
H5	CUL→ATT	−0.60**	0.24	−2.5	Supported
H6	LEF→ATT	−0.27	0.43	−0.62	Not-Supported
H7	UNN→ATT	−0.71***	0.59	−1.2	Supported
H8	MAIN→ATT	−0.64**	0.29	−2.2	Supported
H9	ATT→COIN	−0.83***	0.06	13.83	Supported

Attitude toward mask-wearing R^2: 0.54, Continuance intention to wear masks R^2: 0.73 $^{**}p < 0.01$, $^{***}p < 0.001$.
Table legend: PHD = physical discomfort; COMD = communication discomfort; OVS = overstated news about coronavirus threat; POL = political beliefs; CUL = absence of mask-wearing culture; LEF = lack of effectiveness; UNN = unnecessariness of masks in certain cases; MAIN = mask maintenance issues; ATT = Attitude toward mask-wearing; COIN = Continuance intention to wear masks.

supported. The path coefficient of the negative relationship between the unnecessariness of masks in certain cases and attitude toward mask-wearing is significant, supporting H7 ($\beta = -0.71$, $p < 0.001$). The negative effect of mask maintenance issues on individuals' attitudes toward mask-wearing is significant, supporting H8 ($\beta = -0.64$, $p < 0.01$). The findings also provide enough evidence to support H9 by indicating that the more positive attitudes toward mask-wearing, the more likely individuals are to continue wearing masks regardless of mandates ($\beta = 0.83$ and $p < 0.001$).

Finally, the model explained 54% of the variance in individuals' attitudes toward mask-wearing and 73% of the variance in individuals' continuance intention to wear masks. The R^2 scores suggest that the constructs and their dimensions provide reliable explanatory power to predict individuals' willingness to continue wearing masks during the COVID-19 pandemic. Therefore, we have enough evidence to conclude that multi-dimensional concerns and barriers associated with mask-wearing during the pandemic support the proposed model.

7. Discussion

Face masks are considered an effective personal protection measure in controlling the spread of coronavirus. However, there are controversies in adopting face masks in the USA as some individuals oppose mask-wearing in public during the pandemic. As mentioned by previous studies, the adoption rate of masks is still beyond the optimal level in the USA [14]. As noted by previous studies, evidence shows that negligence in wearing masks and maintaining social distancing has occurred in every country [4]. This study attempts to uncover the key concerns associated with mask-wearing to help policymakers and health care decision-makers identify the barriers and address them to effectively influence individuals' willingness to wear masks during the COVID-19 pandemic. The mask-wearing inhibitors are diverse and have various bases. To address the first research question, we categorize the mask-wearing concerns. The findings are important to sustainable development/cleaner production in the mask-wearing context. The results demonstrate that key barriers to wearing masks are a combination of three categories. Our findings indicate that a group of concerns is on account of discomfort and side effects of using masks, some have roots in external factors such as media, and several barriers are due to mask-related usability issues. Our findings provide more insights by shedding light on why a group of the population has a strong attitude against mask-wearing and is not likely to wear masks.

To address the second research question, we develop a model to explain and predict individuals' continuous intention to wear masks using the identified categories and sub-dimensions. Then, we conduct an empirical study to examine how significantly these concerns can influence people to disengage from mask-wearing in public. The empirical work confirms the significant effects of both dimensions of discomfort issues (*i.e.*, barriers to wearing masks owing to physical and communication discomfort) in predicting attitude toward mask-wearing. Results also indicate that physical side effects are more significant than communication barriers in creating negative attitudes. Consistent with previous studies, wearing face masks may cause several physiological and psychological effects that could impair people's decision to observe protection policies [59]. Some of the main reported physical effects and discomforts are headaches, acne, nasal bridge scarring, facial itching, rash/irritation, and discomfort due to increased facial temperatures [60]. Moreover, our analysis shows that physical discomfort is the strongest variable among the three categories of concerns that could enact negative attitudes toward mask-wearing and hamper continuous intention to wear masks.

Concerning the critical role of external factors, our study provides strong evidence that overstated news about coronavirus threat and the absence of mask-wearing culture can strongly hinder mask adoption. However, the effect of political beliefs and attitudes toward government is not significant in predicting attitude toward mask-wearing. A plausible justification is that compared to the outset of the pandemic, conflicting and abstract messaging from health officials, federal politicians, and state governors have largely been dropped, and mask-wearing strategies have less looked politicized. According to existing studies, the political component (such as political orientation, identity, and ideology) was more supported by the previous USA administration to address pandemic issues and policies [61,62]. Thus, it is likely that political beliefs (associated with different political parties in the USA) about mas-wearing may no longer have significant implications for behavioral intentions such as wearing masks.

Our study demonstrates that exaggerated and manipulated information about the threat and danger of coronavirus can significantly contribute to negative attitudes toward mask-wearing. The significant effects of overstated news about the coronavirus threat are consistent with previous studies highlighting the challenges of coronavirus disease regarding the wild spread of misinformation and conspiracy theories about the COVID-19 pandemic [63]. The rapid spread of fake news, false data, manipulated information, and distorted evidence in social media can cause mass panic and cause damaging results in the real world. People who are misled by unsupported and wrong claims about the nature and treatment of the coronavirus are less likely to observe official health advice and even impede impeding the efforts of public health systems [64]. Thus, they may not practice health protection strategies such as mask-wearing.

Among the external factors, the absence of mask-wearing culture exhibits the most significant barrier. Measures of social distancing, self-quarantining, and mask-wearing during the COVID-19 pandemic have resulted in thinking that encompasses a communitarian ethos [65]. People may modify their behavior to align with social communication and behavioral norms in society. In line with a study, some habits after this pandemic, such as using masks, remote working, will be remarkably changed [66]. In the absence of mask-wearing norms, many individuals may hesitate to follow preventive instructions. Consistent with existing research, the general public from areas where masks were not used in the local culture has strongly been inclined not to wear masks across all situations [31].

According to previous studies, people may need guidance to develop mass-masking norms during the COVID-19 pandemic [67]. By weighing the pros and cons of face masks, society can determine that the benefits of wearing masks would be bilateral as a mask can protect the person wearing it and the person with whom he or she talks. Thus, it can be treated as a cultural norm that, if followed by everybody, benefits the entire society noticeably, with little cost to the person [17]. Wearing masks should be seen as the new social normal after the COVID-19 pandemic across different people with various demographic characteristics.

Regarding the important role of usability issues, the existing contradictions with mask supply and performance should be clearly managed. Among the three dimensions of usability issues, the unnecessary use of masks in certain cases and mask maintenance issues are considerably able to make people reluctant to continue wearing masks. However, the effects of lack of mask effectiveness are not found significant in the mask adoption equation. This finding suggests that if worn properly and accompanied by other protective measures, masks would be considered an appropriate and effective response to possible events caused by the pandemic. This is consistent with previous studies proposing that wearing masks could minimize the spread of the virus from infected to healthy individuals in public when compliance is high [68]. Moreover, as highlighted previously, wearing masks is the most effective measure to slow down the spread of pandemics [69]. A plausible explanation for this finding is that the general knowledge and awareness about the effectiveness of masks has increased due to several recent research and scientific studies on the use of masks to minimize disease spread. Compared to the beginning of the pandemic, studies have changed public opinions and instilled an idea that the use of masks in public is an important health measure and wearing masks is an effective precautionary measure.

Although we found no evidence about mask ineffectiveness, the public still believes that using masks in certain situations is unnecessary. One of the leading cases is when people get vaccinated. Our study shows that many people think getting the COVID-19 vaccine can ease the burden of wearing masks. However, a study using several simulations proposes that COVID-19 elimination is more feasible if the vaccination program is combined with another intervention, especially face mask use in public [70]. Another study also argues that although COVID-19 vaccines are becoming more available, safety measures (*e.g.*, face masks) are still crucial in protecting personal and public health against COVID-19 [71]. Thus, our study displays the gap between the recent research and public opinions on the relationship between vaccination and mask-wearing. A plausible reason is that the vaccination program is still in progress in the USA, and guidelines to stay with control interventions (*i.e.*, face mask usage) even after vaccination is either not clear or not taken seriously by the public. We propose that health experts and government officials need to continuously communicate with people and highlight the importance of COVID-19 preventive practices (such as wearing masks) to ensure people are protected against coronavirus until the end of the pandemic.

Among the dimensions of usability issues, mask maintenance is found as the most significant reason for people who are no longer willing to engage in the COVID-19 prevention behaviors of wearing masks. Mask maintenance issues reflect barriers such as frequency of use, hygiene, supply, cost, and disposal of used masks. Our results align with previous studies that highlight the environmental sustainability of face maks used to prevent virus transmission in the current and future pandemics [72]. The waste utilization associated with masks can be considered from sustainable and circular economy perspectives. According to previous studies, reusable face masks can lead to an over 95% reduction in waste [73]. Since most medical masks are disposable, people may be concerned that using face masks is not a cost-effective strategy and think other preventive practices (such as personal hygiene and social distancing) would be sufficient. The increased demand for disposable masks in the USA has contributed to pollution and raised environmental issues [74]. Also, people may not know how long they can keep their masks for further use and how to dispose of them. A study indicates that if people do not dispose of used masks properly, the used masks can facilitate the transmission of fungus and bacteria [10]. Our finding is consistent with previous studies stating that facemasks should be inexpensive, durable, safe, washable, sterilizable, and reusable [36]. Reusable personal protection equipment (such as face masks) has lower energy consumption and environmental footprints [75]. As previously mentioned, reusable masks and masks with interchangeable filters can reduce environmental burdens [76]. As echoed by previous studies, reusable masks are the most sustainable from the lifecycle assessment perspective since they considerably reduce the environmental burdens [77]. Addressing mask maintenance issues would be unachievable without federal government and states support in allocating special funds and subsidies for R&D activities in the long run [78]. Previous studies call for the production of environment-friendly masks to fight COVID-19 and pollution [79].

Our research differs from previous studies by integrating physical discomforts, external factors, and masking usability issues to develop a comprehensive model for predicting behavioral intention to continue wearing masks. This study can contribute to the literature by proposing a model to better conceptualize and measure mask-wearing concerns and barriers. The proposed research framework, which presents a relatively strong explanatory power (73%), can deepen the existing knowledge on how the combination of inhibitors influences public mask adoption. Our findings also have practical implications for health care officials by highlighting the key barriers that should be addressed to change public attitudes and increase their willingness to engage in mask-wearing. The success of personal preventive measures (such as wearing masks) can be directly dependent on public willingness to continue to practice the recommended precautionary instructions till the pandemic ceases. Public health education programs (such as webinars) and constant messaging through effective social media channels can play an important role since some individuals may not be aware of the potential gain of wearing masks. Thus, health care policymakers may find using target marketing methods and the right communication platforms practical to educate individuals about the potential personal and societal benefits of wearing masks in public. For instance, since there is a debate about mask mandates in schools in the US., face masks are included in their decision-making process. One creative way is that schools distribute stylish masks, which are interesting for kids, and make them part of their dress codes. Another way is to use popular social networking services (such as TikTok) to create mask-wearing norms for the younger generation. Finally, celebrities on social media can establish norms, minimize possible stigmatism attached to masks, and have implications for creating mask-wearing culture.

Robust policy development is needed to overcome the identified impediments by constantly updating public health guidelines and local, regional, and national mask-wearing policies. Health care authorities should consistently communicate the COVID-19 lethality and mortality derived from scientific research to all levels of society. Doing so can moderate misinformation against mask-wearing and its relationship with vaccination, increase people's knowledge about where to use masks, and help them obtain transparent information about coronavirus threats. A national masking standard may help mitigate concerns caused by previous conflicting messaging about mask policies. Public needs education on how to use masks properly, how long masks are usable, and how to dispose of used masks appropriately. Moreover, officials can use social persuasion techniques to explain how effective face masks are even after getting vaccinated. Thus, the credibility and validity of information on the coronavirus threat will influence pubic attitudes and promote continuous intention to wear face masks.

8. Limitations and future directions

In this section, the limitations and future directions are discussed. This study has several limitations. First, the findings of this study, which focused on a sample in the USA, may not be generalizable to other countries. One of the main reasons is the possible effects of cultural factors (such as individualism). Future studies can extend the proposed model to other countries (for instance, Europe). Second, we examined the opinions and attitudes of the general public, not health care professionals or health authorities. It

would be interesting for future research to investigate the perceptions of other stakeholders such as doctors or health care policymakers. Third, we used an online survey to recruit a self-rated sample of participants through the Mturk website. Although the MTurk pool has been recognized as an acceptable data collection means for academic research, caution should be exercised when generalizing this paper's results. For instance, the use of MTurk may cause potential biases such as coverage of low socio-economic and low levels of education. Non-responders may differ regarding their perspectives of mask-wearing compared to those who responded. Thus, future researchers can extend this study using other data collection methods to reach out to the general public. Fourth, the type of masks (*i.e.*, surgical masks or respirators) is not considered in the model. We examined the public opinions about the general concept of face masks, not a specific one. It can be of interest for future research to include the type of mask and examine its role in the mask-wearing adoption equation (*e.g.*, as a moderating variable). Fifth, the role of mask mandates is controlled in this study. So, the model examines attitude toward mask-wearing and continuous intention to use masks regardless of possible government and industry mandates requiring masks. Future research can include specific regional, state-based, or industry-related mandates to study how it can change the explanatory power of the research model. Sixth, due to the time of data collection, our findings may not be generalized to the onset, earlier stages, or during the height of the COVID-19 pandemic. We collected data when the coronavirus vaccine program was in progress in different states. Therefore, the time of data collection might have affected the public attitude toward mask-wearing. We recommend that future studies extend our research in the same context at different times (for instance, when the rate of COVID-19 vaccination is higher). Seventh, another constraint to this study is that in the pandemic's course, official messaging on mask-wearing has changed repeatedly. This creates an immensely difficult research topic, as the time frame for data collection in this study was July 2021. Finally, although the proposed research model explained 73% of the variance in continuous intention to wear masks, it should be noted that other factors such as incidence of disease, prevailing attitudes toward safety, loss of public trust, or subjective norms were not considered in the model. These variables could impact public attitudes and their intention to continue wearing masks. Future researchers can extend the model by adding more widely accepted factors mentioned by previous adoption studies to the framework.

9. Conclusions

The mask-wearing measure, along with other personal protective practices, could significantly contribute to controlling the COVID-19 pandemic. However, the refusal by some people to wear face masks may be considered a careless measure to protect the community from COVID-19 and also reflect the willful disregard of the regional or state-based mask instructions. The concerns and misinterpretation about face mask usage have been intensified following the inconsistent recommendations made by various health authorities at different stages of the pandemic. Previous studies on the COVID-19 impacts and mask-wearing did not clearly explain the factors shaping opposing attitudes toward wearing masks. This study is an attempt to identify and categorize mask-wearing concerns from the general public perspective. The scientific value-added of this paper is to propose a research model based on belief-attitude-intention to predict individuals' continuous intention to wear masks. The findings can be novel by indicating that discomfort issues (physical and communication discomfort), external factors (overstated news about coronavirus threat and absence of mask-wearing culture), and usability issues (unnecessariness of masks in certain cases and mask maintenance issues) are the key predictors of public attitudes toward masks, and in turn, their willingness to continue wearing masks. The results can be practically leveraged to provide insights into public opinions about mask-wearing and common concerns underlying the anti-mask opinions. By addressing concerns and barriers associated with mask-wearing, the general public can obtain adequate knowledge on deciding when the appropriate situation is for using masks and how to properly use them during the pandemic. The results can contribute to practice by proposing that health care officials and policymakers need to exert a significant amount of effort to address potential misinterpretations about public mask-wearing. This can be done by providing effective education campaigns to the general community on the importance of widespread mask-wearing and appropriate ways to obtain transparent information about mask-wearing guidelines. The findings are applicable by proposing that continuous and systematic communications to citizens can create social norms, nurture mask-wearing culture, establish effective behavioral changes, and minimize confusion about the effects of mask-wearing on preventing coronavirus spread during the pandemic.

Ethics approval and consent to participate

The study was assessed and approved by the Florida International University Office of Research Integrity.

Authorship statement

Pouyan Esmaeilzadeh designed the study, collected data, and drafted the manuscript.

Funding

None.

Declaration of Competing Interest

The author has no conflict of interest to declare.

References

[1] Ranjbari M, Esfandabadi ZS, Zanetti MC, Scagnelli SD, Siebers P-O, Aghbashlo M, et al. Three pillars of sustainability in the wake of COVID-19: a systematic review and future research agenda for sustainable development. J Clean Prod. 2021;126660.
[2] Adelodun B, Kareem KY, Kumar P, Kumar V, Choi KS, Yadav KK, et al. Understanding the impacts of the COVID-19 pandemic on sustainable Agri-food system and agroecosystem decarbonization nexus: a review. J Clean Prod. 2021;318:128451.
[3] Wang Q, Li S, Jiang F. Uncovering the impact of the COVID-19 pandemic on energy consumption: new insight from difference between pandemic-free scenario and actual electricity consumption in China. J Clean Prod. 2021;127897.
[4] Nundy S, Ghosh A, Mesloub A, Albaqawy GA, Alnaim MM. Impact of COVID-19 pandemic on socio-economic, energy-environment and transport sector globally and sustainable development goal (SDG). J Clean Prod. 2021;127705.
[5] Severo EA, De Guimarães JCF, Dellarmelin ML. Impact of the COVID-19 pandemic on environmental awareness, sustainable consumption and social responsibility: evidence from generations in Brazil and Portugal. J Clean Prod. 2021;286:124947.
[6] Tirkolaee EB, Goli A, Ghasemi P, Goodarzian F. Designing a sustainable closed-loop supply chain network of face masks during the COVID-19 pandemic: Pareto-based algorithms. J Clean Prod. 2021;130056.
[7] Vătămănescu E-M, Dabija D-C, Gazzola P, Cegarro-Navarro JG, Buzzi T. Before and after the outbreak of covid-19: linking fashion companies' corporate social responsibility approach to consumers' demand for sustainable products. J Clean Prod. 2021;321:128945.
[8] Eikenberry SE, Mancuso M, Iboi E, Phan T, Eikenberry K, Kuang Y, et al. To mask or not to mask: modeling the potential for face mask use by the general public to curtail the COVID-19 pandemic. Infect Dis Model. 2020;5:293–308.
[9] Cherry TL, James AG, Murphy J. The impact of public health messaging and personal experience on the acceptance of mask wearing during the COVID-19 pandemic. J Econ Behav Organ. 2021;187:415–30.
[10] Armstrong-Mensah E, Tetteh AK, Tetteh GR. COVID-19 pandemic: face mask mandates, hospitalization, and infection rates in the United States. Int J Transl Med Res Public Health. 2021;5:113–24.
[11] C. Centers for Disease Control and Prevention. COVID-19: Considerations for wearing masks; 2021.
[12] Jarry J. Why some people choose not to Wear a mask. McGill Office for Science and Society; 2020.
[13] Batova T. To wear or not to wear: a commentary on mistrust in public comments to CDC tweets about mask-wearing during COVID19, international. J Bus Commun. 2021. https://doi.org/10.1177/23294884211008584. 23294884211008584.
[14] He L, He C, Reynolds TL, Bai Q, Huang Y, Li C, et al. Why do people oppose mask wearing? A comprehensive analysis of US tweets during the COVID-19 pandemic; 2021.
[15] Wojcik S, Hughes A. Sizing up twitter users. Pew Research Center; 2019.
[16] Magno F, Cassia F. Effects of agritourism businesses' strategies to cope with the COVID-19 crisis: the key role of corporate social responsibility (CSR) behaviours. J Clean Prod. 2021;325:129292.
[17] Spitzer M. Masked education? The benefits and burdens of wearing face masks in schools during the current Corona pandemic. Trends Neurosci Educ. 2020. ;20:100138.

[18] Phelamei S. Wearing face masks is the “new Normal”: know these tips and tricks to avoid common side effects. The Times Now. 2020. https://www.timesnownews.com/health/article/wearing-face-masks-is-the-new-normal-know-these-tips-and-tricks-to-avoid-common-side-effects/604223. (accessed July 2021).
[19] Ong JJ, Bharatendu C, Goh Y, Tang JZ, Sooi KW, Tan YL, et al. Headaches associated with personal protective equipment–a cross-sectional study among frontline healthcare workers during COVID-19. Headache J Head Face Pain. 2020;60:864–77.
[20] Li Y, Tokura H, Guo Y, Wong A, Wong T, Chung J, et al. Effects of wearing N95 and surgical facemasks on heart rate, thermal stress and subjective sensations. Int Arch Occup Environ Health. 2005;78:501–9.
[21] Lazzarino AI, Steptoe A, Hamer M, Michie S. Covid-19: important potential side effects of wearing face masks that we should bear in mind. The BMJ. 2020;369.
[22] Marini M, Ansani A, Paglieri F, Caruana F, Viola M. The impact of facemasks on emotion recognition, trust attribution and re-identification. Sci Rep. 2021;11:1–14.
[23] Chughtai AA, Stelzer-Braid S, Rawlinson W, Pontivivo G, Wang Q, Pan Y, et al. Contamination by respiratory viruses on outer surface of medical masks used by hospital healthcare workers. BMC Infect Dis. 2019;19:1–8.
[24] Marples M. Pandemic denial: Why some people can't accept Covid-19realities, CNN health, avgust 2020 Pridobljeno s; 2020.
[25] Vogel L. Viral misinformation threatens public health. Can Med Assoc. 2017;189(50): E1567. https://doi.org/10.1503/cmaj.109-5536.
[26] Vargas E, Sanchez G. American individualism is an obstacle to wider mask wearing in the US. The Brookings Institution; 2020.
[27] Vuolo M, Kelly BC, Roscigno VJ. COVID-19 mask requirements as a workers’ rights issue: parallels to smoking bans. Am J Prev Med. 2020;59:764–7.
[28] Wang J, Pan L, Tang S, Ji JS, Shi X. Mask use during COVID-19: a risk adjusted strategy. Environ Pollut. 2020;266:115099.
[29] Taylor DB. For Black men, fear that masks will invite racial profiling. New York Times. 2020;14.
[30] Abd-Alrazaq A, Alhuwail D, Househ M, Hamdi M, Shah Z. Top concerns of tweeters during the COVID-19 pandemic: infoveillance study. J Med Internet Res. 2020;22:e19016.
[31] Tso RV, Cowling BJ. Importance of face masks for COVID-19: a call for effective public education. Clin Infect Dis. 2020;71:2195–8.
[32] Desai AN, Aronoff DM. Masks and coronavirus disease 2019 (COVID-19). JAMA. 2020; 323:2103.
[33] WHO. Advice on the use of masks in the context of COVID-19: Interim guidance. World Health Organization; 2020..
[34] Shen M, Zu J, Fairley CK, Pagán JA, An L, Du Z, et al. Projected COVID-19 epidemic in the United States in the context of the effectiveness of a potential vaccine and implications for social distancing and face mask use. Vaccine. 2021;39:2295–302.
[35] Techasatian L, Lebsing S, Uppala R, Thaowandee W, Chaiyarit J, Supakunpinyo C, et al. The effects of the face mask on the skin underneath: a prospective survey during the COVID-19 pandemic. J Prim Care Community Health. 2020;11 2150132720966167.
[36] Irfan M, Akhtar N, Ahmad M, Shahzad F, Elavarasan RM, Wu H, et al. Assessing public willingness to wear face masks during the COVID-19 pandemic: fresh insights from the theory of planned behavior. Int J Environ Res Public Health. 2021;18:4577.
[37] Ma Y, Lin X, Wu A, Huang Q, Li X, Yan J. Suggested guidelines for emergency treatment of medical waste during COVID-19: Chinese experience, Waste Disposal & Sustainable. Energy. 2020;2:81–4.
[38] Ajzen I. From intentions to actions: A theory of planned behavior, Action control. Springer; 1985; 11–39.
[39] Walter D, Böhmer MM, Reiter S, Krause G, Wichmann O. Risk perception and information-seeking behaviour during the 2009/10 influenza A (H1N1) pdm09 pandemic in Germany. Eurosurveillance. 2012;17:20131.
[40] Fishbein M, Ajzen I. Belief, attitude, intention, and behavior: an introduction to theory and research. Philos Rhetor. 1977;10.
[41] Karahanna E, Straub DW, Chervany NL. Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs. MIS Q. 1999: 183–213.
[42] Hair JF, Ringle CM, Sarstedt M. PLS-SEM: indeed a silver bullet. J Mark Theory Pract. 2011;19:139–52.
[43] Marge M, Banerjee S, Rudnicky AI. Using the Amazon mechanical turk for transcription of spoken language. 2010 IEEE International Conference on Acoustics, Speech and Signal Processing. IEEE; 2010. p. 5270–3.
[44] Behrend TS, Sharek DJ, Meade AW, Wiebe EN. The viability of crowdsourcing for survey research. Behav Res Methods. 2011;43:800.
[45] Huang JL, Curran PG, Keeney J, Poposki EM, DeShon RP. Detecting and deterring insufficient effort responding to surveys. J Bus Psychol. 2012;27:99–114.
[46] Mason W, Suri S. Conducting behavioral research on Amazon’s Mechanical Turk. Behav Res Methods. 2012;44:1–23.
[47] Thomas KA, Clifford S. Validity and Mechanical Turk: an assessment of exclusion methods and interactive experiments. Comput Hum Behav. 2017;77:184–97.
[48] Sharma R, Yetton P, Crawford J. Estimating the effect of common method variance: the method—method pair technique with an illustration from TAM Research. MIS Q. 2009: 473–90.
[49] Cenfetelli RT, Benbasat I, Al-Natour S. Addressing the what and how of online services: positioning supporting-services functionality and service quality for business-to-consumer success. Inf Syst Res. 2008;19:161–81.
[50] Gefen D, Straub D, Boudreau M-C. Structural equation modeling and regression: guidelines for research practice. Commun Assoc Inf Syst. 2000;4:7.
[51] Chin WW. The partial least squares approach to structural equation modeling. Mod Methods Bus Res. 1998;295:295–336.
[52] Hair JF, Black WC, Babin BJ, Anderson RE, Tatham RL. Multivariate data analysis 6th edition, Pearson Prentice Hall New Jersey humans: Critique and reformulation. J Abnorm Psychol. 2006;87:49–74.
[53] Segars AH. Assessing the unidimensionality of measurement: a paradigm and illustration within the context of information systems research. Omega. 1997;25:107–21.
[54] Fornell C, Tellis GJ, Zinkhan GM. Validity assessment: A structural equations approach using partial least squares. Proceedings of the American Marketing Association Educators’ Conference Chicago, IL, USA; 1982. p. 1–5.
[55] Ho R. Handbook of univariate and multivariate data analysis and interpretation with SPSS. Boca Raton, FL, USA: CRC Press Taylor & Francis Group; 2006.
[56] Hu Lt, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equ Modeling. 1999;6:1–55.
[57] Byrne BM. Structural equation modeling: perspectives on the present and the future. Int J Test. 2001;1:327–34.
[58] Kline RB. Principles and practice of structural equation modeling. Guilford publications; 2015.
[59] Scheid JL, Lupien SP, Ford GS, West SL. Commentary: physiological and psychological impact of face mask usage during the COVID-19 pandemic. Int J Environ Res Public Health. 2020;17:6655.
[60] Scarano A, Inchingolo F, Lorusso F. Facial skin temperature and discomfort when wearing protective face masks: thermal infrared imaging evaluation and hands moving the mask. Int J Environ Res Public Health. 2020;17:4624.
[61] Enders AM, Uscinski JE, Klofstad C, Stoler J. The different forms of COVID-19 misinformation and their consequences. Harv Kennedy Sch Misinformat Rev. 2020;1(8) https://doi.org/10.37016/mr-2020-48.
[62] Kahane LH. Politicizing the mask: political, economic and demographic factors affecting mask wearing behavior in the USA. Eastern Econ J. 2021;47:163–83.
[63] Ball P, Maxmen A. The epic battle against coronavirus misinformation and conspiracy theories. Nature. 2020;581:371–5.
[64] Evanega S, Lynas M, Adams J, Smolenyak K, Insights CG. Coronavirus misinformation: quantifying sources and themes in the COVID-19 ‘infodemic’. JMIR Prepr. 2020;19: 2020.
[65] Perkins KM, Munguia N, Ellenbecker M, Moure-Eraso R, Velazquez L. COVID-19 pandemic lessons to facilitate future engagement in the global climate crisis. J Clean Prod. 2021;290:125178.
[66] Sheth J. Impact of Covid-19 on consumer behavior: will the old habits return or die? J Bus Res. 2020;117:280–3.
[67] Leung CC, Lam TH, Cheng KK. Mass masking in the COVID-19 epidemic: people need guidance. Lancet. 2020;395:945.
[68] Rab S, Javaid M, Haleem A, Vaishya R. Face masks are new normal after COVID-19 pandemic. Diabetes Metab Syndr Clin Res Rev. 2020;14:1617–9.
[69] Vaka M, Walvekar R, Rasheed AK, Khalid M. A review on Malaysia’s solar energy pathway towards carbon-neutral Malaysia beyond Covid’19 pandemic. J Clean Prod. 2020; 122834.
[70] Iboi EA, Ngonghala CN, Gumel AB. Will an imperfect vaccine curtail the COVID-19 pandemic in the US? Infect Dis Model. 2020;5:510–24.
[71] Su Z, Wen J, McDonnell D, Goh E, Li X, Šegalo S, et al. Vaccines are not yet a silver bullet: the imperative of continued communication about the importance of COVID-19 safety measures. Brain, Behav Immun Health. 2021;12:100204.
[72] Tabatabaei M, Hosseinzadeh-Bandbafha H, Yang Y, Aghbashlo M, Lam SS, Montgomery H, et al. Exergy intensity and environmental consequences of the medical face masks curtailing the COVID-19 pandemic: malign bodyguard? J Clean Prod. 2021;127880.
[73] Allison AL, Ambrose-Dempster E, Aparsi DT, Bawn M, Arredondo M Casas, Chau C, et al. The environmental dangers of employing single-use face masks as part of a COVID-19 exit strategy; 2020.
[74] Rume T, Islam SD-U. Environmental effects of COVID-19 pandemic and potential strategies of sustainability. Heliyon. 2020;6(9):e04965. https://doi.org/10.1016/j.heliyon.2020.e04965.
[75] Klemeš JJ, Van Fan Y, Jiang P. The energy and environmental footprints of COVID-19 fighting measures–PPE, disinfection, supply chains. Energy. 2020;211:118701.
[76] Rodríguez NB, Formentini G, Favi C, Marconi M. Environmental implication of personal protection equipment in the pandemic era: LCA comparison of face masks typologies. Procedia Cirp. 2021;98:306–11.
[77] Boix Rodríguez N, Formentini G, Favi C, Marconi M. Engineering design process of face masks based on circularity and Life Cycle Assessment in the constraint of the COVID-19 pandemic. Sustainability. 2021;13:4948.
[78] Ji D, Fan L, Li X, Ramakrishna S. Addressing the worldwide shortages of face masks. BMC Mater. 2020;2:1–11.
[79] Das O, Neisiany RE, Capezza AJ, Hedenqvist MS, Försth M, Xu Q, et al. The need for fully bio-based facemasks to counter coronavirus outbreaks: a perspective. Sci Total Environ. 2020;736:139611.