Arab Journal of Administrative Sciences

2023, Vol. 30, No. 3, 617-658
Doi: 10.34120/ajas.v30i3.261

Abrar R. Al-Hasan
Kuwait University
Kuwait

Social Media and Vaccine Intention: The Case of Kuwait

Abstract

Purpose: The COVID-19 pandemic has underscored our heavy reliance on social media platforms for primary information. Misinformation related to the pandemic has significantly affected behaviors related to vaccine hesitancy and overall business confidence. This study uses the extended Information Motivation Behavior (IMB) model to examine the impact of pandemic-era social media usage on vaccine hesitancy and trust in e-commerce.

Study design/methodology/approach: Structural equation modeling is used to assess the extended IMB model.

Sample and data: Online survey data from a diverse cross-section of the Kuwaiti population during the pandemic's peak.

Results: Findings highlight the substantial influence of factors such as knowledge, motivation, observational learning-driven motivation, behavioral skills, social media usage, engagement, and consumption on vaccine willingness. This, in turn, significantly impacts trust in e-commerce. Notably, social media use, consumption, and engagement have adverse effects on health behavior, with observational learning-driven motivation being the most influentia.

Originality/value: This study is one of the few empirical studies that examine and test the impact of e-commerce on the Kuwaiti population during and after the COVID-19 pandemic. The results of this study display the shift in consumer behavior during the pandemic.

Research limitations/implications: The study emphasizes the importance of accurate vaccine information dissemination on social media to counter misinformation, ultimately fostering an informed society and contributing to e-commerce growth.

Keywords: E-Commerce, Trust, Vaccine Willingness, Social Media, IMB, Misinformation, COVID-19.

JEL classification: M380

Submitted: 2/3/2024, revised 1: 29/5/2024, revised 2: 21/6/2024, accepted: 23/7/2024.

Published by the Academic Publication Council of Kuwait University. All rights reserved.

To cite: Al-Hasan, A. R. (2023). Social media and vaccine intention: The case of Kuwait. *Arab Journal of Administrative Sciences*, *30*(3), 617-658. https://doi.org/10.34120/ajas.v30i3.261

الملخص
وسائل التواصل الاجتماعي ونية اللقاح: دراسة حالة الكويت

أبرار رضا الحسن

جامعة الكويت، الكويت

هدف الدراسة: سلطت جائحة كوفيد-19 الضوء على اعتمادنا الكبير على منصات التواصل الاجتماعي للحصول على المعلومات الأولية. لقد أثرت المعلومات الخاطئة المتعلقة بالوباء بشكل كبير على السلوكيات المرتبطة بالتردد في اللقاحات والثقة العامة في الأعمال. تستخدم هذه الدراسة نموذج سلوك تحفيز المعلومات (IMB) الموسع لدراسة تأثير استخدام وسائل التواصل الاجتماعي في عصر الوباء على التردد في اللقاح والثقة في التجارة الإلكترونية.

تصميم/ منهجية/ طريقة الدراسة: استخدمت نمذجة المعادلة الهيكلية لتقييم نموذج IMB الموسع.

عينة الدراسة وبياناتها: جُمعت بيانات المسح عبر الإنترنت من شريحة متنوعة من سكان الكويت خلال ذروة الوباء.

نتائج الدراسة: تسلط النتائج الضوء على التأثير الكبير لعوامل؛ مثل المعرفة، والتحفيز، والتحفيز القائم على التعلم بالملاحظة، والمهارات السلوكية، واستخدام وسائل التواصل الاجتماعي، والمشاركة، والاستهلاك -على الاستعداد للقاح. وهذا بدوره يؤثر بشكل كبير على الثقة في التجارة الإلكترونية. ومن الجدير بالذكر أن استخدام وسائل التواصل الاجتماعي واستهلاكها ومشاركتها لها آثار سلبية على السلوك الصحي؛ إذ يكون الدافع القائم على التعلم بالملاحظة هو الأكثر تأثيراً.

أصالة الدراسة: هذه الدراسة هي واحدة من الدراسات التجريبية القليلة التي تدرس وتختبر تأثير التجارة الإلكترونية على سكان الكويت في أثناء جائحة كوفيد-19 وبعدها. تظهر نتائج الدراسة التحول في سلوك المستهلك في أثناء الوباء.

حدود الدراسة وتطبيقاتها: تؤكد الدراسة أهمية نشر معلومات دقيقة عن اللقاح على وسائل التواصل الاجتماعي لمواجهة المعلومات الخاطئة؛ مما يؤدي في نهاية المطاف إلى تعزيز مجتمع مستنير والمساهمة في نمو التجارة الإلكترونية.

الكلمات المفتاحية: التجارة الإلكترونية، الثقة، الاستعداد للقاحات، وسائل التواصل الاجتماعي، IMB، المعلومات المضللة، كوفيد-19.

تصدر عن مجلس النشر العلمي بجامعة الكويت. جميع الحقوق محفوظة للمجلة.

الإشارة المرجعية: الحسن، أبرار رضا. (2023). وسائل التواصل الاجتماعي ونية اللقاح: دراسة حالة الكويت. *المجلة العربية للعلوم الإدارية*، *30*(3)، 617-658.

https://doi.org/10.34120/ajas.v30i3.261

Introduction

The COVID-19 pandemic has posed unprecedented challenges for health-care systems worldwide, particularly in developing and distributing an effective vaccine to curb the virus's spread. Despite the availability of vaccines, vaccine hesitancy has emerged as a major barrier to achieving widespread immunization (Georgiou, 2019; WHO, 2019). Factors such as mistrust, lack of confidence, complacency, and limited access contribute significantly to this hesitancy (Jennings et al., 2021a; Novak, 2018). Ethical debates surrounding vaccine legality in various regions further complicate the issue (Al-Hasan et al., 2021; Novak, 2018).

Compounding this challenge is the role of social media as a vector for misinformation. Platforms are rife with inaccurate or misleading information about COVID-19, vaccines, and public health measures (Puri et al., 2020; Wilson & Wiysonge, 2020). Reports indicate that vaccine refusal rates are alarmingly high, influenced heavily by misinformation spread online (Biden, 2021; Madani, 2020; Wilson & Wiysonge, 2020). While vaccine hesitancy has been studied in the context of various viruses, the COVID-19 pandemic has brought renewed focus to this issue, particularly due to the proliferation of anti-vaccination misinformation on social media (Puri et al., 2020; Wilson & Wiysonge, 2020).

Vaccine hesitancy is influenced by various informational, psychological, sociodemographic, and cultural factors (Browne et al., 2015; Hornsey et al., 2018; Murphy et al., 2021; Pomares et al., 2020). Socio-economic determinants play a significant role in vaccine hesitancy, as evidenced by both single-country studies (Allington et al., 2021; Chadwick et al., 2021; Khan et al., 2020) and large-scale international surveys (Larson et al., 2016; Marti et al., 2017; Wilson & Wiysonge, 2020). Additionally, the psychological impact of information and misinformation on vaccination intentions has been extensively explored (Allington et al., 2021; Chadwick et al., 2021; Faasse & Newby, 2020; Jennings et al., 2021b; Khan et al., 2020; Loomba et al., 2021; Mannan & Farhana, 2020; Puri et al., 2020; Sallam et al., 2021).

The COVID-19 pandemic has generated a vast amount of information, with both traditional and social media channels continuously disseminating updates (Krause et al., 2020). Prior research underscores the significant role these information channels play in shaping public attitudes toward vaccination (Arif et al., 2018; Basch & MacLean, 2019; Ekram et al., 2019; Moran et al., 2016; Puri et

al., 2020). However, there remains a critical need to comprehensively understand the relationship between social media use, COVID-19 vaccine hesitancy, and the influence of misinformation on vaccine knowledge and attitudes.

This study aims to fill the gap in understanding how social media influences COVID-19 vaccine hesitancy and the impact of misinformation on public perceptions, with a focus on the understudied population of Kuwait. Kuwait offers unique insights due to its diverse demographic composition, socio-cultural norms, economic factors, and political climate. The country's significant expatriate population, varying cultural attitudes towards healthcare, and high level of government-provided health services present distinct challenges and opportunities for understanding vaccine acceptance. Additionally, the role of traditional and social media in spreading information and misinformation, along with the Arabic linguistic context, further distinguishes Kuwait from other regions. By studying vaccine hesitancy in Kuwait, this research seeks to provide valuable insights into the socio-economic and informational determinants of vaccine acceptance, enabling tailored public health strategies and policy recommendations to improve vaccination rates and combat misinformation in similar contexts. The study posits the following research question: How does sharing misinformation about COVID-19 on social media affect vaccine hesitancy and public perceptions in Kuwait? And is there a differential impact when using different social media platforms (e.g., Facebook, Twitter, and Instagram)? The study will use survey data collected from a representative sample of the Kuwaiti population to explore how the use of different social media platforms (e.g., Facebook, Twitter, Instagram) influences individuals' willingness to take the COVID-19 vaccine, how exposure to information on these platforms affects knowledge about the vaccine, and ultimately, vaccine intent.

The Health Belief Model (HBM) theory suggests that individuals' health behaviors are shaped by their perceptions of the severity and susceptibility of a health issue and the benefits and barriers to taking preventive action (Becker, 1974). Building on these principles, the Information-Motivation-Behavioral Skills (IMB) model focuses on the key constructs necessary for effective health behavior change: information, motivation, and behavioral skills (Fisher et al., 2003). The perceived susceptibility and severity from the HBM align with the IMB model's information component, while perceived benefits and barriers correspond to the motivation component. Self-efficacy, a crucial part of the HBM,

is integral to the behavioral skills component of the IMB model. This alignment highlights the importance of informed and motivated individuals with the skills to manage their health effectively, particularly chronic disease self-management (Bitar & Alismail, 2021; Zhou et al., 2020). The extended IMB model tailored to pandemics adds that health behavior impacts can include economic, social, or psychological outcomes (Fisher & Fisher, 2023).

From a theoretical standpoint, this study offers significant contributions by connecting the Information-Motivation-Behavioral Skills (IMB) model with the Health Belief Model (HBM) to extend its application to the context of a global pandemic. By examining the intersection of health-related beliefs, specifically vaccine hesitancy and social media, this research broadens the scope of these models to include economic and social dimensions influenced by pandemics. The study highlights the role of misinformation in shaping health behaviors and public perceptions, providing a comprehensive framework to understand how health crises can impact economic behavior and trust in digital platforms. By exploring these novel relationships, the study enhances our theoretical understanding of health behavior models and their applicability to modern challenges, such as the influence of social media on public health.

Focusing on the Kuwaiti population, this study provides valuable insights into the cultural and societal factors that shape vaccine attitudes in this region. Using rigorous statistical analysis and drawing on the integration of the IMB and HBM models, the research develops a comprehensive conceptual model that explains the mechanisms underlying the relationships between social media use, misinformation, and vaccine hesitancy.

Literature Review

Health Belief and Information-Motivation-Behavioral-Skills

The Health Belief Model (HBM) is an influential theory in understanding and promoting health behavior change (Becker, 1974). The HBM posits that individuals' health behaviors are influenced by their perceptions of the severity and susceptibility of a health issue and the perceived benefits and barriers to taking preventive action. The model emphasizes the role of individual beliefs in decision-making processes regarding health behavior. Key constructs of the HBM include (1) perceived susceptibility, which is an individual's belief about the risk of experiencing a health problem, (2) perceived severity, which refers to an indi-

vidual's belief about the seriousness of the consequences of the health problem, (3) perceived benefits, beliefs about the effectiveness of taking specific actions to reduce risk or severity, and (4) perceived barriers, which are beliefs about the obstacles to performing recommended actions, and self-efficacy, the confidence in one's ability to take action.

The IMB model, proposed by Fisher et al. (2003), builds on the principles of the HBM by focusing on three primary constructs necessary for effective health behavior change: information, motivation, and behavioral skills. The information component involves accurate knowledge about the health issue and the behaviors required to address it. The motivation component includes personal and social motivations to engage in the behavior. Finally, the behavioral skills component comprises the skills and self-efficacy necessary to perform the behavior. The constructs of the HBM align closely with those of the IMB model, indicating a complementary relationship. Perceived susceptibility and severity in the HBM correspond to the IMB model's information component, helping individuals understand the importance of health actions. Perceived benefits and barriers align with the IMB's motivation component, encouraging preventive behaviors. Additionally, self-efficacy in the HBM is crucial for the IMB's behavioral skills component, ensuring individuals have the confidence to act on their health behaviors.

The alignment of these models highlights the importance of informed and motivated individuals equipped with the necessary skills for effective health management. This connection is particularly relevant in chronic disease self-management, where understanding the disease, motivation to manage it, and the skills to do so are critical for positive health outcomes (Bitar & Alismail, 2021; Zhou et al., 2020). The extended IMB model tailored to pandemics further expands on these principles by incorporating the broader impacts of health behavior, including economic, social, and psychological outcomes (Fisher & Fisher, 2023). This extension underscores the multifaceted nature of health behavior change, especially in the face of widespread health crises.

Previous studies have relied on various frameworks to understand health-related behaviors, including the Health Belief Model, the Theory of Reasoned Action, the Theory of Planned Behavior, and the Information-Motivation-Behavioral Skills (IMB) model. These theories outline factors that influence behavior and have the potential to be modified (Li et al., 2023; Newman et al., 2008). Among these, the IMB model has garnered significant attention for several compelling reasons.

Firstly, the IMB model offers a straightforward yet comprehensive framework that simplifies the complexity of health behaviors by focusing on three core constructs: information, motivation, and behavioral skills. This triadic structure is particularly effective in identifying the essential components required for successful self-management and adherence among patients (Fisher & Fisher, 2023; Li et al., 2023).

Secondly, the IMB model is uniquely suited to address the multifaceted nature of vaccine hesitancy and its impact on trust in social media content. The model's emphasis on information aligns well with the current context, where misinformation and disinformation about COVID-19 and vaccines have proliferated, significantly affecting public behavior. By examining the quality and influence of information, the IMB model can elucidate how accurate and persuasive information can mitigate vaccine hesitancy.

Furthermore, the motivation component of the IMB model encompasses both personal and social factors, which are critical in understanding the reluctance to vaccinate. Personal motivation, involving beliefs and attitudes towards vaccines, and social motivation, including perceived social norms and support, are pivotal in shaping health behaviors. The model allows for a nuanced analysis of how these motivational factors interplay with trust in digital platforms.

Behavioral skills, the third component, emphasize the practical abilities and self-efficacy needed to perform health-related behaviors. In the context of e-commerce, this translates to understanding how individuals' confidence in navigating online platforms and making informed decisions is affected by their health-related beliefs and behaviors.

Lastly, the IMB model's adaptability, as demonstrated by its extended version tailored for pandemics (Fisher & Fisher, 2023), makes it particularly relevant for examining the economic, social, and psychological outcomes of health behaviors during COVID-19. This adaptability is crucial for exploring the interplay between vaccine hesitancy, influenced by trust in social media content, and the dynamics of e-commerce.

In conclusion, the IMB model's comprehensive and adaptable framework, its focus on essential constructs, and its applicability to current issues of misinformation and digital trust make it the optimal theoretical lens for exploring the relationship between vaccine hesitancy and e-commerce trust. By leveraging the IMB model, this study aims to provide valuable insights into the evolving dynamics of online commerce and consumer behavior in the post-pandemic world.

Information Motivation Behavioral Skill (IMB) model by Fisher et al. (2003) identifies constructs (including information, motivation, and behavioral skills) that are needed for successful self-management or adherence among patients with chronic diseases (Deakin et al., 2005; Sabaté, 2003). Information is defined as "initial prerequisite for enacting a health behavior" (Misovich et al., 2003). Motivation is composed of two factors: personal motivation, which includes beliefs about the intervention outcome and attitudes toward a particular health behavior, and social motivation, which includes the perceived social support or social norms attained from observational learning in engaging in a particular behavior. Behavioral skills are the skills necessary for performing a particular health behavior. To promote behavioral change, the IMB model's emphasis on behavioral skills involves improving an individual's practical abilities and enhancing their perceived self-efficacy (Fisher et al., 2003).

More recently, Fisher and Fisher (2023) advanced the IMB theory to address the COVID-19 pandemic, terming the model as the IMB model of pandemic prevention. This updated model focuses on specific constructs that are assumed to determine pandemic risk and preventive behavior. It posits that an individual's engagement in pandemic prevention behaviors is contingent upon their access to actionable information related to pandemic prevention, their motivation to partake in such preventive actions, and their proficiency in effectively executing these preventive measures (Fisher & Fisher, 2023). The extended Information Motivation Behavior (IMB) model offers a comprehensive framework that not only delves into the influential role of various factors on information and health behavior outcomes but also considers the moderating potential of these factors. Amidst the COVID-19 pandemic, economic outcomes emerged as one of the most profound impacts, creating a dichotomy where numerous businesses faced closures (Jeanne, 2020), while others experienced unprecedented growth. The pandemic's seismic impact also reverberated throughout the e-commerce landscape on a global scale, triggering significant shifts in the dynamics of both business operations and consumer behavior (Bhatti et al., 2020).

The COVID-19 pandemic has resulted in an unprecedented global health crisis, with the development of a COVID-19 vaccine being seen as a significant breakthrough in the battle against the virus. However, despite the vaccine's efficacy, concerns remain regarding vaccine hesitancy and skepticism, which pose significant challenges to vaccine uptake and the realization of herd immunity. One

factor identified as contributing to vaccine hesitancy is social media use, which has been critical in shaping individuals' knowledge, attitudes, and beliefs about vaccination. This literature review aims to provide a comprehensive understanding of the relationship between different types of social media platform use and COVID-19 vaccine hesitancy as well as the role of misinformation in shaping knowledge about vaccination.

Hypotheses

The IMB model posits that information is a fundamental prerequisite for health behaviors. Accurate and comprehensive vaccine-related information helps individuals understand the benefits, risks, and procedures associated with vaccination (Misovich et al., 2003). Studies have shown that higher levels of knowledge about vaccines correlate with more positive attitudes toward vaccination (Dunn et al., 2015). During the COVID-19 pandemic, misinformation has been a significant barrier to vaccination (Puri et al., 2020). Efforts to disseminate accurate vaccine information have been shown to improve public willingness to vaccinate (Freeman et al., 2022). By increasing vaccine knowledge, individuals are better equipped to navigate vaccination processes and are more likely to follow through with vaccination recommendations. This study thus hypothesizes:

H1: *Increased vaccine-related information increases individuals' willingness to vaccinate.*

The IMB model posits that personal motivation is a critical element that includes personal attitudes, beliefs about outcomes, and social influences such as perceived social norms and support (Fisher et al., 2003). Motivation directly impacts the development and application of behavioral skills necessary for performing health behaviors. Research indicates that higher levels of personal motivation, including positive attitudes towards vaccination and strong beliefs in its benefits, are associated with better health outcomes and adherence to health recommendations (Witte & Allen, 2000). Increased motivation enhances an individual's confidence and ability to acquire and apply the necessary skills to perform a health behavior. For example, motivated individuals are more likely to seek out information, practice vaccination procedures, and overcome barriers (Bandura, 1997). Motivation also boosts self-efficacy, which is the belief in one's ability to execute the behavior successfully (Bandura, 1997). The willingness to vaccinate is directly influenced by motivation. When individuals are highly motivated, they are

more likely to develop the skills needed to navigate the vaccination process, such as understanding where and how to get vaccinated, and they feel more confident in doing so. Increased motivation leads to improved behavioral skills, increasing the likelihood of vaccination (Glanz et al., 2008). During the COVID-19 pandemic, motivational factors have been crucial in vaccination campaigns. Efforts to enhance motivation through public health messaging, addressing vaccine hesitancy, and fostering a positive social norm around vaccination have been key strategies. These efforts have been shown to increase both the ability and willingness to get vaccinated (Schmidt et al., 2021).

H2: *Increased vaccine-related motivation increases individuals' willingness to vaccinate.*

The IMB model posits that social motivation through observational learning is a critical element that can significantly enhance behavior. Albert Bandura's Social Cognitive Theory posits that people learn behaviors by observing others, primarily when those behaviors are modeled by influential or similar individuals (Bandura, 1986). When people see others getting vaccinated and see positive outcomes, they are more likely to be motivated to vaccinate themselves. A study by Betsch et al. (2020) found that observational learning significantly influences vaccination intentions. When individuals saw others in their social circle getting vaccinated, their motivation to vaccinate increased. A systematic review by Brewer et al. (2017) indicated that seeing peers or public figures getting vaccinated can enhance vaccine uptake through increased motivation and perceived social norms. Nyhan et al. (2014) showed that exposure to information about others getting vaccinated, especially from trusted sources, significantly increased vaccination intentions. Observational learning not only boosts motivation but also enhances behavioral skills related to vaccination. When individuals see others navigating the vaccination process, they gain practical knowledge and confidence (self-efficacy) in their ability to do the same. Thus, this study hypothesizes:

H3: *Increased vaccine-related social motivation through observational learning increases individuals' willingness to vaccinate.*

The IMB model suggests that individuals' health behaviors are influenced by the behavioral skills necessary to perform the behavior (Fisher & Fisher, 2023). Behavioral skills include the information and motivation required to execute the behavior effectively. Vaccine ability refers to the practical skills and self-efficacy needed to get vaccinated, such as knowing where and how to get the vaccine,

understanding the procedure, and having confidence in one's ability to complete the process. Studies have shown that self-efficacy, or the belief in one's ability to perform a specific action, is a crucial determinant of health behaviors. Bandura (1986) social cognitive theory emphasizes that higher self-efficacy leads to greater effort and persistence in performing health-related tasks. Several studies have demonstrated that individuals with higher confidence in navigating the healthcare system and understanding vaccination procedures are more likely to get vaccinated. For instance, a study by Opel et al. (2011) found that parents' confidence in their ability to make informed vaccination decisions was associated with higher vaccination rates among their children. Brewer et al. (2017) demonstrated that providing clear, actionable information about how and where to get vaccinated increased vaccine uptake. Enhancing individuals' behavioral skills and self-efficacy related to vaccination is expected to increase their willingness to vaccinate, leading to higher vaccination rates.

H4: *Increased vaccine-ability through behavioral skills increases individuals' willingness to vaccinate.*

Social Media and Vaccine Hesitancy

Social media has emerged as a dominant force shaping individuals' attitudes and beliefs towards vaccination, with a growing body of literature indicating that social media use is associated with vaccine hesitancy. Research has shown that social media platforms such as Facebook, Twitter, and Instagram are widely used to share and disseminate information about vaccines, with users being exposed to various vaccine-related messages and opinions. While social media can be a powerful tool for vaccine education, but it can also spread misinformation and create confusion, ultimately leading to vaccine hesitancy.

Studies have found that individuals who frequently use social media are more likely to express vaccine hesitancy and skepticism than those who do not use social media. For instance, Larson et al. (2014) found that social media users were more likely to have negative attitudes toward vaccination and were less likely to trust vaccines than non-users. Similarly, Kata (2012) found that individuals who used social media to gather information about vaccines were more likely to express concerns about vaccine safety than those who relied on other sources of information.

While the connection between vaccine hesitancy and social media utilization is well-established, it is important to recognize that social media can also have

positive effects on vaccination attitudes. Social media platforms can serve as powerful tools for disseminating accurate vaccine information, promoting public health campaigns, and countering misinformation. For example, studies have shown that exposure to pro-vaccine content on social media can increase vaccine acceptance and trust in vaccines (Wilson & Wiysonge, 2020).

While the connection between vaccine hesitancy and social media utilization is well-established, the precise link between distinct social media platforms and vaccine hesitancy remains unclear. Each social media platform boasts distinctive attributes and user demographics that could potentially shape individuals' perspectives and convictions concerning vaccinations. For instance, Facebook is known for its algorithm-driven content selection that can create filter bubbles and echo chambers that reinforce existing attitudes and beliefs (Pariser, 2011). Twitter, on the other hand, is characterized by its rapid-fire nature, which can create a sense of urgency and panic around vaccine-related issues (Nuzhath et al., 2020; Scherrer & Sullivan, 2021). Additionally, platforms like Instagram and YouTube can be leveraged to spread engaging and informative content that encourages vaccination. Thus, while social media use has been linked to vaccine hesitancy, it is crucial to consider the dual role of these platforms in both promoting and challenging vaccination efforts.

Research has shown that the relationship between social media platform use and vaccine hesitancy is complex and depends on various factors, including the type of social media platform used, the content of vaccine-related messages, and users' demographic characteristics. For instance, a study by Betsch et al. (2020) found that exposure to vaccine-related messages on Twitter was associated with increased vaccine hesitancy among individuals with low levels of education, while exposure to vaccine-related messages on Facebook was not associated with vaccine hesitancy. Similarly, a study by Tomeny et al. (2017) found that exposure to vaccine-related messages on Twitter was associated with decreased vaccine acceptance among African-American and Hispanic users.

Furthermore, the proliferation of vaccine-related misinformation has emerged as an escalating concern. Social media platforms have been pinpointed as a chief conduit for the dissemination of inaccurate vaccine information. Misinformation has the potential to fuel vaccine hesitancy by instilling apprehension and uncertainty in individuals, subsequently prompting them to scrutinize the safety and effectiveness of vaccines. For instance, Bode and Vraga (2021) found that in-

dividuals who were exposed to false information about COVID-19 vaccines on social media were more likely to express vaccine hesitancy than those who were not exposed to such information. Similarly, Roozenbeek et al. (2020) found that exposure to misinformation about vaccines on social media was associated with decreased willingness to take a COVID-19 vaccine.

Moreover, research has shown that individuals who are more likely to believe and share vaccine-related misinformation on social media are often influenced by conspiracy theories, ideological beliefs, and mistrust of the authorities. For instance, Hornsey et al. (2018) found that individuals who expressed vaccine hesitancy on social media were more likely to endorse conspiracy theories about vaccines and have negative attitudes towards the medical establishment.

In sum, a comprehensive analysis of how social media usage influences the willingness to vaccinate is imperative for advancing the existing body of literature. A key aspect of this examination is to understand how social media, both directly and indirectly by facilitating the transfer of information and knowledge, shapes people's attitudes toward vaccination. This examination serves as a vital step in augmenting the knowledge base in this field.

Numerous studies have documented the widespread presence of misinformation about COVID-19 and vaccines on social media platforms. This misinformation ranges from conspiracy theories about the origin of the virus to false claims about the safety and efficacy of vaccines. This prevalence of misinformation on social media during COVID-19 leads to the following:

H5(a): *Social media use with COVID-19-related content is negatively associated with willingness to vaccinate.*

H5(b): *Social media consumption of COVID-19-related content is negatively associated with willingness to vaccinate.*

H5(c): *Social media engagement with COVID-19-related content is negatively associated with willingness to vaccinate.*

The overall conceptual model of this study is shown in Figure 1. This study makes substantial contributions to the IMB model by adapting it to the context of a global pandemic and extending the model to include the influence of social media. It investigates the interplay between health-related beliefs, such as vaccine hesitancy, and social media, thereby expanding the IMB model to encompass economic

and social aspects affected by pandemics. The research underscores the impact of misinformation on health behaviors, offering a comprehensive framework to understand the effects of health crises on economic behavior and digital platform trust. By examining these novel connections, the study advances our theoretical comprehension of the IMB model and demonstrates its relevance to contemporary challenges, including the role of social media in shaping public health and commerce.

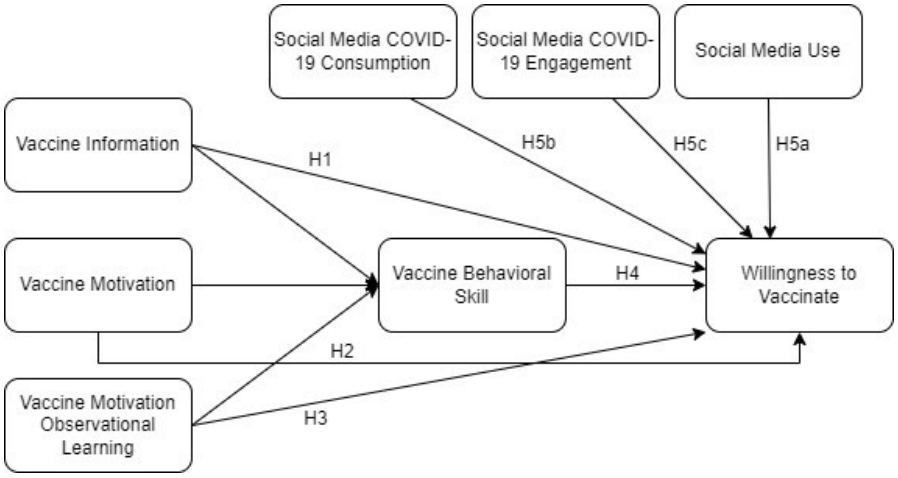

Figure 1: Extended IMB Model

Methodology

Study Design

This study used a cross-sectional survey design to investigate the relationship between social media exposure to COVID-19 vaccine-related information, vaccine hesitancy, and e-commerce trust among adults in Kuwait. The survey was conducted online via Qualtrics, and the participants were recruited through social media platforms and online forums.

Sample

The study sample included 465 adults aged 18 years and above living in Kuwait. Participants were selected using convenience sampling and were required

to have access to the internet and social media platforms. Informed consent was obtained from all participants prior to data collection, and they were assured of the confidentiality and anonymity of their responses. Participants were also informed that their participation was voluntary and that they could withdraw from the study at any time without penalty. To reduce bias, each item was set as mandatory to ensure data integrity. Each IP address was limited to one submission to avoid repeated participation, and real-time monitoring of response time to remove participants with a response time of less than 1 minute.

Data Collection

Data were collected between April and June 2020, during the peak of COVID-19 using a self-administered questionnaire that was designed based on adopted scales from the extended Information-Motivation-Behavioral Skills model (Fisher & Fisher, 2023; Luo et al., 2020), and the WHO to assess COVID-19 knowledge and ability (Al-Hasan et al., 2021; Islam et al., 2021; Mannan & Farhana, 2020; Venkataraman et al., 2023). The questionnaire was divided into several sections, including demographics (age, gender, education level, marital status, health status, and health specialist), social media use, exposure and engagement to COVID-19 vaccine-related information on social media, COVID-19 vaccine knowledge, motivation to be vaccinated, motivation to be vaccinated through observational learning, vaccine behavioral ability, outcome expectations, willingness to vaccinate, and trust in e-commerce. The measures were adapted from established scales, with minor adjustments in terminology to align with the context of the current study. The questionnaire was pretested with a sample of 20 participants to ensure clarity and comprehension. Survey question details are provided in Table 1.

Table 1
Survey Questions

Variable Category	Variable	Question	Reference
Health Behavior	Willingness to vaccinate	How likely are you to get vaccinated against COVID-19? Choices: a) Very likely, b) Somewhat likely, c) Neutral, d) Somewhat unlikely, e) Very unlikely.	(Hassani et al., 2014)

Cont. Table 1
Survey Questions

Variable Category	Variable	Question	Reference
Information	Vaccine Knowledge	Assessment of respondents' COVID-19 vaccine knowledge. Questions: Q1 - A single dose of the COVID-19 vaccine is enough to prevent infection. Q2- The reason for inoculating the COVID-19 vaccine is to develop the neutralizing antibodies against COVID-19. Q3- The common side effects of COVID-19 vaccines are Injection site pain, myalgia, fever and chills. Q4- All the age groups can be vaccinated.	(Venkataraman et al., 2023)
Motivation	Vaccine Motivation Observational Learning	Exposure to others' vaccine-related behaviors and attitudes on social media. Questions: Q1- Have you seen people in your social network getting vaccinated against COVID-19? Choices: a) Yes b) No Q2- To what extent do you think seeing others in your social network get vaccinated against COVID-19 will influence your decision to get vaccinated? Choices: a) A lot, b) Somewhat, c) Neutral, d) Not much, e) Not at all.	(Luo et al., 2020)
Motivation	Vaccine Motivation	COVID-19 is very contagious. Choices: 5 Point Likert Scale – (5) Strongly Agree, (4) Agree, (3) Neither agree nor disagree, (2) Disagree, (1) Strongly disagree. Taking appropriate health behaviors could reduce the risk of infection. I am very afraid of COVID-19. I was aware of confirmed and/or suspected cases of COVID-19 within a radius of 1km.	(Luo et al., 2020)

Cont. Table 1
Survey Questions

Variable Category	Variable	Question	Reference
Behavior	Vaccine Ability	Self-efficacy and the ability to effectively execute health behaviors were used to evaluate behavioral skills in terms of vaccine ability. Choices: (5) Strongly Agree, (4) Agree, (3) Neither agree nor disagree, (2) Disagree, (1) Strongly disagree. I actively paid attention to real-time COVID-19 information. I understood the importance of home isolation during the COVID-19 pandemic. I adhere to masking and put on the mask correctly. I can follow government health regulations.	(Luo et al., 2020)
Social Media Use	Frequency of Social Media Usage	How frequently do you use social media platforms (e.g., Facebook, Twitter, Instagram)? Choices: a) Multiple times a day, b) Once a day, c) A few times a week, d) Rarely, e) Never.	
Social Media Use	Platforms of Use	Which social media platforms do you use the most? Choices: a) WhatsApp, b) Twitter, c) Instagram d) Snapchat, e) YouTube, f) Other, (please specify).	
Social Media COVID-19 Consumption	Social media-19 vaccine Consumption	Consumption amount in terms of COVID-19 vaccine content on social media. On a 5-point Likert scale: (1) Strongly Disagree, (2) Disagree, (3) Neither agree nor disagree, (4) Agree, (5) Strongly Agree. Questions: Q1- I read posts related to COVID-19 vaccines on social media. Q2- I watch videos and digital content related to COVID-19 vaccines on social media. Q3- I follow accounts related to COVID-19 vaccines on social media.	(Schivinski et al., 2016)

Cont. Table 1
Survey Questions

Variable Category	Variable	Question	Reference
Social Media COVID-19 Engagement	Social media-19 vaccine Engagement	Social media-19 vaccine engagement level. On a 5 point Likert scale : (1) Strongly Disagree , (2) Disagree , (3) Neither agree nor disagree , (4) Agree , (5) Strongly Agree. Questions: Q1- I comment on videos related to COVID-19 vaccines on social media. Q2- I comment on posts related to COVID-19 vaccines on social media. Q3- I share COVID-19 vaccine related posts. Q4- I "Like" posts related to COVID-19 vaccines on social media.	(Schivinski et al., 2016)
Demographic	Age	What is your age? Choices: a) Under 18, b) 18-24, c) 25-34, d) 35-44, e) 45-54, f) 55-64, g) 65 or over.	
Demographic	Gender	What is your gender? Choices: a) Male, b) Female.	
Demographic	Education	What is your highest level of education? Choices: a) High School or less, b) Some college or technical school, c) bachelor's degree, d) master's degree, e) Doctoral degree.	
Demographic	Health Status	Do you have any pre-existing medical conditions? Choices: a) Yes, b) No.	
Demographic	Health Specialist	Do you work in a health-related profession? Choices: a) Yes, b) No.	

Statistical Analysis

Descriptive statistics were used to summarize the sample characteristics, social media use, and exposure to COVID-19 vaccine-related information on social media, as shown in Table 2. Inferential statistics were used to investigate the relationships between vaccine-related information on social media, vaccine hesitancy, and demographic and psychographic factors. The Pearson correlation coefficient and point double correlation coefficient were used to estimate the correlation between variables as displayed in Table 3. Confirmatory Factor Analysis (CFA) was used to test the relationship between latent variables and

observable variables of the measurement model as shown in Table 4. Structural Equation Modeling (SEM) was used to evaluate the research model. The model was considered to have a good fit if the ratio of chi-square to degrees of freedom was < 5.0 (Wheaton et al., 1977), Root Mean Square Error of Approximation (RMSEA) < 0.08, Goodness-of-Fit Index (GFI) > = 0.90, Tucker Lewis Index (TLI) > = 0.90, and Comparative Fit Index (CFI) > = 0.90 (Barrett, 2007), as displayed in Figure 2. SEM and CFA were conducted using AMOS 26.0.

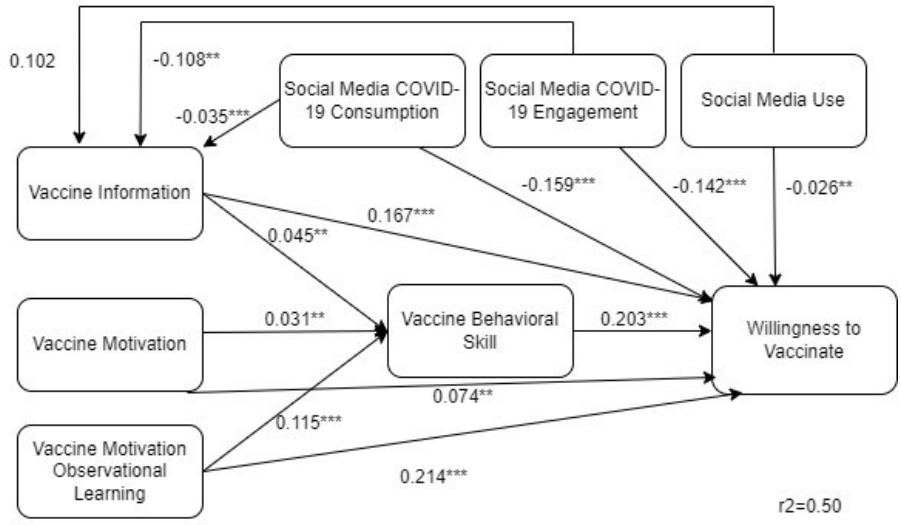

Figure 2: SEM Coefficients are Standardized Path Coefficients
$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Results

In total, 482 participants completed the questionnaires; 465 of these were valid. Table 2 shows the descriptive statistics of the study participants. Around 58% of the sample were female. The majority of the participants were in the age group of 26-30 years, accounting for 34.4%. Most had a baccalaureate degree, making up 43.2% of the participants. Around 50% of the sample were single, and 30% had a pre-existing health condition. Additionally, around 29% of the sample were health specialists.

Table 2
Descriptive Statistics

Sociodemographic Characteristic	Variable	*N*= 465	Percent (%)
Gender	Male	195	41.9%
	Female	270	58.1%
Age (years)	18-25	87	18.7%
	26-30	160	34.4%
	31-40	92	19.8%
	41-50	81	17.4%
	51-60	36	7.7%
	> = 61	9	1.9%
Education Level	High School and Less	18	3.9%
	Diploma	74	15.9%
	Baccalaureate degree	201	43.2%
	Master's degree or higher	172	37.0%
Marital Status	Married	189	40.6%
	Single	233	50.1%
	Other	43	9.2%
Health Status	Yes-Pre-existing Medical conditions	126	30.0%
	No	339	70.0%
Health Specialist	Yes	135	29.0%
	No	330	71.0%

Confirmatory Factor Analysis (CFA) was employed to assess the appropriateness of the proposed model for the collected data and to establish the constructs' reliability and validity. The results, as depicted in Table 4, demonstrate robust evidence of both convergent and discriminant validity. Specifically, the factor loadings for all constructs fall within the range from 0.6 to 0.8, indicating that each measurement item effectively captures the underlying construct it was intended to assess. This substantiates the model's ability to accurately measure these constructs. Furthermore, the goodness-of-fit metrics, including the Incremental Fit Index (IFI)

and Comparative Fit Index (CFI), as well as the Root Mean Square Error of Approximation (RMSEA), surpass the accepted thresholds. These values reflect the model's strong fit with the observed data and highlight its satisfactory reliability and validity. Additionally, the internal consistency of the survey items was evaluated using Cronbach's alpha (α), with all constructs yielding values exceeding 0.7. This outcome underscores the strong internal reliability of the measurement items within each construct, indicating the stability and consistency of the collected data.

Table 3
Correlation Coefficients among Model Constructs (*N*= 465)

Constructs	1	2	3	4	5	6	7	8
1. Willingness to Vaccinate	1							
2. Vaccine Information	0.187***	1						
3. Vaccine Motivation	0.032	0.184***	1					
4. Vaccine Motivation Observational Learning	0.161***	0.211***	0.127***	1				
5. Behavioral Skills-Vaccine Ability	0.137***	0.032***	0.101***	0.142***	1			
6. Social Media Use	0.203***	0.142	0.042	0.494*	0.055	1		
7. Social Media COVID-19 Consumption	-0.283***	-0.184***	-0.123***	0.131	0.001	0.215***	1	
8. Social Media COVID-19 Engagement	-0.535***	-0.131***	-0.141***	0.181	0.011	0.226***	0.245***	1

*** $p < 0.001$

The correlation coefficients among all constructs are presented in Table 3. The correlation between latent constructs does not exceed 0.7, which further signals measure distinctness (Ping Jr, 2004).

The study model (as illustrated in Figure 2) exhibited a strong fit, as indicated by several key goodness-of-fit statistics. The model demonstrated a favorable χ^2/df ratio of 4.892, suggesting a reasonable fit between the model and the observed data. Furthermore, the Goodness of Fit Index (GFI = 0.949), underscoring the model's ability to accurately represent the data. The Comparative Fit Index (CFI) showed a noteworthy value of 0.939, indicating a high degree of compatibility between the hypothesized model and the empirical data. The Tucker-Lewis Index

(TLI) was equally robust, registering at 0.930, reinforcing the model's adequacy in explaining the observed data patterns. The Root Mean Square Error of Approximation (RMSEA) was exceptionally low at 0.041, affirming the model's precise fit to the data, with values below the accepted threshold.

Table 4
Construct Items and Scores

Constructs Items (total scores range)	B	*P*	Mean	SD	IFI/CFI	RMSEA	Cronbach α
Willingness to Vaccinate			3.87	1.57			0.787
Vaccine Information Score			3.42	1.12			0.739
Vaccine Motivation			23.11	2.67	0.973/0.972	0.054	0.712
M1	0.671	< 0.001					
M2	0.613	< 0.001					
M3	0.676	< 0.001					
M4	0.669	< 0.001					
Vaccine Motivation Observational Learning							
MOBS1	0.671	< 0.001	23.16	2.71	0.961/0.960	0.059	0.768
MOBS2	0.630	< 0.001					
Behavioral Skills- Vaccine Ability							
A1	0.784	< 0.001	22.56	2.97	0.968/0.968	0.043	0.891
A2	0.785	< 0.001					
A3	0.750	< 0.001					
A4	0.758	< 0.001					
Social Media Use			4.34	1.27			0.701
Social Media COVID-19 Consumption/Exposure							
SMC1	0.800	< 0.001	3.11	2.04	0.983/0.982	0.042	0.802
SMC2	0.785	< 0.001					
SMC3	0.765	< 0.001					
Social Media COVID-19 Contribution/Engagement							
SME1	0.760	< 0.001	2.58	2.43	0.973/0.972	0.049	0.831
SME2	0.713	< 0.001					
SME3	0.671	< 0.001					
SME4	0.688	< 0.001					

SD = Standard Deviation; IFI = Incremental Fit Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation

Seven factors had significant direct effects on willingness to vaccinate: (1) Vaccine Knowledge ($\beta = 0.167$, $p < 0.001$), (2) Vaccine Ability ($\beta = 0.203$, $p < 0.001$), (3) Social Media Use ($\beta = -0.026$, $p < 0.01$), (4) Social Media COVID-19 Vaccine Engagement ($\beta = -0.142$, $p < 0.001$), (5) Social Media COVID-19 Vaccine Consumption ($\beta = -0.159$, $p < 0.001$), (6) Vaccine Motivation ($\beta = 0.074$, $p < 0.010$), (7) Vaccine Motivation through Observational Learning ($\beta = 0.214$, $p < 0.001$).

Vaccine Knowledge exerted indirect impacts on willingness to vaccinate through vaccine ability. Social media COVID-19 vaccine consumption, social media COVID-19 vaccine engagement, and social media usage also exerted indirect impacts on willingness to vaccinate through Vaccine Knowledge. Vaccine Motivation and Vaccine Motivation through Observational Learning both exert indirect impacts on willingness to vaccinate through vaccine ability.

The total effect coefficients of vaccine knowledge, social media use, social media COVID-19 vaccine engagement, social media COVID-19 vaccine consumption, vaccine motivation, and vaccine motivation through observational learning on willingness to vaccinate were 0.176, -0.009, -0.160, -0.165, 0.080, and 0.237, respectively. All variables accounted for 50% of the consumer behavior. Table 7 displays a summary of the hypothesis tests on the direct effects.

To further analyze the differential impacts of different social media platforms, factor analysis (as shown in Table 5) was conducted and allowed us to categorize social media platforms into four main categories: (1) Short video-based social media (Snapchat and TikTok), (2) Social network communities (Facebook, Instagram, and LinkedIn), (3) Informational social media (Twitter), and lastly (4) Social media for social purposes such as communication and entertainment (WhatsApp and YouTube). The mean for Informational social media and social communication social media was -0.01 with a standard deviation of 1.00 and 0.70, respectively. On the other hand, short video social media and community-based social media were 0.01 with a standard deviation of 1.00 and 1.01, respectively.

To investigate the varying influence of distinct social media platforms on the willingness to receive a COVID-19 vaccine, we employed an ordered probit regression model. Given the ordinal nature of the dependent variable, this analytical approach is well-suited for estimating the parameters of the key variables while

accounting for robust standard errors. By applying the ordered probit regression, the study estimates to what extent the different set of social media platforms influence the willingness to get vaccinated against COVID-19. Table 6 displays the results of the ordered probit model.

Table 5
Rotated Factor Loadings- Social Media Platforms Used for COVID-19 Vaccine Information

Variable	Factor1	Factor2	Factor3	Factor4	Commu-nality
Facebook	0.778	0.165	0.445	0.189	0.866
Instagram	0.844	0.209	0.305	0.215	0.895
LinkedIn	0.645	0.492	0.121	0.202	0.714
Snapchat	0.14	0.73	0.319	0.175	0.685
TikTok	0.239	0.743	0.249	0.092	0.679
WhatsApp	0.203	0.28	0.802	0.181	0.795
YouTube	0.217	0.285	0.889	0.086	0.926
Twitter	0.219	0.052	0.217	0.947	0.994
Variance	2.5153	2.488	2.0863	1.9594	9.0491
Var %	0.21	0.207	0.174	0.163	0.754

The outcome of the probit model in Table 6 reveals compelling insights. Notably, information-centric social media platforms like Twitter exhibit a positive and substantial impact on individuals' willingness to get vaccinated ($\beta = 0.325$, $p < 0.001$). This indicates that an increase in the use or influence of Twitter is associated with an increased likelihood of individuals being in a higher category of willingness to get vaccinated. The finding indicates a strong and positive impact, meaning that as people engage more with information-centric platforms like Twitter, they are more likely to be willing to get vaccinated.

Table 6
Ordered Probit Regression Model

Dependent Variable: Willingness to Vaccinate	Coefficient
SM_SHORTVIDEO	-0.476
	($p < 0.001$)
SM_INFORMATION	0.325
	($p < 0.001$)
SM_COMMUNICATION	-0.523
	($p < 0.001$)
SM_COMMUNITY	-0.540
	($p < 0.001$)
Observations	465
Pseudo-R Square	0.219
Wald Chi Square (30)	239.368
Prob > Chi-sq.	($p < 0.001$)

p values in parentheses.

In contrast, platforms characterized by their community-driven nature (β = -0.540, $p < 0.001$), short video content (β = -0.476, $p < 0.001$), or communication focus all display negative and significant effects. Notably, communication platforms such as WhatsApp and YouTube demonstrate the most pronounced negative impact (β = -0.523, $p < 0.001$). This suggests that an increase in the use or influence of community-driven platforms, short video content platforms, and communication-focused platforms is associated with a decreased likelihood of individuals being in a higher category of willingness to get vaccinated, suggesting that these platforms may contribute to vaccine hesitancy. This indicates that these platforms might be disseminating information or fostering sentiments that reduce vaccination willingness.

Table 7
Summary of Hypothesis Test on Direct Effects

Hypotheses	Path	Path Coefficient (p)	Supported
H1	Vaccine Information → Willingness to Vaccinate	0.167***	Yes
H2	Vaccine Motivation → Willingness to Vaccinate	0.074**	Yes
H3	Vaccine Motivation Observational Learning → Willingness to Vaccinate	0.214***	Yes
H4	Vaccine Behavioral Skill → Willingness to Vaccinate	0.203***	Yes
H5a	Social Media Use → Willingness to Vaccinate	-0.026**	Yes
H5c	Social Media COVID-19 Engagement → Willingness to Vaccinate	-0.142***	Yes
H5b	Social Media COVID-19 Consumption → Willingness to Vaccinate	-0.159***	Yes

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Discussion

This study empirically tested the extended IMB model in the health context, where knowledge, motivation, and motivation through observational learning are positive factors for health behaviors; and social media use, consumption, and engagement are negative factors for health behaviors. In addition, vaccine ability and vaccine knowledge were mediators for health behaviors. Lastly, the study finds a positive and significant association between individuals' health behaviors and trust in e-commerce.

In line with the fundamental principles of the extended IMB model, our findings substantiate that information has a direct impact on an individual's willingness to undergo vaccination. Furthermore, it exerts an indirect influence through the development of vaccine-related behavioral abilities. Knowledge plays a pivotal role

as an essential prerequisite in mitigating risky behaviors, and it can also stimulate behavioral skills to change and maintain behavior (You et al., 2023). Our study corroborates these insights, underscoring the multifaceted role of information in shaping health-related behaviors. Individuals with a better understanding of vaccines and their benefits are more likely to express a willingness to get vaccinated. This emphasizes the need for robust public health education and information campaigns to address misconceptions and enhance vaccine knowledge among the public.

Motivation is also required to facilitate the occurrence and maintenance of behavior aside adequate information and proficient behavioral skills such as vaccine ability (You et al., 2023), as it was observed in our study. Prior research has consistently emphasized the significant influence of motivation on health behaviors, reinforcing its importance in achieving desired health outcomes (Lee & Kim, 2022; Luo et al., 2022). Moreover, our findings reveal a noteworthy aspect: social motivation, particularly through observational learning, exerts the most substantial overall impact on individuals' willingness to embrace vaccination. This outcome aligns with earlier studies indicating that motivation stemming from social connections, whether through family, friends, or other social influences, can substantially enhance positive health-related behaviors (Kim et al., 2022; Luo et al., 2022; Peng et al., 2023). Leveraging social motivation through observational learning can be a powerful tool in promoting health-related behaviors and should be a focal point for future health campaigns and initiatives. Public health initiatives can harness the influence of family, friends, and social networks to promote health-related behaviors. Encouraging individuals to share their positive health experiences and be role models within their social circles can be an effective strategy. Building on the influence of observational learning, interventions can strategically employ testimonials, success stories, and role models within specific communities or groups. This targeted approach can enhance the impact of observational learning and drive changes in health behaviors.

This study also finds a positive and significant relationship between behavioral skills of vaccine ability and health behaviors. Previous studies have shown that people in general may have good knowledge of guidelines, but usually lack the confidence and ability to put them into practice (Huang & Fan, 2023; You et al., 2023). This gap between knowing what is beneficial for one's health and being able to implement those recommendations can significantly impact health outcomes. Public health campaigns and educational efforts should recognize the

need to address not only the "what" but also the "how" of health behaviors. Effective health education should encompass not only the dissemination of information but also the development of practical skills that empower individuals to make healthier choices and take positive actions. Understanding the potential barriers that hinder individuals from translating knowledge into action is crucial. This can include factors such as fear, lack of access to resources, or misconceptions about the ease of performing certain health-related tasks. Identifying and addressing these barriers can enhance the effectiveness of health promotion initiatives. Interventions that aim to bridge the gap between knowledge and practical ability can have a significant impact on public health. For example, programs designed to improve vaccine administration skills can lead to higher vaccination rates. These interventions can be especially vital in the context of critical public health events, such as vaccination campaigns during pandemics.

The central focus of this study revolves around the noteworthy findings related to social media's influence. It is pivotal to emphasize that general social media usage demonstrates a direct negative impact on individuals' willingness to vaccinate. This finding is in line with a recent review that found most studies find a negative impact of social media on willingness to vaccinate (Cascini et al., 2022). The negative impact of social media on vaccine willingness highlights the need for better quality control of information. Misinformation can easily spread on social media, leading to public skepticism. Prior studies have demonstrated that vaccine-skeptical communities on social media leave a significant impact, with a significant portion of vaccine-related content on popular social media platforms being anti-vaccination in nature (Keelan et al., 2010; Smith & Graham, 2019). This, in turn, leads to increased user interaction (Basch & MacLean, 2019; Blankenship et al., 2018). Additionally, it's noteworthy that social media platforms tend to create echo chambers by bringing together individuals with similar ideological views (Jiang et al., 2021). Thus, ensuring that accurate and reliable information is readily available and accessible on these platforms is crucial.

Furthermore, when exploring the usage of social media among different platforms, the findings of the study underscore the potential influence of specific platforms in facilitating the spread of misinformation regarding COVID-19 vaccination. While information-oriented platforms can bolster vaccination intentions, communication and community-driven platforms may contribute to hesitancy. This finding is also in line with previous studies displaying differential impacts

of misinformation across platforms (Al-Hasan et al., 2021; Suarez-Lledo & Alvarez-Galvez, 2021). This nuanced analysis sheds light on the distinct roles that various social media platforms play in shaping public perception and willingness to vaccinate against COVID-19. Recognizing that communication-focused platforms like WhatsApp and YouTube have a pronounced negative effect, it is imperative to focus on these channels for misinformation monitoring and mitigation.

Furthermore, when delving into the specifics, it becomes evident that the consumption and active engagement with COVID-19 vaccine-related content on social media platforms not only exert direct negative effects but also cascade into indirect repercussions, all of which adversely affect the overall willingness to receive vaccinations. This interaction not only exerts a direct negative impact but also triggers indirect repercussions that collectively contribute to a reduction in overall willingness to receive vaccinations. Even when knowledge serves as a mediator, the total effect remains negative, indicating the persistence of hesitancy. This suggests that while knowledge is vital, it may not be sufficient on its own to counteract the negative influence of social media. Public health strategies should consider addressing not only knowledge gaps but also the emotional and social aspects that shape vaccination decisions. There is a complex interplay between social media and vaccine willingness. While social media offers opportunities for disseminating information, its impact can be negative when not properly managed. By understanding these dynamics, public health initiatives can refine their strategies to effectively engage with audiences on social media and counteract vaccine hesitancy.

Limitations and Directions for Future Research

The results of this study should be interpreted considering the following limitations. The cross-sectional design of this study limits the ability to draw causal inferences and fully capture the temporal dynamics of behavior change. Longitudinal studies are indeed more impactful for understanding how knowledge, motivation, ability, social media use, consumption, and engagement evolve over time and influence willingness to vaccinate. To enhance robustness, future research should aim to employ longitudinal designs. These designs would allow for the observation of changes and developments in vaccine-related behaviors over extended periods, providing deeper insights into how personal, political, economic, and global changes influence vaccination willingness. Despite these limitations, cross-sectional studies remain valuable for identifying relationships and patterns at

a specific point in time. This study provides a snapshot of current attitudes and behaviors, which is particularly relevant in rapidly changing contexts like the COVID-19 pandemic. Cross-sectional data can serve as a critical first step in identifying key factors and hypotheses that can be further explored in longitudinal research.

Second, this study examined a population in an Arab country. Given the differences in cultural norms across various cultures (Hofstede, 2011), the findings may not be generalizable to other cultural settings. Therefore, future studies could replicate this framework in different cultural contexts to understand how cultural values, religious beliefs, family support, and peer influence affect the IMB model and social media's impact on vaccination willingness.

Third, in addition to the primary dimensions of the IMB model and the social media aspects examined in this study, it is important to acknowledge the potential existence of other significant dimensions that were not included. For instance, misinformation on social media could be a key factor explaining why social media usage negatively impacts willingness to vaccinate. Future research should investigate the type of content consumed, distinguishing between accurate information and misinformation. Exploring these omitted factors across diverse cultural and individual contexts is essential.

Fourthly, the study did not fully address other critical factors such as cultural values, religious beliefs, family support, and the influence of peers and friends. Future research should delve into how these social and psychological factors interact with the IMB model and social media use to influence vaccination behavior. Understanding these influences can provide a more comprehensive picture of the determinants of vaccination willingness. In addition, the study did not differentiate between vaccines from different manufacturers (e.g., Chinese, American, etc.). Future studies should consider how the characteristics and perceived efficacy of different vaccines impact public willingness to vaccinate. This will help tailor public health messages to address specific concerns related to different vaccine types.

Lastly, while this study focused on the IMB model, it is important to consider other behavioral theories that could provide additional insights into the factors influencing vaccination behavior. These theories include: (1) Connectionism Theory (Rumelhart et al., 1986): This theory, based on neural networks, suggests that behavior and learning are products of interconnected networks of information processing units. Exploring how information about vaccines is processed and

connected in individuals' minds could provide insights into how misinformation spreads and how accurate vaccine information can be effectively communicated. (2) Cognitive Theory (Piaget & Cook, 1952): Cognitive theories focus on how mental processes such as perception, memory, and reasoning influence behavior. Research could delve into how cognitive biases, risk perception, and health literacy affect vaccine-related decisions. Understanding these cognitive processes can help design interventions that address misconceptions and improve vaccine uptake. (3) Behavioral Genetic Theory (Plomin, 2005): This theory examines the role of genetic and environmental factors in shaping behavior. Investigating the genetic predispositions and environmental influences on health behaviors, including vaccination, could reveal underlying biological and social determinants of vaccine hesitancy and acceptance. Future studies should consider integrating insights from these various theories to provide a more comprehensive understanding of vaccination behavior. Combining elements from different frameworks can help identify multifaceted strategies to address vaccine hesitancy.

Conclusion

This study empirically validates and extends the IMB model in the health context, demonstrating that information, motivation, and observational learning are significant positive factors for health behaviors, particularly vaccination willingness. The findings highlight the critical role of robust public health education and information campaigns in addressing misconceptions and enhancing vaccine knowledge. Motivation, especially through social connections and observational learning, emerged as a powerful tool in promoting vaccination, suggesting that leveraging social networks can substantially improve health-related behaviors.

Furthermore, the study underscores the complex role of social media in shaping public perception and willingness to vaccinate against COVID-19. Our findings reveal that while information-oriented platforms (e.g., Twitter) can bolster vaccination intentions, communication-focused platforms, community-driven platforms, and short video content platforms may contribute to vaccine hesitancy (e.g., WhatsApp, YouTube). This nuanced analysis aligns with previous studies that demonstrate differential impacts of misinformation across various platforms. Recognizing that communication-focused platforms like WhatsApp and YouTube have a pronounced negative effect, it is imperative to focus on these channels for misinformation monitoring and mitigation. This approach is crucial in ensuring

that accurate and reliable information is readily available and accessible, thereby countering the negative influence of social media on vaccination willingness. By addressing both knowledge gaps and the emotional and social factors influencing vaccination decisions, public health strategies can be more effective in promoting vaccination and improving overall health outcomes.

References

Al-Hasan, A., Khuntia, J., & Yim, D. (2021). Does seeing what others do through social media influence vaccine uptake and help in the herd immunity through vaccination? A cross-sectional analysis. *Frontiers in Public Health, 9*, 715931. https://doi.org/10.3389/fpubh.2021.715931

Allington, D., McAndrew, S., Moxham-Hall, V., & Duffy, B. (2021). Coronavirus conspiracy suspicions, general vaccine attitudes, trust and coronavirus information source as predictors of vaccine hesitancy among UK residents during the COVID-19 pandemic. *Psychological Medicine*, *53*(1), 236-247. https://doi.org/10.1017/s0033291721001434

Arif, N., Al-Jefri, M., Bizzi, I. H., Perano, G. B., Goldman, M., Haq, I., Chua, K. L., Mengozzi, M., Neunez, M., & Smith, H. (2018). Fake news or weak science? Visibility and characterization of antivaccine webpages returned by Google in different languages and countries. *Frontiers in Immunology, 9*, 1215. https://doi.org/10.3389/fimmu.2018.01215

Bandura, A. (1986). *Social foundations of thought and action* (pp. 23-28). Englewood Cliffs.

Bandura, A., & Wessels, S. (1997). *Self-efficacy* (pp. 4-6). Cambridge University Press.

Barrett, P. (2007). Structural equation modelling: Adjudging model fit. *Personality and Individual Differences, 42*(5), 815-824. https://doi.org/10.1016/j.paid.2006.09.018

Basch, C. H., & MacLean, S. A. (2019). A content analysis of HPV related posts on Instagram. *Human Vaccines & Immunotherapeutics, 15*(7-8), 1476-1478. https://doi.org/10.1080/21645515.2018.1560774

Becker, M. H. (1974). The health belief model and sick role behavior. *Health Education Monographs, 2*(4), 409-419. https://doi.org/10.1177/109019817400200407

Betsch, C., Habersaat, K. B., Deshevoi, S., Heinemeier, D., Briko, N., Kostenko, N., Kocik, J., Böhm, R., Zettler, I., & Wiysonge, C. S. (2020). Sample study pro-

tocol for adapting and translating the 5C scale to assess the psychological antecedents of vaccination. *BMJ Open, 10*(3), e034869. https://doi.org/10.1136/bmjopen-2019-034869

Bhatti, A., Akram, H., Basit, H. M., Khan, A. U., Raza, S. M., & Naqvi, M. B. (2020). E-commerce trends during COVID-19 pandemic. *International Journal of Future Generation Communication and Networking, 13*(2), 1449-1452.

Biden, J. (2021). *Remarks by President Biden on fighting the COVID-19 pandemic.* The White House. https://www.whitehouse.gov/briefing-room/speeches-remarks/2021/09/09/remarks-by-president-biden-on-fighting-the-covid-19-pandemic-3/

Bitar, H., & Alismail, S. (2021). The role of ehealth, telehealth, and telemedicine for chronic disease patients during COVID-19 pandemic: A rapid systematic review. *Digital Health, 7*, 20552076211009396. https://doi.org/10.1177/20552076211009396

Blankenship, E. B., Goff, M. E., Yin, J., Tse, Z. T. H., Fu, K.-W., Liang, H., Saroha, N., & Fung, I. C.-H. (2018). Sentiment, contents, and retweets: A study of two vaccine-related Twitter datasets. *The Permanente Journal, 22*, 17–138. https://doi.org/10.7812/tpp/17-138

Bode, L., & Vraga, E. (2021). The Swiss cheese model for mitigating online misinformation. *Bulletin of the Atomic Scientists, 77*(3), 129-133. https://dx.doi.org/10.1080/00963402.2021.1912170

Brewer, N. T., Chapman, G. B., Rothman, A. J., Leask, J., & Kempe, A. (2017). Increasing vaccination: Putting psychological science into action. *Psychological Science in the Public Interest, 18*(3), 149-207. https://doi.org/10.1177/1529100618760521

Browne, M., Thomson, P., Rockloff, M. J., & Pennycook, G. (2015). Going against the herd: Psychological and cultural factors underlying the 'vaccination confidence gap'. *PloS One, 10*(9), e0132562. https://doi.org/10.1371/journal.pone.0132562

Cascini, F., Pantovic, A., Al-Ajlouni, Y. A., Failla, G., Puleo, V., Melnyk, A., Lontano, A., & Ricciardi, W. (2022). Social media and attitudes towards a COVID-19 vaccination: A systematic review of the literature. *eClinicalMedicine, 48*, 101454. https://doi.org/10.1016/j.eclinm.2022.101454

Chadwick, A., Kaiser, J., Vaccari, C., Freeman, D., Lambe, S., Loe, B. S., Vanderslott, S., Lewandowsky, S., Conroy, M., & Ross, A. R. (2021). Online social endorsement and Covid-19 vaccine hesitancy in the United Kingdom. *Social Media + Society, 7*(2), 20563051211008817. https://doi.org/10.1177/20563051211008817

Deakin, T. A., McShane, C. E., Cade, J. E., & Williams, R. (2005). Group based training for self-management strategies in people with type 2 diabetes mellitus. *Cochrane Database of Systematic Reviews*, (2), CD003417. https://doi.org/10.1002/14651858.cd003417.pub2

Dunn, A. G., Leask, J., Zhou, X., Mandl, K. D., & Coiera, E. (2015). Associations between exposure to and expression of negative opinions about human papillomavirus vaccines on social media: An observational study. *Journal of Medical Internet Research, 17*(6), e144. https://doi.org/10.2196/jmir.4343

Ekram, S., Debiec, K. E., Pumper, M. A., & Moreno, M. A. (2019). Content and commentary: HPV vaccine and YouTube. *Journal of Pediatric and Adolescent Gynecology, 32*(2), 153-157. https://doi.org/10.1016/j.jpag.2018.11.001

Faasse, K., & Newby, J. (2020). Public perceptions of COVID-19 in Australia: Perceived risk, knowledge, health-protective behaviors, and vaccine intentions. *Frontiers in Psychology, 11*, 551004. https://doi.org/10.3389/fpsyg.2020.551004

Fisher, J. D., & Fisher, W. A. (2023). An Information-Motivation-Behavioral skills (IMB) model of pandemic risk and prevention. *Advances.in/Psychology, 1*(1), 1-26. https://doi.org/10.56296/aip00004

Fisher, W. A., Fisher, J. D., & Harman, J. (2003). *The Information-Motivation-Behavioral skills model: A general social psychological approach to understanding and promoting health behavior.* Social Psychological Foundations of Health and Illness, (pp. 82-106). Blackwell Publishing. https://doi.org/10.1002/9780470753552.ch4

Freeman, D., Loe, B. S., Chadwick, A., Vaccari, C., Waite, F., Rosebrock, L., Jenner, L., Petit, A., Lewandowsky, S., & Vanderslott, S. (2022). COVID-19 vaccine hesitancy in the UK: The Oxford coronavirus explanations, attitudes, and narratives survey (Oceans) II. *Psychological Medicine, 52*(14), 3127-3141. https://doi.org/10.1017/s0033291720005188

Georgiou, A. (2019). *Anti-vax movement listed by World Health Organization as one of the top 10 health threats for 2019*. Retrieved 4/14/2021 from https://www.

newsweek.com/world-health-organization-who-un-global-health-air-pollution-anti-vaxxers-1292493

Glanz, K., Rimer, B. K., & Viswanath, K. (2008). *Health behavior and health education: Theory, research, and practice* (4th ed., pp. 23–40). Jossey-Bass.

Hassani, L., Dehdari, T., Hajizadeh, E., Shojaeizadeh, D., Abedini, M., & Nedjat, S. (2014). Development of an instrument based on the protection motivation theory to measure factors influencing women's intention to first pap test practice. *Asian Pac J Cancer Prev, 15*(3), 1227-1232. https://doi.org/10.7314/apjcp.2014.15.3.1227

Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online Readings in Psychology and Culture, 2*(1), 2307-0919.1014. https://doi.org/10.9707/2307-0919.1014

Hornsey, M. J., Harris, E. A., & Fielding, K. S. (2018). The psychological roots of anti-vaccination attitudes: A 24-nation investigation. *Health Psychology, 37*(4), 307-315. https://psycnet.apa.org/doi/10.1037/hea0000586

Huang, X., & Fan, J. (2023). Understand the impact of technology feature in online health communities: Why the representation of information matters. *International Journal of Human–Computer Interaction, 39*(4), 691-706. https://doi.org/10.1080/10447318.2022.2046922

Islam, M. S., Siddique, A. B., Akter, R., Tasnim, R., Sujan, M. S. H., Ward, P. R., & Sikder, M. T. (2021). Knowledge, attitudes and perceptions towards COVID-19 vaccinations: A cross-sectional community survey in Bangladesh. *BMC Public Health, 21*(1), 1851. https://doi.org/10.1186/s12889-021-11880-9

Jeanne, W. (2020). *Keeping your distance is good for public health but tough for small businesses*. The Washington Post. https://www.washingtonpost.com/business/2020/03/13/small-business-impact-coronavirus/

Jennings, W., Stoker, G., Bunting, H., Valgarðsson, V. O., Gaskell, J., Devine, D., McKay, L., & Mills, M. C. (2021a). Lack of trust, conspiracy beliefs, and social media use predict COVID-19 vaccine hesitancy. *Vaccines, 9*(6), 593. https://doi.org/10.3390/vaccines9060593

Jennings, W., Stoker, G., Willis, H., Valgardsson, V., Gaskell, J., Devine, D., Mckay, L., & Mills, M. C. (2021 b). Lack of trust and social media echo chambers pre-

dict COVID-19 vaccine hesitancy. medRxiv. https://doi.org/10.1101/2021.01.26.21250246

Jiang, J., Ren, X., & Ferrara, E. (2021). Social media polarization and echo chambers in the context of COVID-19: Case study. *JMIRx Med, 2*(3), e29570. https://doi.org/10.2196/29570

Kata, A. (2012). Anti-vaccine activists, Web 2.0, and the postmodern paradigm–An overview of tactics and tropes used online by the anti-vaccination movement. *Vaccine, 30*(25), 3778-3789. https://doi.org/10.1016/j.vaccine.2011.11.112

Keelan, J., Pavri, V., Balakrishnan, R., & Wilson, K. (2010). An analysis of the Human Papilloma Virus vaccine debate on MySpace blogs. *Vaccine, 28*(6), 1535-1540. https://doi.org/10.1016/j.vaccine.2009.11.060

Khan, Y. H., Mallhi, T. H., Alotaibi, N. H., Alzarea, A. I., Alanazi, A. S., Tanveer, N., & Hashmi, F. K. (2020). Threat of COVID-19 vaccine hesitancy in Pakistan: The need for measures to neutralize misleading narratives. *The American Journal of Tropical Medicine and Hygiene, 103*(2), 603-604. https://doi.org/10.4269/ajtmh.20-0654

Kim, S. R., Kim, S., Kim, H. Y., & Cho, K.-H. (2022). Predictive model of self-management in patients with stroke based on the Information-Motivation-Behavioral skills model. *Journal of Cardiovascular Nursing*, *38*(2), 158–167. https://doi.org/10.1097/JCN.0000000000000883

Krause, N. M., Freiling, I., Beets, B., & Brossard, D. (2020). Fact-checking as risk communication: The multi-layered risk of misinformation in times of COVID-19. *Journal of Risk Research, 23*(7-8), 1052-1059. https://doi.org/10.1080/13669877.2020.1756385

Larson, H. J., Jarrett, C., Eckersberger, E., Smith, D. M., & Paterson, P. (2014). Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: A systematic review of published literature, 2007–2012. *Vaccine, 32*(19), 2150-2159. https://doi.org/10.1016/j.vaccine.2014.01.081

Larson, H. J., De Figueiredo, A., Xiahong, Z., Schulz, W. S., Verger, P., Johnston, I. G., Cook, A. R., & Jones, N. S. (2016). The state of vaccine confidence 2016: Global insights through a 67-country survey. *EBioMedicine, 12*, 295-301. http://dx.doi.org/10.1016/j.ebiom.2016.08.042

Lee, Y., & Kim, D.-H. (2022). A preliminary study on the effects of an osteoporosis prevention program based on an Information-Motivation-Behavioral skill model in older adult women: A cluster randomized controlled trial. *Geriatric Nursing, 45*, 55-63. https://doi.org/10.1016/j.gerinurse.2022.03.001

Li, Z.-G., Ge, J.-J., Zhang, C., Peng, X.-Q., Wu, Q.-F., & You, H. (2023). Information-Motivation-Behavioral skills model supplemented with the Moderated-Mediation path: A framework for interpreting patients' online medical services utilization. *American Journal of Health Promotion*, *37*(7), 924–932. https://doi.org/10.1177/08901171231186313

Loomba, S., de Figueiredo, A., Piatek, S. J., de Graaf, K., & Larson, H. J. (2021). Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA. *Nature Human Behaviour, 5*(3), 337-348. https://doi.org/10.1038/s41562-021-01056-1

Luo, Y., Yao, L., Hu, L., Zhou, L., Yuan, F., & Zhong, X. (2022). Urban and rural disparities of personal health behaviors and the influencing factors during the COVID-19 outbreak in China: Based on an extended IMB model. *Disaster Medicine and Public Health Preparedness, 16*(3), 880-884. https://doi.org/10.1017%2Fdmp.2020.457

Luo, Y., Yao, L., Zhou, L., Yuan, F., & Zhong, X. (2020). Factors influencing health behaviours during the coronavirus disease 2019 outbreak in China: An extended Information-Motivation-Behaviour skills model. *Public Health, 185*, 298-305. https://doi.org/10.1016/j.puhe.2020.06.057

Madani, D. (2020). *Many front-line workers refuse Covid vaccines as distribution rollout struggles*. NBC News. https://www.nbcnews.com/news/us-news/many-front-line-workers-refuse-covid-19-vaccines-distribution-rollout-struggles-n1252617

Mannan, D. K. A., & Farhana, K. M. (2020). Knowledge, attitude and acceptance of a COVID-19 vaccine: A global cross-sectional study. *International Research Journal of Business and Social Science, 6*(4), 1-23. https://dx.doi.org/10.2139/ssrn.3763373

Marti, M., de Cola, M., MacDonald, N. E., Dumolard, L., & Duclos, P. (2017). Assessments of global drivers of vaccine hesitancy in 2014—Looking beyond safety concerns. *PloS One, 12*(3), e0172310. https://doi.org/10.1371/journal.pone.0172310

Misovich, S. J., Martinez, T., Fisher, J. D., Bryan, A., & Catapano, N. (2003). Predicting breast self-examination: A test of the Information-Motivation-Behavioral skills model[1]. *Journal of Applied Social Psychology, 33*(4), 775-790. https://dx.doi.org/10.1111/j.1559-1816.2003.tb01924.x

Moran, M. B., Lucas, M., Everhart, K., Morgan, A., & Prickett, E. (2016). What makes anti-vaccine websites persuasive? A content analysis of techniques used by anti-vaccine websites to engender anti-vaccine sentiment. *Journal of Communication in Healthcare, 9*(3), 151-163. https://doi.org/10.1080/17538068.2016.1235531

Murphy, J., Vallières, F., Bentall, R. P., Shevlin, M., McBride, O., Hartman, T. K., McKay, R., Bennett, K., Mason, L., & Gibson-Miller, J. (2021). Psychological characteristics associated with COVID-19 vaccine hesitancy and resistance in Ireland and the United Kingdom. *Nature Communications, 12*(1), 1-15. https://doi.org/10.1038/s41467-020-20226-9

Newman, S., Steed, E., & Mulligan, K. (2008). *Chronic physical illness: Self-management and behavioural interventions*. McGraw-Hill Education (UK).

Novak, S. (2018). *The long history of America's anti-vaccination movement*. Discover magazine. https://www.discovermagazine.com/health/the-long-history-of-americas-anti-vaccination-movement

Nuzhath, T., Tasnim, S., Sanjwal, R. K., Trisha, N. F., Rahman, M., Mahmud, S. F., Arman, A., Chakraborty, S., & Hossain, M. M. (2020). *COVID-19 vaccination hesitancy, misinformation and conspiracy theories on social media: A content analysis of Twitter data,* SocArXiv. https://doi.org/10.31235/osf.io/vc9jb

Nyhan, B., Reifler, J., Richey, S., & Freed, G. L. (2014). Effective messages in vaccine promotion: A randomized trial. *Pediatrics, 133*(4), e835-e842. https://doi.org/10.1542/peds.2013-2365

Opel, D. J., Mangione-Smith, R., Taylor, J. A., Korfiatis, C., Wiese, C., Catz, S., & Martin, D. P. (2011). Development of a survey to identify vaccine-hesitant parents: The parent attitudes about childhood vaccines survey. *Human Vaccines, 7*(4), 419-425. https://doi.org/10.4161/hv.7.4.14120

Pariser, E. (2011). *The filter bubble: What the Internet is hiding from you*. Penguin UK.

Peng, Z., Chen, H., Wei, W., Yu, Y., Liu, Y., Wang, R., Yu, X., Xu, C., Long, R., & Hou, Y. (2023). The Information-Motivation-Behavioral skills (IMB) model of antiret-

roviral therapy (ART) adherence among people living with HIV in Shanghai. *AIDS Care, 35*(7), 1001-1006. https://doi.org/10.1080/09540121.2021.2019667

Piaget, J., & Cook, M. (1952). *The origins of intelligence in children* (Vol. 8). International Universities Press New York.

Ping Jr, R. A. (2004). On assuring valid measures for theoretical models using survey data. *Journal of Business Research, 57*(2), 125-141. https://psycnet.apa.org/doi/10.1016/S0148-2963(01)00297-1

Plomin, R. (2000). Behavioural genetics in the 21st century. *International Journal of Behavioral Development*, *24*(1), 30-34. https://doi.org/10.1080/016502500383449

Pomares, T. D., Buttenheim, A. M., Amin, A. B., Joyce, C. M., Porter, R. M., Bednarczyk, R. A., & Omer, S. B. (2020). Association of cognitive biases with human papillomavirus vaccine hesitancy: A cross-sectional study. *Human Vaccines & Immunotherapeutics, 16*(5), 1018-1023. https://doi.org/10.1080/21645515.2019.1698243

Puri, N., Coomes, E. A., Haghbayan, H., & Gunaratne, K. (2020). Social media and vaccine hesitancy: New updates for the era of COVID-19 and globalized infectious diseases. *Human Vaccines & Immunotherapeutics, 16*(11), 2586-2593. https://doi.org/10.1080/21645515.2020.1780846

Roozenbeek, J., Schneider, C. R., Dryhurst, S., Kerr, J., Freeman, A. L., Recchia, G., Van Der Bles, A. M., & Van Der Linden, S. (2020). Susceptibility to misinformation about COVID-19 around the world. *Royal Society Open Science, 7*(10), 201199. https://doi.org/10.1098/rsos.201199

Rumelhart, D. E., McClelland, J. L., & Group, P. R. (1986). *Parallel distributed processing, volume 1: Explorations in the microstructure of cognition: Foundations*. The MIT Press. https://doi.org/10.7551/mitpress/5236.001.0001

Sabaté, E. (2003). *Adherence to long-term therapies: Evidence for action*. World Health Organization.

Sallam, M., Dababseh, D., Eid, H., Al-Mahzoum, K., Al-Haidar, A., Taim, D., Yaseen, A., Ababneh, N. A., Bakri, F. G., & Mahafzah, A. (2021). High rates of COVID-19 vaccine hesitancy and its association with conspiracy beliefs: A study in Jordan and Kuwait among other Arab countries. *Vaccines, 9*(1), 42. https://doi.org/10.3390/vaccines9010042

Scherrer, J. F., & Sullivan, M. D. (2021). Is obesity associated with odds of prescription opioid use independent of depression? *Pain, 162*(1), 319. https://doi.org/10.1097/j.pain.0000000000002105

Schmidt, R. A., Genois, R., Jin, J., Vigo, D., Rehm, J., & Rush, B. (2021). The early impact of COVID-19 on the incidence, prevalence, and severity of alcohol use and other drugs: A systematic review. *Drug and Alcohol Dependence*, *228*, 109065. https://doi.org/10.1016/j.drugalcdep.2021.109065

Schivinski, B., Christodoulides, G., & Dabrowski, D. (2016). Measuring consumers' engagement with brand-related social-media content: Development and validation of a scale that identifies levels of social-media engagement with brands. *Journal of Advertising Research, 56*(1), 64-80. https://dx.doi.org/10.2501/JAR-2016-004

Smith, N., & Graham, T. (2019). Mapping the anti-vaccination movement on Facebook. *Information, Communication & Society, 22*(9), 1310-1327. https://dx.doi.org/10.1080/1369118X.2017.1418406

Suarez-Lledo, V., & Alvarez-Galvez, J. (2021). Prevalence of health misinformation on social media: Systematic review. *Journal of Medical Internet Research, 23*(1), e17187. https://doi.org/10.2196/17187

Tomeny, T. S., Vargo, C. J., & El-Toukhy, S. (2017). Geographic and demographic correlates of autism-related anti-vaccine beliefs on Twitter, 2009-15. *Social Science & Medicine, 191*, 168-175. https://doi.org/10.1016/j.socscimed.2017.08.041

Venkataraman, R., Yadav, U., Shrestha, Y., Narayanaswamy, S., & Basavaraju, S. H. P. (2023). Knowledge and attitudes toward the COVID-19 vaccine among India's general rural population. *Vacunas (English Edition), 24*(2), 128-134. https://doi.org/10.1016%2Fj.vacun.2022.11.002

Wheaton, B., Muthen, B., Alwin, D. F., & Summers, G. F. (1977). Assessing reliability and stability in panel models. *Sociological Methodology, 8*, 84-136. https://doi.org/10.2307/270754

WHO. (2019). *Ten threats to global health in 2019*. Retrieved 4/14/2021 from https://web.archive.org/web/20190627025209/http:/www.who.int/emergencies/ten-threats-to-global-health-in-2019

Wilson, S. L., & Wiysonge, C. (2020). Social media and vaccine hesitancy. *BMJ Global Health, 5*(10), e004206.

Witte, K., & Allen, M. (2000). *A Meta-Analysis of fear appeals: Implications for effective public health campaigns. Health Education & Behavior, 27(5), 591–615.* https://doi.org/10.1177/109019810002700506

You, H., Wang, Y.-Y., Zhang, C., Walker, A. N., Ge, J.-J., Zhao, S.-Q., & Peng, X.-Q. (2023). Empirical validation of the Information-Motivation-Behavioral skills model of gestational weight management behavior: A framework for intervention. *BMC Public Health, 23*(1), 130. https://doi.org/10.1186/s12889-023-15067-2

Zhou, X., Snoswell, C. L., Harding, L. E., Bambling, M., Edirippulige, S., Bai, X., & Smith, A. C. (2020). The role of telehealth in reducing the mental health burden from COVID-19. *Telemedicine and e-Health, 26*(4), 377-379. https://doi.org/10.1089/tmj.2020.0068

Abrar R. Al-Hasan is an Associate Professor of Information Systems at the College of Business Administration, Kuwait University. She received a B.Sc. degree in Computer Engineering from Kuwait University, Kuwait, and the M.B.A. and Ph.D. degrees in Management of Information Systems from the University of Maryland at College Park, MD, USA. She has more than ten years of consulting experience in IT, specializing in digital transformations, data mining, and market analysis. Her research interests include social media and social networks, health IT, digital strategy, online markets, digital innovations, and economics of information systems. She is currently involved in research on the impact of digital markets on consumer behavior within the financial, educational, and healthcare industries. (abrar.alhasan@ku.edu.kw)

Acknowledgments and Disclosures

This study has been funded by Kuwait University Grant Number IQ02/20. Author would like to thank Kuwait University's Research Administration for granting the project and facilitating the research implementation. Because the author is a member of the editorial board, this paper was reviewed by the Kuwait University's Academic Publication Council without any involvement from the editorial board. The review process was conducted in accordance with standard editorial policies to ensure an impartial evaluation.