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Does Risk Perception and Knowledge of Covid-19 Correspond with Vaccination Decision?

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Abstract
This research examines the correlation between perception of risk of Covid-19 and knowledge of Covid-19 to reach vaccination decisions. A number of researches have shown that among many factors that are associated with people's decision to get vaccinated are the perception of how vulnerable are they to be infected by the virus and the perception of how severe is the impact of the virus on them as well as how knowledgeable are they about the disease being prevented. This research aims to investigate the same finding in the context of a group of respondents in Indonesia. With the online survey that collected data of more than three hundred research participants, the result of the data analysis in this research, however, does not corroborate the finding in the previous research. Part of the possible explanation is the approach to drive the vaccination through the implementation of the vaccine mandate. The policy of vaccine mandate in Indonesia was implemented since the vaccine was first available in the country. The proof of vaccination was used as a requirement to have access to public transportations and other public services. This vaccine mandate continued progressively to the second and even third or booster vaccination. This policy of mandatory vaccination became an approach to increase vaccine uptake, which was rather different from other vaccinations that allow some room for voluntary choices.
Keywords: knowledge of Covid-19; perceived risk of Covid-19; vaccine, vaccination decision.

Introduction

Even though the peak of Covid-19 transmission seems to be already in the distant past, the impact of the pandemic still lingers to date toward mid-year of 2023, more than three years since the first outbreak took place. Several economic predictions (e.g. from IMF and UN) stated that the growth of the world economy will de-accelerate by historical standards, as part of the pandemic impacts (Gourinchas, 2023; United Nations, 2023). Not only the economic impact, the aftermath of the pandemic also raises concern on human development impact as the pandemic "caused a massive collapse in human capital at critical moments in the life cycle, derailing development for millions of children and young people in low and middle-income countries", based on the World Bank Report (World Bank, 2023). Some factors lead to this collapse, according to the report, are school closure, lockdown, education service disruption, and ineffective remote learning that caused learning loss of the students in early childhood up to teenagers. On the health domain, the concern regarding virus mutation that brought new variants of the virus is still in the forefront of public health discussion. In Indonesia, the new

sub-variant of Arcturus is published in Covid-19.go.id (the main government website to communicate all about Covid-19 information) as of 17 April 2023. Although it is reported that the symptoms of this sub-variant are not severe and most of the people contracted by the variant are recovered, it is also mentioned that it is highly contagious and can cause the spike of Covid-19 cases (Covid-19.go.id., 2023).

The profound and long-lasting impact of the pandemic brings attention to the importance of vaccination in preventing the spread of virus, the main cause of the Covid-19 pandemic. Immunization and vaccination has been considered as the cornerstone of preventive medicine since this medical intervention is a cost-effective way in global disease prevention (Streefland, 2001). In the population where the coverage of vaccination is high, the rate of infectious diseases, such as smallpox, polio, and measles are relatively low. Therefore, the campaign of vaccination became the main agenda to prevent the spread of viruses, including Coronavirus that cause Covid-19. In Indonesia, the national government states that it aims to administer Covid-19 vaccines to 234,666,020 citizens consisting of medical health workers, senior citizens, public officers, vulnerable communities, and the general public, aged 12-17 years, aged 6-11 years (Kemenkes RI, 2023). As of March 2023, it is reported that the number of Indonesian citizens who have received the first vaccination reached up to 86.86%, while those who have received second dose of vaccination was 74.51%. However, this number is staggeringly low for those who receive the third and fourth doses, which only reached 37.78% and 1.67%, respectively (Kemenkes RI, 2023).

The effectiveness of vaccination, however, does not always lead to acceptance of the vaccine and has been challenged and questioned by individuals or groups. This challenge can go as far as refusal to the vaccine or refusal to be vaccinated. There are many reasons for vaccine challenge or refusal, including religious reasons, political reasons, or even scientific reasons. The negative attitude toward vaccines and vaccinations is nowadays known as "vaccine hesitancy", which can range from questioning, refusing some vaccine (but accepting others), delaying vaccines, or accepting vaccines but unsure doing so (Larson et al., 2014). The debate regarding vaccination has increasingly become more complex amidst the widespread information on the adverse effects of vaccines, thus leading to the question of vaccine safety and risk. Adding to this is the growth of some conservative groups that are actively campaigning their positions against vaccination. With the presence of internet-based digital media communication network, these negative attitudes are now easily disseminated and exacerbated, causing difficulties to conduct vaccination when it is needed.

Researchers and scholars have conducted numerous researches to better understand negative attitudes toward vaccine and have provided explanations of multitudes factors that lead to this attitude (Shen & Dubey, 2019; Opel et al., 2011; Falagas & Zarkadoulia, 2008; Dubé et al., 2014; Hu et al., 2018; Gust et al., 2008; Harmsen et al., 2012; Schuster et al., 2015; Evrony & Caplan, 2017; Larson et al., 2014; Getman et al., 2018; MacDonald & SAGE Working Group on Vaccine Hesitancy, 2015; Smith et al., 2017). These researches identify numerous factors that could generate negative attitudes toward vaccine and vaccination, including perception of vaccine safety, conflicting religious beliefs and political ideologies, competing health priorities, politicization of vaccine recommendations, perception of commercial interest of pharmaceutical industry, mistrust and fear of vaccine, lack of support from healthcare professionals, and also the misinformation and misleading media environment. In the case of children's vaccinations, parents' decision determines whether or not children will be vaccinated, and parents' refusals are associated with limitation of vaccination services, unpleasant vaccination experiences, low quality vaccination pattern, and religious convictions. Some research also identifies sociodemographic factors, such as level of income or Socioeconomic Status (SES) and level of education also contribute to vaccine hesitancy.

In the case of Covid-19, there has been some information that identifies the factors of vaccine refusal in a country-specific context. In the USA, for example, the reasons of refusing to be vaccinated, among others, are the lack of access (real or perceived), the perception that Covid-19 is not a threat, the concerns about vaccine side effects, the lack of trust to the vaccine, the lack of trust to the institutions, and the high circulation of variety of conspiracy

theories through media and information channel (Lopez, 2021). On the other hand, a study in the context of Germany reveals the contributing factors to negative attitude toward Covid-19 vaccine are the perception of lack of vaccination benefit, the perception of low risk in contracting Coronavirus, the perception of potential of vaccine side effect to existing health concerns, lack of information about Covid-19 vaccination, and systemic mistrust and spiritual or religious reasons (Fieselmann et al., 2022). This study highlights the significance of (mis)information and inadequate knowledge in forming negative attitudes toward Covid-19 vaccine, in which conspiracy theories can be the major cause. In the context of Indonesia, based on the survey conducted by University of Maryland in cooperation with Facebook, cited by the Indonesian Ministry of Health, vaccine hesitancy among adults is driven by the concern of vaccine side effects and the perceived uncertainty that lead to delay and to a "wait and see" attitude (Kemenkes RI, 2021). Robson (2023) in his article summarize these various factors that lead to vaccine refusal as 5C, which are: *Confidence* (trust to the vaccine, health services, and health policymakers); *Complacency* (self-pride of having low risk to be infected); *Calculation* (excessive information considerations of pros and cons); Constraint (ease or hassle to access vaccine), Collective Responsibility (willingness to protect other through one's own vaccination).

The previous researches have indicated that among many factors that determine or contribute to attitude formation and decision of vaccination, the risk perception (complacency) and possession of information and knowledge about vaccination (calculation) are factors that are significant and frequently reemerge in many studies. The current research will focus on these two factors to verify their validity whether the factors also contribute to vaccine decision in the context of Indonesian population in this research. The subsequent sections will explore more about these two factors, their measurements used in this research, the method of research, the finding and discussion, which will be concluded with some recommendations.

Theoretical Framework

Risk perception is generally known as the ways in which one thinks and feels about threats or difficulties that she or he faces. In a more elaborate explanation, Rother (2019) defines risk perception as "people's beliefs, attitudes, judgments, and feelings toward risk, and incorporates the wider social and cultural values, as well as outlook, people adopt toward hazards." The thinking, feeling, judgment, or assessment of risk emerge from personal experiences and interpretation of certain events or certain stories, thus it is fundamentally subjective. Affect or emotionality, therefore, plays a critical role in an individual's risk assessment (Thalmann, 2006), and at the same time it would be very likely to contain personal bias. Optimistic bias, for example, is a situation where people think their risk is lower than others when they are asked to compare their risk to similar others (e.g. same age and sex) (Weinstein & Klein, 2015). Hence, risk perception is not unbiased assessment of information, but it is estimation of personal vulnerability based on particular sets of evidence of information (Weinstein, 2001). Because of this reason, the exposure to and possession of correct and accurate information can increase the possibility of accurate risk perception, which will lead to the ability of individuals to make appropriate decisions to avoid illness or injury (Weinstein, 2001).

In regards to attitude toward Covid-19 vaccine and vaccination, several researches have investigated the ways in which risk perception determines or corresponds to attitude formation. Research from Mahmud et al. (2021) in investigating vaccine acceptance in Bangladesh reveals that risk perception, together with other variables, significantly associated with vaccine acceptance. Risk perception in this research was measured by asking respondents about the likelihood of them getting Covid-19 in the future. The questions can be answered with low chance, medium chance, and high chance. The results of this research showed that the perception of high risk of being infected with Covid-19, the perception of high severity, and good knowledge about Covid-19 were significantly linked with vaccine acceptability. Similar research in the UK to examine attitude toward vaccine hesitancy from Phillips et al. (2022) found that the perceived risk threat of Covid-19 among respondents has strong influence on vaccine hesitancy. This research identifies perceived risk by asking participants about the perception of harmfulness of Covid-19, fear of Covid-19, worry of Covid-19, and the

likelihood of participants getting Covid-19 in the next 12 months (Phillips et al., 2022). Interestingly, since this research investigates participants' attitude longitudinally, it found that participants perceived susceptibility and fear of Covid-19 diminished in the period of 3 – 12 months of the survey. This research predicts this decline was caused by, among other, decreased attention to the threat, the perception of population protection due to natural exposure to the virus (Phillips et al., 2022).

Research that examines individual risk perception and vaccine hesitancy was also conducted in Vietnam (Van Nguyen & Nguyen (2022). This research takes into account the information about vaccines that is acquired from social media. This research found that Covid-19 risk perception positively affects vaccine hesitancy, in which the higher the risk of Covid-19 perceived by individuals the higher their vaccine hesitancy. However, this Covid-19 risk perception negatively affects vaccine hesitancy if individuals have had more information about vaccines, including information about safety and efficacy. The authors argued that this finding means the more individuals perceived risk of Covid-19, the more they carefully consider about vaccination; however, the more they acquired more information about vaccine, the more they perceived vaccination positively (Van Nguyen & Nguyen, 2022). Slightly different focus with previous research, research from Liu et al. (2023) investigates how parents' risk perception determine their decision to vaccinate their children. This research reveals that parents who perceive that vaccine Covid-19 would have long-term risk to their children have less probability to get their children vaccinated, although the parents already vaccinated themselves. From this finding, this research recommends more accurate information about vaccine risk to parents to increase vaccines for children, including information that there is no evidence found that mRNA vaccine could change children's genetic makeup (Liu et al., 2023). All these researches show that individual perception of risk in Covid-19 cases is positively associated or positively determined attitude toward vaccines.

Another factor that is the focus of this research is knowledge about Covid-19, or also termed as Covid literacy. Health literacy has long been the focus of research in the field of Public Health as well as in the field of Health Communication. Personal health literacy is, as defined by CDC, "the degree to which individuals have the ability to find, understand, and use information and service to inform health-related decisions and action for themselves and others" (CDC, 2023). This definition from CDC emphasizes the "use" of information and services to make health-related decisions, not only just understanding and comprehending information. It is also emphasizing the "well-informed" health decision that is based on accurate information. In the time of pandemic Covid-19 the challenge for literacy was not so much to find information, as there was abundance of information related to Coronavirus and Covid-19. The challenge was to find trustworthy information and to differentiate accurate information from inaccurate and misleading information. Hence, the term of critical health literacy is gaining traction in sharpening the idea of literacy. Abel & McQueen (2020) argue that critical health literacy, which they defined as "individuals' ability to reflect on complex health issues and critically assess the information available", can be an essential element to address the complexity brought by abundance of information in the timeline Covid-19 crisis.

A number of researches regarding the way in which health-related knowledge would determine individual health-related decisions and behavior have been conducted. Research from Islam et al. (2021) on residents of New Delhi India regarding knowledge, preferences, and anxiety in facing the Covid-19 vaccination revealed those who agree to get the vaccine are people who have sufficient knowledge (quite aware) about the Covid-19 vaccine. Another example is research from Kara et al. (2018) in an investigation of parental acceptance of vaccines for their children in Turkey. This research found that knowledge and understanding of vaccines and their benefits were important factors that attract parents to receive vaccines and accept if vaccines involve additional costs. This type of research has proven that health knowledge or health literacy is an important element in determining health-related behavior.

In regard to measurement of health literacy, particularly Covid-19 literacy, research conducted by Naveed et al. (2020) has come up with a scale that attempts to measure

comprehensive aspects related to knowledge of Covid-19. The constructed instrument comprises 23 items, which consist of two dimensions; (1) knowledge about the transmission of virus and the symptoms of infection (11 questions); and knowledge about infection prevention and treatment knowledge (12 questions) (Naveed et al., 2020). This instrument was developed in two stages. In the first stage, items were generated based on a literature review, public information platforms, and public service messages related to Covid-19, which then resulted in a number of questions submitted to a panel of experts to test content validity and face validity. In the second stage, a cross-sectional survey was conducted on several respondents to test the construct's validity and reliability. The statistical test results show that this instrument is reliable and valid for assessing Covid-19 literacy. Measurement of this factor is done by measuring agreement using a Likert Scale, with a score between 1 and 5, where a score of 1 indicates strongly disagree, and a score of 5 indicates strongly agree. This agreement is stated in a statement that is true or false regarding information on the spread of Covid-19. This is used as an indication of whether the respondent has sufficient understanding about the spread of the Covid-19 virus infection.

Material and Methodology

This research focuses on three main factors, risk perception of Covid-19, knowledge about Covid-19, and vaccination decision. Each of the factors is measured, and then the associations of factors are statistically analyzed. The measurement of the risk perception of Covid-19 consists of 9 items, including perceived risk for oneself and perceived risk for community or population. Measurement of perceived risk of oneself, includes: (1) I have a high risk of contracting Covid-19 during this pandemic; (2) If infected with Covid-19, this will threaten my health; (3) Covid-19 infection has a high risk of threatening my life; (4) Whether I get infected with Covid-19 or not is beyond my control; and (5) I think the current situation of Covid-19 is dangerous". While measurement for perceived risk on community or population includes: (1) People around me (family, neighbors, co-workers, etc.) are at high risk of being infected with Covid-19; (2) In my opinion, the Indonesian population has a high risk of contracting Covid-19 during the pandemic; (3) In my opinion in the next 6 (six) months the transmission of Covid-19 will still occur; (4) I think the government is making the right efforts in dealing with the Covid-19 pandemic (health protocols, PPKM policies, vaccinations)". This measurement used a Likert Scale, with a score between 1 and 5, where a score of 1 indicates strongly disagree, and a score of 5 indicates strongly agree.

Meanwhile, the second factor, knowledge about Covid-19 or Covid Literacy, was measured by Covid Literacy Scale developed by Naveed et al. (2020). As mentioned previously, this scale comprises two dimensions; knowledge of the transmission of virus and the symptoms of infection (11 items questions); and knowledge about infection prevention and treatment knowledge (12 question items). The first dimension measured with statements, such as: (1) I understand how Covid-19 is transmitted and how high is the transmission rate; (2) I understand that people infected with Covid-19 without symptoms can transmit Covid-19 within 15 days; (3) I understand that the transmission of Covid-19 occurs through human intercession; (4) I understand that avoiding body fluids from infected people helps protect myself from the transmission of Covid-19; (5) I understand that an infected person can transmit Covid-19 within 14 days; (6) I know that quarantine and isolation are effective measures to reduce the transmission of Covid-19; (7) I understand that a person infected with Covid-19 with symptoms must isolate; (8) I know the symptoms of Covid-19 (e.g. cough, sore throat, fever, shortness of breath, etc.); (9) I know that if there is contact with someone who is infected with Covid-19, they must be self-isolated for two to three weeks; (10) I know that avoiding direct contact with infected people is one way to protect myself from Covid-19; (11) I understand that a person infected with Covid-19 must isolate for 2 to 3 weeks".

On the other hand, knowledge about infection prevention and treatment knowledge was measured by statement, such as: (1) I can identify people around me who may be infected with Covid-19; (2) I know that after recovering, people infected with Covid-19 can still be at risk of infecting others; (3) There is no vaccine that can cure Covid-19; (4) I understand that people infected with Covid-19 can be cured; (5) I understand the role of spiritual healers during

a pandemic; (6) I know what actions can be taken to prevent transmission of Covid-19 (for example washing hands, using a sanitizer, wearing a mask, social distancing, avoiding public gatherings and traveling, covering your mouth when you sneeze, and self-quarantine; (7)I know the death toll from the Covid-19 pandemic; (8) I know what are the credible sources of information about the Covid-19 pandemic; (9) I understand when to do a Covid-19 test; (10) I understand the role of alternative medicine in curing Covid-19; (11) I know when to self-quarantine; (12) I know when to seek medical care for professional healthcare. This measurement also used a Likert Scale, with a score between 1 and 5, where a score of 1 indicates strongly disagree, and a score of 5 indicates strongly agree.

The third factor in this research, the vaccination decision, was measured with the question: "have you been vaccinated against Covid-19 (first dose or second dose)?". This question was followed by a number of follow up questions, if the answer to the previous question is "no". which are; (1) if given the opportunity to receive the Covid-19 vaccine, would you be willing to be vaccinated?; (2) do you allow your family to receive the Covid-19 vaccine?; (3) would you encourage your family to get vaccinated against Covid-19? All these questions were answered by "yes" or "no".

Data Collection

Data collection in this study was carried out through online surveys by distributing questionnaires via social media and email. The data collection period spanned from September 2021 to January 2022 (a period of almost two years during the pandemic), and data for 362 responses were collected. Some of all the data collected were scrapped or were not taken into account, for the following reasons: (1) One respondent stated that he was not willing to participate in the survey; (2) Fourteen respondents did not provide correct age information; (3) Thirteen respondents have not yet reached the age of 18 (the age limit that is considered able to make decisions independently). From the results of this initial evaluation, 334 responses were obtained and considered to provide responses that met the requirements to be taken into account in the data analysis stage.

Result and Discussion

From the total of 334 participants in this research, the composition of gender, educational level, and working status can be seen in Table 1. In regards to the gender composition of the respondents, more than half (61.7%) were women while a small percentage of participants (1.5%) did not identify to a particular gender group. Meanwhile, from the aspect of educational level, the majority of respondents have reached university education (50.3%), followed by high school education (47.9%). Small percentage of respondents reported they only reached elementary school and junior high school education (0.9%). In terms of working status, the majority of respondents were students (51.8%). Almost one fifth (19.8%) of research participants were private sector employees, higher than public sector employees that reached only less than 10% of participants. At least 4.2% of participants reported they were business owners, while 2.7% were homemakers, and 2.4% were unemployed. These characteristics of participants can be seen in Table 2 below.

Table 1. Data of research respondents

Characteristics	
Gender	
Male	36.8%
Female	61.7%
Other (not mentioned)	1.5%
Highest educational level	
Elementary school	0.9%
Junior High school	0.9%
Senior High school	47.9%
University/College	50.3%
Working status	
Homemaker	2.7%
Private sector employee	19.8%

	Public sector (government) employee	9%
	Student	51.8%
	SME (small-medium enterprise)	0.9%
	Medical worker	0.3%
	Teacher/lecturer	9%
	Unemployed	2.4%
	Business owner	4.2%

In regards to the participants' knowledge of Covid-19, descriptive statistical analysis shows that research participants have relatively a good knowledge of Covid-19 (with scale 1 to 5, M=4.26, SD=.742). This result indicates that research respondents have a considerable good knowledge of the transmission of virus, the symptoms of infection, infection prevention and treatment if infected by virus. In addition, respondents have a relatively moderate perception of risk of Covid-19 (with scale 1 to 5, M=3.54, SD = 1.141). This means their perceived own risk of being infected by the virus as well as perceived risk of community is neither high nor low. It also indicates that they are not too optimistic about not being infected/immune, but also are not pessimistic about being easily infected and would be severely affected by the infection. As for vaccination decisions, the majority of research respondents decided to be vaccinated (with scale 0 and 1; M=.97, SD=.17). This means that only a small number of respondents have not decided to be vaccinated, or have not taken the vaccine. In addition, from the follow up questions, the respondents showed that they were willing to be vaccinated, and would recommend their family member(s) to be vaccinated.

To examine the correlation between perceived risk of Covid-19, knowledge of Covid-19 and vaccine decision, 0-order correlation was performed (Table 2). Analysis between literacy about Covid-19 and vaccine

decision shows that there is no correlation between these two variables. It means that whether participants decide to take or not to take the vaccine, is not based on their knowledge of Covid-19. The similar result also can be seen from the statistical analysis of correlation between perceived risk of Covid-19 and vaccination decision, in which there is no correlation between these two variables. It also means whether research participants view themselves as having high risk and low risk of being infected by Covid-19 or having risk of being severely affected by it, has not had any association with their decision to be vaccinated or not to be vaccinated. The result of this data analysis shows the result is different from that of previous research that shows vaccination decision is correlated with knowledge of Covid-19 and the individual perception of risk to be infected and affected by Covid-19 (Mahmud et al., 202; Phillips et al., 2022; Van Nguyen & Nguyen, 2022; Liu et al., 2023; Islam et al., 2021; Kara et al., 2018).

Table 2. 0-order correlation examining the relationship between vaccination decision and other related variables

	Variables	M	SD	1	2	3	4	5
1	Gender	n/a	n/a					
2	Educational level	13.93	2.176	0.130*				
3	Working status	n/a	n/a	13.746**	0.717**			
4	Covid-19 literacy	4.26	0.742	-0.244**	0.177**	0.139*		
5	Perceived risk	3.54	1.141	-0.067	0.093	0.076	0.253**	
6	Vaccination decision	0.97	0.170	0.066	-0.006	0.011	-0.022	0.014

a = Kendall's Tau; **Pearson Correlation is significant at the 0.01 level (2-tailed); Strong correlation between ± 0.50 and 1; Medium correlation between ± 0.30 and ± 0.49; Small correlation below ± 0.29.

An explanation that can be made of this result is the approach that was used by the Indonesian government in compelling or pushing people to be vaccinated. The Indonesian government implemented a vaccine mandate to the citizens, and linked vaccination with authorization for accessing public transportations (i.e. inter-city bus, train, ship, and air transportation) for domestic traveling. The vaccine mandate as a requirement for domestic traveling began to take effect in July 2021, with regulation of Covid-19 Handling from Task Force in Circular No. 14/2021 (Satgas Covid-19, 2022). Before issuing vaccine mandates for domestic travel, requirements for traveling were just some sets of health protocols, such as usage of facemask, physical distancing, in addition to PCR testing. The vaccine mandate for domestic traveling was continuously updated, from mandating first vaccine, second vaccine, up to booster vaccine (the updates of the vaccine mandates for domestic traveling can be traced in Covid-19 National Task Force website). The latest vaccine mandate for domestic traveling was issued on March 13, 2023, with Addendum to Circular No. 24/2022. The similar mandate was also implemented for accessing public facilities (such as banking services, public service offices, shopping centers, etc.) and participation in public gathering.

This type of vaccine mandate puts pressure on the citizens, particularly those who are already 18 years old and above to get vaccinated. Otherwise, they would not have access to public transportations and public facilities. Unvaccinated individuals would be unable to access all these facilities, or they have to provide a negative PCR test. This PCR test was not available for free, and individuals need to pay a certain cost for the test. This is most likely part of the reason why Indonesia has a high percentage of coverage for the first and the second vaccination (86.86% and 74.51%, respectively). This number significantly decreased for the first and second vaccine booster (37.78% and 1.67%, respectively) because the vaccine mandate was no longer implemented for the vaccine booster. Or even if it was mandated, the implementation was not strictly monitored. Since this research investigated the vaccination decision from the first vaccine, it shows no correlation between perceived risk and knowledge of Covid-19). The analysis perhaps would show different results if the correlation analysis particularly examined the third and fourth vaccination (first and second booster) where the decision to get vaccinated is more voluntary and not mandated to have access to other public facilities. This point can be further investigated in future research since the endeavor to get citizens vaccinated for first and second boosters is continuing to date.

The implementation of the vaccine mandate in Indonesia can be seen as one of the approaches to increase vaccine intake in case of emergency such as pandemic Covid-19. Not all countries in the world implemented such a vaccine mandate, but Indonesia is among several countries in the group. Some countries opted for limited mandate, such as mandate for certain groups in population like at-risk age groups or health worker groups. From the public health perspective, this is an effective way to increase the number of vaccinated citizens. However, such a mandate has always followed by the controversy that oftentimes contrasted to individual freedom and personal choice. However, many see the vaccine mandate as ethically justified in the situation where the threat is profound and there are no better alternatives that are as effective as vaccine available. In the case of implementation of the vaccine mandate in Indonesia, vaccine hesitancy and resistance can be pushed down to increase immunity to the virus in the community, or known as herd immunity. The willingness or unwillingness to be vaccinated based on possession of knowledge of the virus and risk perception become irrelevant in talking about vaccine uptake. The case of Covid-19 outbreak displays a rather different explanation of vaccine uptake and the ways in which individual attitudes related to it from cases of other vaccinations.

Conclusions

This research aimed to investigate whether the perceived risk of Covid-19 and knowledge of Covid-19 correlate to the vaccination decision in the case of a group of citizens in Indonesia. The statistical analysis showed there was no correlation between knowledge of Covid-19 and perception of risk of Covid-19 to vaccination decision among participants of this research. This result did not corroborate a number of previous researches that have shown some correlation and causation among the investigated factors. Part of

explanation to this result was the vaccine mandate that was implemented in the context of where the research was conducted. Vaccination of Covid-19 was compelled by linking it to access to many public facilities, such as public transportations and various public services. This vaccine mandate was effective to increase vaccine uptake, as shown in the percentage of population that has been vaccinated, particularly for the first and second vaccination. The number, however, was rather different for the percentage of booster vaccine, where vaccine mandates were no longer implemented or strongly monitored. The factors of knowledge and risk perception are more likely to have association to vaccine decisions where the vaccination is more voluntary rather than mandated. Further research can be conducted to this theme as well as to investigate and to analyze vaccine decision for indifferent groups of citizens in Indonesia.

References

Abel, T., & McQueen, D. (2020). Critical health literacy and the COVID-19 crisis. *Health Promotion International*, *35*(6), 1612–1613. https://doi.org/10.1093/heapro/daaa040

CDC. (2023, March 31). *What is health literacy? Take action. Find out.* Centers for Disease Control and Prevention. https://www.cdc.gov/healthliteracy/learn/index.html

Covid-19.go.id. (2023, April 20). *Per 17 April 2023 Terdapat 7 Kasus COVID-19 sub varian Arcturus Ditemukan di Indonesia | Covid19.go.id*. Covid-19.Go.Id. https://covid19.go.id/artikel/2023/04/20/17-april-2023-terdapat-7-kasus-covid-19-sub-varian-arcturus-ditemukan-di-Indonesia

Dubé, E., Gagnon, D., Nickels, E., Jeram, S., & Schuster, M. (2014). Mapping vaccine hesitancy—Country-specific characteristics of a global phenomenon. *Vaccine*, *32*(49), 6649–6654. https://doi.org/10.1016/j.vaccine.2014.09.039

Evrony, A., & Caplan, A. (2017). The overlooked dangers of anti-vaccination groups' social media presence. *Human Vaccines & Immunotherapeutics*, *13*(6), 1475–1476. https://doi.org/10.1080/21645515.2017.1283467

Falagas, M. E., & Zarkadoulia, E. (2008). Factors associated with suboptimal compliance to vaccinations in children in developed countries: A systematic review. *Current Medical Research and Opinion*, *24*(6), 1719–1741. https://doi.org/10.1185/03007990802085692

Fieselmann, J., Annac, K., Erdsiek, F., Yilmaz-Aslan, Y., & Brzoska, P. (2022). What are the reasons for refusing a COVID-19 vaccine? A qualitative analysis of social media in Germany. *BMC Public Health*, *22*(1), 846. https://doi.org/10.1186/s12889-022-13265-y

Getman, R., Helmi, M., Roberts, H., Yansane, A., Cutler, D., & Seymour, B. (2018). Vaccine Hesitancy and Online Information: The Influence of Digital Networks. *Health Education & Behavior*, *45*(4), 599–606. https://doi.org/10.1177/1090198117739673

Gourinchas, P.-O. (2023, January 30). *Global Economy to Slow Further Amid Signs of Resilience and China Re-opening*. IMF. https://www.imf.org/en/Blogs/Articles/2023/01/30/global-economy-to-slow-further-amid-signs-of-resilience-and-china-re-opening

Gust, D. A., Darling, N., Kennedy, A., & Schwartz, B. (2008). Parents with doubts about vaccines: Which vaccines and reasons why. *Pediatrics*, *122*(4), 718–725. https://doi.org/10.1542/peds.2007-0538

Harmsen, I. A., Lambooij, M. S., Ruiter, R. A. C., Mollema, L., Veldwijk, J., van Weert, Y. J. W. M., Kok, G., Paulussen, T. G. W., de Wit, G. A., & de Melker, H. E. (2012). Psychosocial determinants of parents' intention to vaccinate their newborn child against hepatitis B. *Vaccine*, *30*(32), 4771–4777. https://doi.org/10.1016/j.vaccine.2012.05.034

Hu, Y., Chen, Y., Wang, Y., & Liang, H. (2018). Measuring childhood vaccination acceptance of mother in Zhejiang province, East China. *Human Vaccines & Immunotherapeutics*, *15*(2), 287–294. https://doi.org/10.1080/21645515.2018.1526557

Islam, F., Agarwalla, R., Panda, M., Alvi, Y., Singh, V., Debroy, A., Ray, A., Vadnerkar, A., & Uttekar, S. (2021). Assessment of the knowledge, preferences and concern regarding the prospective COVID- 19 vaccine among adults residing in New Delhi, India-A cross sectional study. *MedRxiv*, 2021.01.23.21250164. https://doi.org/10.1101/2021.01.23.21250164

Kara, S. S., Polat, M., Yayla, B. C., Demirdag, T. B., Tapisiz, A., Tezer, H., & Camurdan, A. D. (2018). Parental vaccine knowledge and behaviours: A survey of Turkish families. *Eastern Mediterranean Health Journal = La Revue De Sante De La Mediterranee Orientale = Al-Majallah Al-Sihhiyah Li-Sharq Al-Mutawassit*, *24*(5), 451–458. https://doi.org/10.26719/2018.24.5.451

Kemenkes RI. (2021, Mei). *80,8% Orang Indonesia Bersedia Menerima Vaksin COVID-19*. Kementerian Kesehatan Republik Indonesia. https://www.kemkes.go.id/article/view/21051200002/80-8-orang-indonesia-bersedia-menerima-vaksin-covid-19.html

Kemenkes RI. (2023, March 18). *Vaksin Dashboard*. Vaksinasi Covid-19 Nasional. https://vaksin.kemkes.go.id/#/vaccines

Larson, H. J., Jarrett, C., Eckersberger, E., Smith, D. M. D., & 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

Liu, Y., Bruine de Buin, W., Kapteyn, A., & Szilagyi, P. G. (2023). Role of Parents' Perceived Risk and Responsibility in Deciding on Children's COVID-19 Vaccination. *Pediatrics*. https://doi.org/10.1542/peds.2022-058971

Lopez, G. (2021, June 2). *The 6 reasons Americans aren't getting vaccinated*. Vox. https://www.vox.com/2021/6/2/22463223/covid-19-vaccine-hesitancy-reasons-why

MacDonald, N. E. & SAGE Working Group on Vaccine Hesitancy. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine*, *33*(34), 4161–4164. https://doi.org/10.1016/j.vaccine.2015.04.036

Mahmud, S., Mohsin, Md., Khan, I. A., Mian, A. U., & Zaman, M. A. (2021). Knowledge, beliefs, attitudes and perceived risk about COVID-19 vaccine and determinants of COVID-19 vaccine acceptance in Bangladesh. *PLoS ONE*, *16*(9), e0257096. https://doi.org/10.1371/journal.pone.0257096

Naveed, M. A., Shaukat, R., & Anwar, M. (2020). Development and Validation of a Covid-19 Literacy Scale. *Library Philosophy and Practice (e-Journal)*, *4362*. https://digitalcommons.unl.edu/libphilprac/4362

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

Phillips, R., Gillespie, D., Hallingberg, B., Evans, J., Taiyari, K., Torrens-Burton, A., Cannings-John, R., Williams, D., Sheils, E., Ashfield-Watt, P., Akbari, A., Hughes, K., Thomas-Jones, E., James, D., & Wood, F. (2022). Perceived threat of COVID-19, attitudes towards vaccination, and vaccine hesitancy: A prospective longitudinal study in the UK. *British Journal of Health Psychology*, 10.1111/bjhp.12606. https://doi.org/10.1111/bjhp.12606

Robson, D. (2023, July 23). *Why some people don't want a Covid-19 vaccine*. https://www.bbc.com/future/article/20210720-the-complexities-of-vaccine-hesitancy

Rother, H.-A. (2019). Challenges in Pesticide Risk Communication☆. In J. Nriagu (Ed.), *Encyclopedia of Environmental Health (Second Edition)* (pp. 566–576). Elsevier. https://doi.org/10.1016/B978-0-12-409548-9.02150-3

Satgas Covid-19. (2022, August 28). *Regulasi Perjalanan Domestik*. https://covid19.go.id/artikel/2022/08/26/surat-edaran-kasatgas-nomor-24-tahun-2022

Schuster, M., Eskola, J., Duclos, P., & SAGE Working Group on Vaccine Hesitancy. (2015). Review of vaccine hesitancy: Rationale, remit and methods. *Vaccine*, *33*(34), 4157–4160. https://doi.org/10.1016/j.vaccine.2015.04.035

Shen, S., & Dubey, V. (2019). Addressing vaccine hesitancy. *Canadian Family Physician*, *65*(3), 175–181.

Smith, L. E., Amlôt, R., Weinman, J., Yiend, J., & Rubin, G. J. (2017). A systematic review of factors affecting vaccine uptake in young children. *Vaccine*, *35*(45), 6059–6069.

Streefland, P. H. (2001). Public doubts about vaccination safety and resistance against vaccination. *Health Policy (Amsterdam, Netherlands)*, *55*(3), 159–172. https://doi.org/10.1016/s0168-8510(00)00132-9

Thalmann, A. T. (2006). How to Communicate Risks in Gene Therapy**The views expressed in this article are entirely those of the author and may not in any circumstances be regarded as stating an official position of the Swiss Federal Office for Public Health. In J. Niewöhner & C. Tannert (Eds.), *Gene Therapy* (pp. 203–221). Elsevier Science B.V. https://doi.org/10.1016/B978-044452806-3/50016-0

United Nations. (2023, January 25). *World Economic Situation and Prospects 2023*. UN DESA Publications. http://desapublications.un.org/publications/world-economic-situation-and-prospects-2023

Van Nguyen, D., & Nguyen, P.-H. (2022). Social media and COVID-19 vaccination hesitancy: Mediating role of the COVID-19 vaccine perception. *Heliyon*, *8*(9), e10575. https://doi.org/10.1016/j.heliyon.2022.e10575

Weinstein, N. D. (2001). Health Risk Appraisal and Optimistic Bias. In N. J. Smelser & P. B. Baltes (Eds.), *International Encyclopedia of the Social & Behavioral Sciences* (pp. 6612–6615). Pergamon. https://doi.org/10.1016/B0-08-043076-7/03805-5

Weinstein, N. D., & Klein, W. M. P. (2015). Health Risk Appraisal and Optimistic Bias. In J. D. Wright (Ed.), *International Encyclopedia of the Social & Behavioral Sciences (Second Edition)* (pp. 698–701). Elsevier. https://doi.org/10.1016/B978-0-08-097086-8.25012-5

World Bank. (2023, February 16). *COVID-19's Impact on Young People Risks a Lost Generation*. World Bank. https://www.worldbank.org/en/news/press-release/2023/02/16/covid-19-s-impact-on-young-people-risks-a-lost-generation.