

# COVID-19 Vaccine Hesitancy among International University Students: An Empirical Study at Siam University

Lucky Darlami, Rashminda Attanayake

Siam University,  
Thailand

*luckydarlami360@gmail.com*

## ABSTRACT

The COVID-19 pandemic is seen as a worldwide problem, with countries from all around the world cooperating to control it. Vaccine hesitancy is a barrier in controlling the covid-19 pandemic. This study aimed to determine the COVID-19 vaccine hesitancy among international university students utilizing the 5C psychological antecedents' model (confidence, constraints, complacency, calculation, and collective responsibility). This study adopted a cross-sectional research design. 50 responses were collected from international university students in Siam University, Thailand through an online survey (Google form).

Around 76% of international students are in favor with taking the vaccine. Moreover, around 80% of students are willing to encourage others (family and friends) to take the vaccine while the rest discourage their families or request them to delay on taking the vaccine. According to the simple linear regression, more substantial confidence ( $\beta = -0.772$ ,  $p < 0.05$ ) and collective responsibility ( $\beta = -0.728$ ,  $p < 0.05$ ) were significantly associated with reduced Covid-19 vaccine hesitancy, whereas increased complacency ( $\beta = 0.755$ ,  $p < 0.05$ ) significantly increased the vaccine hesitancy. However, Constraints (Academic Stress) and Calculation were non-significant predictors of covid-19 vaccine hesitancy. According to multiple regression analysis, 72% of the variation in hesitancy can be explained by the model containing 5C psychological antecedents. This is quite high so the predictions from the regression equation are fairly reliable.

These findings suggest that public confidence in the vaccine and health system that delivers the vaccination service are crucial. Widespread misinformation, conspiracy beliefs and superstitions regarding the covid-19 vaccine and its potential health hazards have been found to diminish public trust that need to be addressed through proper communication. This study also supported the fact that higher collective responsibility lowers vaccine hesitancy. So, it is important to educate the people about herd immunity and the importance of collectivism to eradicate the pandemic.

**Keywords:** COVID – 19, Vaccine Hesitancy, 5C Psychological Antecedents, International University Students



## INTRODUCTION

### Background of the Study

The COVID-19 pandemic is seen as a worldwide problem, with countries from all around the world cooperating to stop it from spreading. The World Health Organization (WHO) and a vast number of research teams and clinical experts across the world are spearheading initiatives and campaigns focused on illness prevention, early diagnosis, and medical treatment. Vaccine reluctance is defined as delaying or rejecting immunization despite the availability of vaccinations. Because herd immunity is required to flatten epidemic curves, vaccine hesitation impacts the hesitance of the person and therefore the whole community. International students, as compared to the general population, are increasingly considered as a susceptible group because they experience greater levels of anxiety and depression, are misled by social media, and have the capacity to disseminate incorrect information about the covid-19 vaccination. The coronavirus disease pandemic that began in 2019, has had an impact on university education across the globe. Additionally, in addition to the increased danger of mortality, the broad breakout of the COVID-19 virus has resulted in a significant increase in covid-19 vaccine hesitancy. However, no research has been conducted in Thailand to determine the Covid-19 vaccine hesitancy among undergraduate students. Until recently, the consequences of Covid-19 vaccine hesitancy among foreign university students were not taken into consideration. To determine why certain international undergraduate students at Siam University are reluctant to get the covid-19 vaccination while others are not, this research seeks to uncover the reasons for their differences.

### Significance of the Study

The goal of this research is to evaluate undergraduate students' reluctance and acceptance of the COVID-19 vaccination at Siam University, with the premise that some students are hesitant to be vaccinated while others are getting vaccinated without voluntarily. This study can also help the university to understand why students are reluctant to the COVID-19 vaccine and what are the main reasons behind them. Collected data might also help the international college to organize awareness program of the importance of COVID-19 vaccine and why students should not refuse the vaccine or delay getting vaccinated.

### Statement of the Problem

The coronavirus has revealed a substantial amount of information in recent months, and it is still being examined. For example, children and teens may be carriers of the virus but are unaware of it since they are asymptomatic and have not been tested. While the new vaccines were offered to select groups by the end of December 2020, they were not be available to the general public for several months beyond that date. It is hard to emphasize enough the importance of immunizations for children and adolescents when they are accessible. The worry is whether or not young people, particularly college students, will take advantage of community-based vaccination programs. Indeed, information has the capacity to transform perspectives. It is critical that early actions be made to determine whether or not college students will get the immunization in order to tailor awareness campaigns to them. In Thailand, the determinants affecting students' hesitancy for covid-19 vaccines has not yet been studied. Moreover, the studies connected to understand vaccine hesitancy-related Behaviour did not use 5C psychological antecedents.

## The Objectives of the Study

1. To determine the effect of 5C psychological antecedents on Covid-19 vaccine hesitancy among international students at Siam University.
2. To assess the degree of Covid-19 vaccine hesitancy among international students at Siam University.

## LITERATURE REVIEW

### COVID-19 Pandemic

In December 2019, the World Health Organization (WHO) classified COVID-19 as a new infectious respiratory illness in Wuhan, Hubei province, China. The COVID-19 pandemic is described as the century's most significant global health disaster and humanity's biggest challenge since the 2nd World War. According to the report of the World Health Organization (WHO as of September 17, 2021), the current outbreak of COVID-19, has affected over 226,844,344 people and killed more than 4,666,334 people in more than 200 countries throughout the world. Coronavirus pandemic has not only had dramatic health impact but also disrupted national economies. Almost every country is attempting to stem the spread of the disease by testing and treating patients, quarantining suspects through contact tracing, banning big gatherings, and maintaining total or partial lockdown, among other measures, however these measures aren't sustainable to control this pandemic and allow economies to restart. For that reason, to end this pandemic, vaccines for covid-19 were developed under just 1 year time, which is quite remarkable. Normally any vaccines development process takes years to be complete. As of 14 September 2021, a total of 5,634,533,040 vaccine doses have been administered despite some population hesitance to the COVID-19 vaccines (WHO, 2020).

### COVID-19 Vaccines

To control this pandemic, COVID-19 vaccines were developed rapidly and in a very short amount of time than any other vaccine. Normally any vaccine development process can take years before they can be successfully passing the safety standards, which might explain that many people are hesitant to receive these fastest made vaccines, fearing that these vaccines might not be very safe. Moreover, the hesitancy is also related to the manufacturers and their respective countries. According to a poll conducted by Suan Dusit Rajabhat University, or Suan Dusit Poll (Bangkok Post, 2021) the Pfizer vaccine (75.11%) is preferred more than other vaccines, Moderna (72.14%), Johnson & Johnson (68.52 %), AstraZeneca (65.89%), and Sputnik V (61.89 %). The published poll made no mention of Sinovac.

Around 119 million doses of Chinese made COVID-19 vaccines were supplied to Southeast Asia, making it the main region for China's strong diplomacy through vaccine, however the largely negative perception towards the likes of Sinovac and Sinopharm vaccines (Khairulanwar Zaini and Hoang Thi Ha, 2021) As mentioned above, Sinovac vaccine was not even mentioned in the pool of Suan Dusit Poll. Interestingly, according to a recent nationwide poll conducted by social weather station discovered that Sinovac biotech and Pfizer and biotech were the most preferred covid-19 vaccines among adults Filipinos. In the poll, carried out on 28 April 2021 and published on Monday 24 May 2011, 39% of adult Filipino people indicated they chose vaccination for Sinovac and 32% selected vaccine (Tomagruz, 2021). These

findings indicate that hesitancy towards COVID-19 vaccine is correlated to the type of vaccine people trust.

### **Covid-19 Vaccine Hesitancy**

In the form of successful mass immunization programs, vaccines have saved millions of lives and improved health and wellbeing across the world. The World Health Organization has identified vaccine hesitancy as one of the top ten global health threats. The World Health Organization (WHO) defines COVID-19 vaccine hesitancy as "delay in accepting or refusing immunization notwithstanding the availability of vaccination services."

The COVID-19 vaccine hesitancy among Egyptian medical students shows that 46% had vaccination hesitancy (Saied et al., 2021) and medical students of Southeast Michigan shows 23% were unwilling to take COVID-19 vaccine (Lucia et al., 2021), whereas only 13.9% medical students in Italy were hesitant (Barello et al., 2020). Students who chose to receive the vaccination right away were more likely to trust public health officials, had fewer concerns about side effects, and support vaccine requirements. Fear of significant adverse effects was associated with a reduced likelihood of wanting to participate in a COVID-19 vaccination study (Lucia et al., 2021).

According to a poll of 1,900 colleges and institutions conducted by the New York Times, 321,000 college students in the United States have tested positive for the coronavirus since the outbreak began. 68,000 new instances were added in the last month. More than 65 universities have reported 1,000 cases since the outbreak began, with 540 colleges reporting around 100 cases (Smith M., 2020).

According to Smith M., (2020), The New York Times stated that as of November 19, more than 80 people have died since the epidemic started, the majority of them workers, not pupils. However, at least four students have died in recent weeks as a result of the illness. Blanco & Courant (2020) stated that on November 13, 2020, the whole University of Connecticut Storrs campus was quarantined. On campus, a total of 62 confirmed or probable positive cases were isolated. This semester, 288 on-campus students and 181 off-campus students tested positive for the virus in instances was attributable to off-campus events when the weather improved.

According to Trimble (2019), "WHO defined vaccine hesitancy as the hesitation or refusal to vaccinate notwithstanding the availability of vaccinations." Additionally, she said, "Vaccination, the organization continued, is 'one of the most cost-effective methods of disease prevention,' adding that it saves between 2 million and 3 million fatalities each year. Around 1.5 million more deaths might be averted if immunization rates were raised globally." This hesitation is due to a variety of factors. For instance, some individuals are fearful about vaccines. The Internet, particularly social media, plays a significant role in instilling fear about vaccines.

Yang (2012) conducted a survey of 371 college students to ascertain why they were reluctant to get the H1N1 influenza vaccine. College students had one of the highest infection rates, yet just 8% got the H1N1 vaccination. Yang discovered that the majority of pupils lacked fundamental understanding about H1N1 and the H1N1 vaccination. They erred in their assessment of what they understood about the vaccination. They were persuaded to receive the vaccine when they sought information about the real dangers connected with vaccination. Yang

stated that communication with college students must emphasize the distinction between what they believe they know and what they really know.

Synnott, n.d. conducted a survey of 735 college students to ascertain their willingness to get the COVID-19 coronavirus vaccine. They discovered that 633 (86.1%) pupils said they would get vaccinated, whereas 102 (13.9%) indicated they would not or were unsure.

A significant lot of information on the coronavirus has come to light in recent months, and it is still being investigated. Children and teenagers, for example, may be carriers of the virus but be unaware of it since they are asymptomatic and have not been tested for it. Despite the fact that the new vaccinations will be accessible for some groups by the end of December 2020, they will not be available for all individuals for many months beyond that date. It is impossible to emphasize the significance of vaccinating children and adolescents when vaccinations are available. The issue is whether or not young people, especially college students, will take advantage of the vaccinations available in their communities. Information does have the ability to alter views. It is imperative that steps be taken immediately to identify whether or not college students will get the vaccination in order to create information campaigns specifically for them.

## **5C psychological antecedents of vaccination**

It is important to understand the determinants of the individual decision-making process that result in delay or omission of vaccination. The vaccine hesitancy is predominantly the outcome of the individual decision-making process, which is influenced by individual's feelings about the vaccination or a particular vaccine, barriers and enablers to vaccinate. Thus, it is crucial to understand which psychological drivers determine to delay or refusal of the vaccination. Bestch et al. have incorporated and expanded existing vaccination Behaviour measures and proposed a framework of 5C psychological antecedents of vaccination. It includes confidence, complacency, constraints, calculation and collective responsibility.

### **Confidence**

Confidence is defined as trust in (i) the effectiveness and safety of vaccines, (ii) the system that delivers them, including the reliability and competence of the health services and health professionals, and (iii) the motivations of policymakers who decide on the need of vaccines” (MacDonald, 2015). Individuals who lack confidence have negative attitudes towards vaccination (in contrast to the complacency and convenience types), which guide behavior. Misinformation, belief in conspiracies, and increased perceptions of vaccine-related risks contribute to the negative attitude. Therefore, we expect a positive correlation between confidence and attitudes toward vaccination (Askelson et al., 2010a), correct knowledge about vaccination (Zingg & Siegrist, 2012), trust in the health care system, beliefs about benefits of medicines, and a negative correlation with beliefs about harms of medicines (Horne et al., 2007) and conspiracy mentality (Bruder et al., 2013).

### **Complacency**

Complacency “exists where perceived risks of vaccine-preventable diseases are low, and vaccination is not deemed a necessary preventive action” (MacDonald, 2015). Complacent individuals do not feel threatened by infectious diseases and thus have no impetus to change their prevention behavior (Schwarzer R, 1996). As there is low involvement, general knowledge, awareness, and the level of active information searching are also low (Fischer et

al., 2011). The preventive behavior is also not seen as the descriptive or injunctive norm in the society; therefore, we expect no relation to subjective norms (Askelson et al., 2010b). Complacency should, however, be negatively related to perceived risks of diseases (Brewer et al., 2007). As prevention is a future-oriented behavior, we also expect a negative correlation with the consideration of future consequences (Petrocelli, 2003). As consequences in the future are not relevant, individuals high in complacency should also have a positive general risk attitude, indicating a preference for risk-seeking behaviors (Petrocelli JV, 2003). This could also be related to feelings of invulnerability (Lapsley & Hill, 2009) and a positive subjective personal health status.

### **Constraints**

Constraints are an issue when “physical availability, affordability and willingness-to-pay, geographical accessibility, ability to understand (language and health literacy) and appeal of immunization service affect uptake” (MacDonald, 2015). Thus, structural, and psychological barriers (access, a lack of self-control) are ‘gate-keepers’, impeding the implementation of vaccination intentions into behavior. Travel time or inconvenient procedures may also act as barriers. Perceiving constraints should therefore be related to a lack of perceived behavioral control (Askelson et al., 2010c) self-efficacy (Luszczynska et al., 2005) and empowerment (Marta et al., 2017). We expect positive correlations with perceived time pressure and daily hassles (Holm EJ, 1992), and a negative correlation with perceived access to health care (Cylus & Papanicolas, 2015).

### **Calculation**

Calculation refers to individuals’ engagement in extensive information searching. We assume that individuals high in calculation evaluate risks of infections and vaccination to derive a good decision. Calculation should therefore be related to perceived vaccination and disease risks (Brewer et al., 2007). Engaging in cost-benefit calculations could be a sign of being risk-averse, thus, the correlation with risk-attitude should be negative (Johnson et al., 2004). Depending on the information sources that are used, high calculation can lead to non-vaccination due to the high availability of anti-vaccination sources, for instance, on the internet (Johnson et al., 2004; Kata, 2012). In general, we expect that the more information a person looks for, the more vaccine-critical sources will be obtained (Dubé et al., 2013), also supported by a false-balance effect in the media (e.g., by providing an equal number of pro- and contra-vaccination experts even though in total there are many more pro-vaccinations than contra-vaccination experts (Dixon & Clarke, 2013). Thus, we predict a positive correlation with perceived vaccination risks. Individuals high in calculation should be rather risk-averse, i.e., their conscious and controlled processing leads us to assume that avoiding risks may be an important motivator (Brewer et al., 2007). This should also be associated with a more deliberative cognitive style of decision making (Betsch, 2006) and less irrational thinking (superstitious beliefs; (Wiseman R, 2004). We will further explore the relation with numeracy (Cokely ET, 2012).

### **Collective Responsibility**

Collective responsibility can be defined as the willingness to protect others by one’s own vaccination by means of herd immunity (Fine et al., 2011). The flipside is the willingness to freeride when enough others are vaccinated (Betsch et al., 2018; Fine et al., 2011) (Betsch, 2006). Collective responsibility should correlate positively with collectivism (Betsch et al., 2018; Shulruf B, 2007) communal orientation (Clark et al., 1987), and empathy (Spreng et al.,

2009). It should correlate negatively with individualism (Shulruf B, 2007). Thus, people high in collective responsibility are willing to vaccinate in another person’s interest. Having low values can indicate that a person does not know about herd immunity or does not care or does not want to vaccinate for the benefit of others.

### Development of Hypothesis

Based on the foregoing information, the following hypotheses are developed:

**H<sub>1</sub>:** Higher confidence in COVID-19 vaccines will lower the covid-19 vaccines hesitancy among international students.

**H<sub>2</sub>:** Complacency has a relationship with the covid-19 vaccines hesitancy among international students.

**H<sub>3</sub>:** Academic Stress has a relationship with the covid-19 vaccines hesitancy among international students.

**H<sub>4</sub>:** Calculation has a relationship with the covid-19 vaccines hesitancy among international students.

**H<sub>5</sub>:** Collective responsibility has a relationship with the covid-19 vaccines hesitancy among international students.

### Proposed Conceptual framework

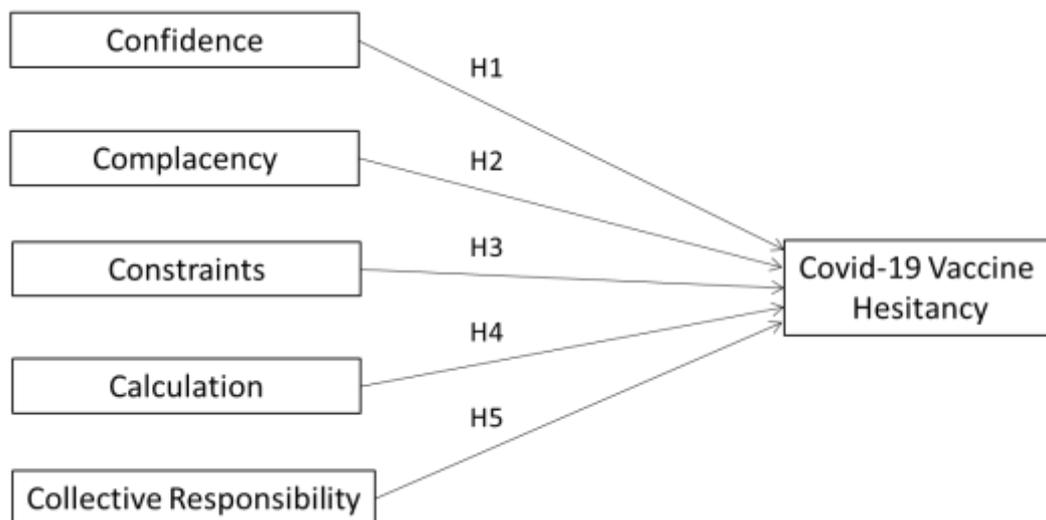


Figure 1: Proposed Conceptual Framework

## METHODOLOGY

### Research Design

To operationalize the variables related to Covid-19 vaccine hesitancy among international students, an online survey was conducted to obtain quantitative data to be able to examine the recommended hypotheses. To measure the Covid-19 vaccine hesitancy, an online survey is often used by the researchers (Alyami & Spiteri, 2015). An empirical study was adopted to understand the association between Covid-19 vaccine hesitancy and international students. The questionnaire for this study was considered from the previous literature. The instrument comprised of the following: independent variables from 5C psychological antecedents: Confidence, Complacency, Constraints, Calculations and Collective Responsibility; on the other hand, Covid-19 Vaccine Hesitancy is the dependent variable and demographic information like gender, age, nationality, educational background, income, employment, online shopping platform. The data will be analyzed to draw the inference and recommend ways forward for additional improvement. As the researcher is also an international student in Thailand that created the motivation to conduct this study. Further study is suggested on the issue with a broader purview to recognize pertinent issues in order to obtain in-depth outcomes and draw insightful interference.

### Sample and Participants

An online survey was conducted at the International Colleges in a public and a private university located in Bangkok, Thailand. International students studying undergraduate program in English were considered as the sampling frame. Because of examining the certain population, purposive convenient sampling was used. 50 questionnaires were sent via email, line, WhatsApp, and Facebook, and a total number of 50 international students from Siam University participated in this survey. The participants from the Bachelor of Business Administration program were from the first, second, third and fourth year and Master of Business Administration and Doctoral program in Management respectively.

### Scale Measurement

The scales used in this survey were adopted from previous literature. 5C Psychological antecedents used for the measurement. (1) Confident was measured by using 3 items, (2) Constraints was measured by using 1 item, (3) Complacency was measured by using 3 items, (4) Calculations was measured by using 3 items, and the last (5) Collective responsibility was measured by using 2 items, all of these items were adopted by Hossain et al. (2021). COVID-19 vaccine hesitancy was measured using two 6-points Likert-type items which was also adopted by Hossain MA & Mamun AA (2021) in their study. Demographic questionnaires covered age, gender, marital status, educational background, employment status and household income of the international students.

### Data Collection

To conduct the survey online questionnaire was being adopted. The survey was carried out in English as the respondents chosen for this study are studying in an international program under international college at Siam University in Thailand. Cross-sectional data were collected via an online questionnaire through Google Form during the month of October 2021 to January 2022. The link of Google Form was sent via email, Line, and Facebook to the target population.



To keep the confidentiality personal data like names, email addresses were not collected, and participants were told that at any point, they can withdraw from the survey. Primary data was obtained from the international students who are currently studying at Siam University in Thailand. No financial incentives were given to the participants during the survey.

### **Operationalization of Variables**

In the research, there are five independent variables i.e., Confidence, Constraints, Complacency, Calculations, and Collective Responsibility from the 5C Psychological Antecedents, and Covid-19 vaccine hesitancy is the dependent variable. At first, Exploratory Factor Analysis (EFA) was carried out to find out the validity of the variables by SPSS followed by Reliability test of each variable. To authenticate the internal consistency, Cronbach's alpha coefficient was examined. For testing the hypotheses, regression analysis was computed.

### **Data Analysis Technique**

The data of international students who are hesitant to receive covid-19 vaccine were examined by Statistical Package for the Social Science (SPSS) version 25 was used to examine the data. The responses were inserted and saved in the (.sav) format for SPSS calculation. After that, the mean comparison was carried out using SPSS between independent variables. Pearson's bivariate correlation was also carried out to find the association between the independent, and dependent variables.

## **RESULTS AND DISCUSSION**

### **Demographic Information**

The total number of respondents were 51 undergraduates' students. According to Table 1 below, among the respondents there were 29 (56.90%) female and 22 (43.10%) are male international students. Mean age of the students' group is 24.22 with the standard deviation (SD) of 6.087 with the minimum and maximum age group of 16 and 45 respectively. The majority of participants 27 (52.90%) were from Bachelor program, followed by 21 (42.20%) and 1 (2.0%) were from Masters and 2 (2.90%) from Doctorate program respectively. Among the participants, 43 (84.30%) were students, 7 (13.70%) were employed full time, 1 (2.0%) were unemployed. There are 45 (88.20%) people who are single and 6 (11.80%) people who are married and 0 (0.0%) people who are divorced. As for the religion, the majority are Buddhist 16 (21.40%), followed by Christianity 10 (19.60%), Hindu 7 (13.70%), atheist 5 (9.80%), Islam 4 (7.80%) and others 9 (17.60%). There were 42 (82.40%) participants who never tested positive for COVID-19 whereas 9 (17.60%) respondents tested positive for the corona virus. The respondents prefer Pfizer vaccine 27 (52.90%) the most, followed by AstraZeneca 8 (15.70%), and Moderna 5 (9.80%). However, 6 (11.80%) respondents preferred none of the vaccines.

Table 1: Demographic Characteristics

Gender	Male: 22 (43.10%) Female: 29 (56.90%)
Age (in years)	Mean: 24.22; Standard Deviation: 6.087
Marital Status	Single: 45 (88.20%) Married: 6 (11.8%) Divorced: N/A
Educational Level	Below Bachelor's degree: 21 (41.20%) Bachelor's degree: 27 (52.90%) Master's degree: 1 (2.0%) Doctoral degree: 2 (3.90%)
Employment	Student: 43 (84.30%) Unemployed: 1 (2.0%) Employed: 7 (13.7%)
Religion	Buddhism: 16 (31.40%) Christianity: 10 (19.60%) Islam: 4 (7.80%) Hindu: 7 (13.7%) Atheist: 5 (9.80%) Others: 9 (17.60%)
Preferred covid-19 vaccine	AstraZeneca: 8 (15.70%) SinoVac: 2 (3.90%) Johnson and Johnson: 1 (2.0%) Pfizer: 27 (52.90%) Moderna: 5 (9.80%) Sinopharm: 2 (3.90%) None: 6 (11.80%)
Have you ever tested positive for Covid-19?	Yes: 9 (17.6%) No: 42 (82.40%)
Is there anyone in your close contact who tested positive? (Example: Family, friends, work)	Yes: 37 (72.50%) No: 14 (27.50%)

### Mean and Standard Deviation

The results obtained from the survey were compiled and calculated. Step by step was documented and all the sub-factors were duly measured. Table 2 exhibits the variable's mean and standard deviation used in this study.

**Table 2: Mean and Standard Deviation**

		<b>Statistics</b>					
		Confidence	Constraints	Complacency	Calculation	CollectiveR	Hesitancy
N	Valid	51	51	51	51	51	51
	Missing	0	0	0	0	0	0
Mean		3.16	2.78	2.39	3.98	3.85	2.08
Std. Deviation		1.042	1.064	1.061	.732	1.045	1.305

It shows that mean of all the psychological antecedents of 5C scale are fluctuating significantly, ‘‘Calculation’’ (Mean = 3.98, SD: .732) and ‘‘Collective Responsibility’’ (Mean: 3.85, SD: 1.045) are higher among international students during COVID-19 pandemic in Thailand followed by ‘‘Confidence’’ (Mean: 3.16, SD: 1.042), ‘‘Constraints’’ (Mean: 2.78, SD: 1.064), ‘‘Complacency’’ (Mean: 2.39, SD: 1.061).

**Table 3: Vaccine Hesitancy among Students I**

		<b>Hesitancy1</b>			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Surely, I will take it	27	52.9	52.9	52.9
	Probably I will	13	25.5	25.5	78.4
	I am not sure what I will do	5	9.8	9.8	88.2
	Probably I will not take it	1	2.0	2.0	90.2
	Surely, I will not take it	5	9.8	9.8	100.0
	Total	51	100.0	100.0	

According to Table 3, the dependent variable ‘‘Hesitancy1’’ illustrates that 52.9% of international students are in favor with taking the vaccine, followed by probably I will at 25.5%, I am not sure what I will do at 9.8%, surely, I will not take it at 9.8% and lastly probably I will not take it at only 2.0%. Overall, majority of the students are not hesitant to take the vaccine.

**Table 4: Tendency to encouraging Family and Friends**

		<b>Hesitancy2</b>			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly encourage them	18	35.3	35.3	35.3
	Encourage them	23	45.1	45.1	80.4
	Ask them to delay getting the vaccine	2	3.9	3.9	84.3
	I will not say anything about it	6	11.8	11.8	96.1
	Discourage them to take vaccine	2	3.9	3.9	100.0
	Total	51	100.0	100.0	

As for the dependent variable ‘‘Hesitancy2’’,45.1% of students are willing to encourage others to take the vaccine, followed by 35.3% of students who are willing to strongly encourage others, 11.8% students prefer to not say anything, and only 3.9% of students both for ask others to delay and discourage for taking vaccine. Overall, majority of students are willing to encourage others to take the covid-19 vaccine.

## Correlation Analysis

Bivariate correlation was calculated between independent variables of psychological 5C model of Confidence, Constrains, Complacency, Calculation, Collection Responsibility, and dependent variable ‘Covid-19 vaccine Hesitancy’. According to Table 5, It was observed that ‘Confidence’ was negatively correlated with ‘Hesitancy’ ( $r = -0.772$ ,  $p < 0.05$ ), and followed by ‘Collective Responsibility’ was negatively correlated with ‘Hesitancy’ ( $r = -0.728$ ,  $p = -0.05$ ). Whereas ‘Complacency’ is positively correlated with ‘Hesitancy’ ( $r = 0.755$ ),  $p = .000$ ). As for ‘Constrains’: academic stress ( $r = 0.340$ ,  $p = 0.162$ ) and ‘Calculation’ ( $r = 0.340$ ,  $p = 0.162$ ) there was almost no relationship with the ‘Hesitancy’.

Bivariate correlation was calculated between independent variables of psychological 5C model of Confidence, Constrains, Complacency, Calculation, Collection Responsibility, and dependent variable ‘Covid-19 vaccine Hesitancy’. It was observed that ‘Confidence’ was negatively correlated with ‘Hesitancy’ ( $r = -0.772$ ,  $p < 0.05$ ), and followed by ‘Collective Responsibility’ was negatively correlated with ‘Hesitancy’ ( $r = -0.728$ ,  $p = -0.05$ ). Whereas ‘Complacency’ is positively correlated with ‘Hesitancy’ ( $r = 0.755$ ),  $p = .000$ ). As for ‘Constrains’: academic stress ( $r = 0.340$ ,  $p = 0.162$ ) and ‘Calculation’ ( $r = 0.340$ ,  $p = 0.162$ ) there was almost no relationship with the ‘Hesitancy’.

Table 5: Pearson’s Correlations of the variables

		Correlations					
		Confidence	Constrains	Complacency	Calculation	CollectiveR	Hesitancy
Confidence	Pearson Correlation	1	-.028	-.665**	-.203	.628**	-.772**
	Sig. (2-tailed)		.847	.000	.154	.000	.000
	N	51	51	51	51	51	51
Constrains	Pearson Correlation	-.028	1	-.067	.131	.079	.034
	Sig. (2-tailed)	.847		.643	.358	.583	.813
	N	51	51	51	51	51	51
Complacency	Pearson Correlation	-.665**	-.067	1	.130	-.654**	.755**
	Sig. (2-tailed)	.000	.643		.363	.000	.000
	N	51	51	51	51	51	51
Calculation	Pearson Correlation	-.203	.131	.130	1	-.034	.162
	Sig. (2-tailed)	.154	.358	.363		.811	.255
	N	51	51	51	51	51	51
CollectiveR	Pearson Correlation	.628**	.079	-.654**	-.034	1	-.728**
	Sig. (2-tailed)	.000	.583	.000	.811		.000
	N	51	51	51	51	51	51
Hesitancy	Pearson Correlation	-.772**	.034	.755**	.162	-.728**	1
	Sig. (2-tailed)	.000	.813	.000	.255	.000	
	N	51	51	51	51	51	51

\*\* . Correlation is significant at the 0.01 level (2-tailed).

## Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) & Bartlett’s Test

A Kaiser-Meyer-Olkin (KMO) test is used in research to determine the sampling adequacy of data that are to be used for Factor Analysis. Social scientists often use Factor Analysis to ensure that the variables they have used to measure a particular concept are measuring the concept intended. The KMO test allows us to ensure that the data we have are suitable to run a Factor Analysis and therefore determine whether or not we have set out what we intended to measure.

It is a measure of how suited your data is for Factor Analysis. The test measures sampling adequacy for each variable in the model and for the complete model. The statistic is a measure

of the proportion of variance among variables that might be common variance. The lower the proportion, the more suited your data is to Factor Analysis. The statistic that is computed is a measure of 0 to 1. Interpreting the statistic is relatively straightforward; the closer to 1, the better. The KMO measures the sampling adequacy which should be greater than 0.5 for a satisfactory factor analysis to proceed. Kaisen (1974) recommend 0.5 as minimum (barely accepted), values between 0.7-0.8 acceptable, and values above 0.9 are superb.

Table 6: KMO & Bartlet's Test

<b>Variable</b>	<b>KMO*</b>	<b>Sig.</b>
Confidence	0.720	0.000
Constraints	-	-
Complacency	0.653	0.000
Calculation	0.594	0.000
Collective Responsibility	0.500	0.000
Hesitancy	0.500	0.000

According to Table 6, all KMO values are greater or equal to 0.5 and significance values is less than 0.05.

### Reliability Test with Cronbach's Alpha

Cronbach's alpha measures internal consistency between items in a scale. It is most commonly used when you have multiple Likert questions in a survey/questionnaire that form a scale and you wish to determine if the scale is reliable. Cronbach's Alpha ranges from 0 to 1, with higher values indicating greater internal consistency (and ultimately reliability).

Common guidelines for evaluating Cronbach's Alpha are:

- .00 to .69 = Poor
- .70 to .79 = Fair
- .80 to .89 = Good
- .90 to .99 = Excellent/Strong

Table 7: Cronbach's Alpha

<b>Variable</b>	<b>Cronbach's alpha</b>	<b>No of Items</b>
Confidence	0.897	3
Constraints	-	1
Complacency	0.748	3
Calculation	0.717	3
Collective Responsibility	0.804	2
Hesitancy	0.842	2

Table 7 shows the reliability of total factors analysis from the Cronbach coefficient alphas in each group of questionnaires. All Cronbach's alphas of all variables are larger than 0.70. Thus, it could be concluded that all questions related in this study are relevant and reliable and applicable for research scales instruments.

## Multiple Linear Regression Analysis

A multiple linear regression using Enter Method was fitted to explain the Covid-19 Vaccine hesitancy (dependent variable) based on 5C psychological antecedents (independent variables): Confidence, Constraints, Complacency, Calculation and Collective responsibility. Table 8 contains the coefficients for the regression equation (model), tests of significance for each variable and collinearity statistics.

Table 8: Coefficients of Regression Model

		Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.583	1.008		3.556	.001		
	Confidence	-.461	.138	-.368	-3.354	.002	.470	2.128
	Complacency	.394	.136	.321	2.892	.006	.462	2.165
	Calculation	.049	.139	.027	.350	.728	.929	1.076
	CollectiveR	-.363	.134	-.291	-2.715	.009	.494	2.023
	Constraints	.079	.094	.064	.841	.405	.965	1.036

a. Dependent Variable: Hesitancy

Table 9: Significant Predictors of the Model

Predictor	Standardized Coefficients	P Value		Remark
Confidence	-0.368	0.002	p < 0.05	Confidence is a significant predictor of hesitancy
Constraints	0.064	0.405	p > 0.05	Constraints is not a significant predictor of hesitancy
Complacency	0.321	0.006	p < 0.05	Complacency is a significant predictor of hesitancy
Calculation	0.027	0.728	p > 0.05	Calculation is not a significant predictor of hesitancy
Collective Responsibility (CR)	-0.291	0.009	p < 0.05	CR is a significant predictor of hesitancy

According to Table 9, confidence is the strongest determinant of Covid-19 vaccine hesitancy (beta = -0.368, p < 0.05). Complacency and Collective responsibility also significantly affect the hesitancy. However, the impact of constraints and calculation on hesitancy is negligible.

Based on the standardized beta coefficients, the linear regression equation can be written as follows.

$$\text{Hesitancy} = -0.368 * \text{Confidence} + 0.321 * \text{Complacency} + 0.027 * \text{Calculation} - 0.291 * \text{CollectiveR} + 0.064 * \text{Constraints} + 3.583$$

The standardized beta coefficients give a measure of the contribution of each variable to the model. A larger value indicates that a unit change in this predictor variable has a large effect on the dependent variable. A larger absolute t value and small p value suggest that a predictor variable is having a larger impact on the dependent variable.

All VIF values are less than 10; Thus, there is no collinearity between independent variables. Collinearity is the correlation between independent variables. Correlation between two or more independent variables makes it difficult to determine the separate effects of individual variables. Larger VIF (variance inflation factor) – 10 or above OR small tolerance value (0.10 or below) indicates high collinearity.

Table 10: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.863 <sup>a</sup>	.745	.716	.695

a. Predictors: (Constant), Constraints, Confidence, Calculation, CollectiveR, Complacency

According to Table 10, the adjusted R square value is 0.716 = 72%

The overall model explains 72% variation of hesitancy, OR Taken as a set, collectively, the independent variables account for 72% of the variance of hesitancy, OR 72% of the variation in hesitancy can be explained by the model containing 5C psychological antecedents. This is quite high so the predictions from the regression equation are reliable. It also means that 28% of the variation is still unexplained; so, adding other independent variables could improve the fit of the model.

Table 11: ANOVA Table

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63.440	5	12.688	26.256	.000 <sup>b</sup>
	Residual	21.746	45	.483		
	Total	85.186	50			

a. Dependent Variable: Hesitancy

b. Predictors: (Constant), Constraints, Confidence, Calculation, CollectiveR, Complacency

According to Table 11,

$$F(5,45) = 26.25, p < 0.05$$

The overall regression model is significantly useful in explaining the covid-19 vaccine hesitancy (DV).

## Hypothesis Testing

Simple linear regression was carried out to check the relationship of each individual variable with dependent variable.

Table 12: Results of Simple Linear Regression

Predictor	R Square	Sig.	Beta coefficient	Sig.
Confidence	0.596	F (1,49) = 72.14, p < 0.05	-0.772	p < 0.05
Complacency	0.570	F (1,49) = 64.97, p < 0.05	0.755	p < 0.05
Academic Stress	0.001	F (1,49) = 0.057, p > 0.05	0.034	p > 0.05
Calculation	0.026	F (1,49) = 1.324, p > 0.05	0.162	p < 0.05
Collective Responsibility	0.530	F (1,49) = 55.21, p < 0.05	-0.728	p < 0.05

According to Table 12, more substantial confidence ( $\beta = -0.772$ ,  $p < 0.05$ ) and collective responsibility ( $\beta = -0.728$ ,  $p < 0.05$ ) were significantly associated with reduced Covid-19 vaccine hesitancy, whereas increased complacency ( $\beta = 0.755$ ,  $p < 0.05$ ) significantly increased the vaccine hesitancy. These findings are supported by other studies in Covid-19 and other contexts. However, Constraints (Academic Stress) and Calculation were non-significant predictors of covid-19 hesitancy. This was supported by previous research work.

These findings suggest that public confidence in the vaccine and health system that delivers the vaccination service are crucial. Widespread misinformation, conspiracy beliefs and superstitions regarding the covid-19 vaccine and its potential health hazards have been found to diminish public trust that need to be addressed through proper communication.

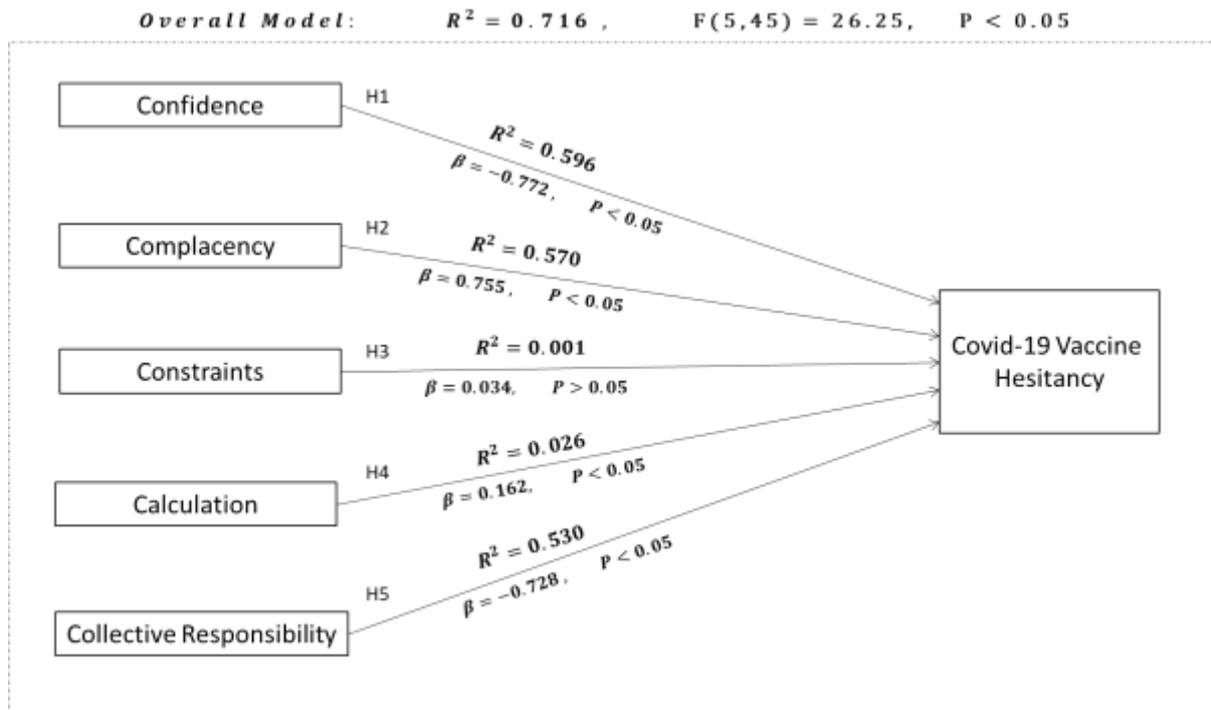
Table 13: Hypothesis Testing

#	Hypotheses	Pearson correlation		Beta coefficient		Results
		r	Sig.	beta	Sig.	
H <sub>1</sub>	Confidence ----> Hesitancy	-0.772	0.000	-0.772	p < 0.05	Support
H <sub>2</sub>	Complacency----> Hesitancy	0.755	0.000	0.755	p < 0.05	Support
H <sub>3</sub>	Academic Stress----> Hesitancy	0.034	0.813	0.034	p > 0.05	Not Support
H <sub>4</sub>	Calculation ----> Hesitancy	0.162	0.255	0.162	p < 0.05	Not Support
H <sub>5</sub>	Collective responsibility ----> Hesitancy	-0.728	0.000	-0.728	p < 0.05	Support

Note: Correlation is statistically significant at 0.05 level

According to Table 13, Hypotheses 1,2 and 5 were supported and 3 and 4 were not supported. Table 14 depicts the overall model with respective R<sup>2</sup>, beta coefficients and P values of each independent variable.

Table 14: Overall Model



## CONCLUSION AND RECOMMENDATIONS

### Conclusions

An empirical study from a sample of 50 respondents using multiple linear regression analysis was implemented in examining the relationships between 5C psychological antecedents and covid-19 vaccine hesitancy among International University Students at Siam University, Thailand. According to the analysis of the dependent variable ‘Hesitancy’, approximately 76% of international students are in favor with taking the vaccine while the rest are not sure or reluctant to take the vaccine. Overall, majority of the students are not hesitant to take the vaccine. Moreover, around 80% of students are willing to encourage others (family and friends) to take the vaccine while the rest discourage their families or request them to delay on taking the vaccine. Overall, majority of students are willing to encourage others to take the covid-19 vaccine.

According to the simple linear regression, more substantial confidence ( $\beta = -0.772$ ,  $p < 0.05$ ) and collective responsibility ( $\beta = -0.728$ ,  $p < 0.05$ ) were significantly associated with reduced Covid-19 vaccine hesitancy, whereas increased complacency significantly increased the vaccine hesitancy. These findings are supported by other studies in Covid-19 and other contexts. However, Constraints (Academic Stress) and Calculation were non-significant predictors of covid-19 vaccine hesitancy. This was supported by previous research work.

Confidence and collective responsibility were the strongest determinants of covid-19 vaccine hesitancy, whereas constraints and calculation were non-significant predictors of covid-19 vaccine hesitancy. These findings suggest that public confidence in the vaccine and health system that delivers the vaccination service are crucial. Widespread misinformation, conspiracy beliefs and superstitions regarding the covid-19 vaccine and its potential health

hazards have been found to diminish public trust that need to be addressed through proper communication.

Collective responsibility which is defined as the willingness to protect others by one's own vaccination by means of herd immunity. Thus, people high in collective responsibility are willing to vaccinate in another person's interest. This study also supported this fact that higher collective responsibility lowers vaccine hesitancy. So, it is important to educate the people about herd immunity and the importance of collectivism to eradicate the pandemic.

### Recommendations

This study can be extended to other universities in Thailand and further into general public. Thus, the findings can be used to craft targeted interventions to reduce vaccine hesitancy and increase vaccine uptake. Thus, it will steer Thailand's vaccination campaign and thereby paving the way for successful prevention of Covid-19 pandemic.

### Limitations of the Study

This empirical study was limited to international students at Siam University, Thailand. And this research used a cross-sectional study design which cannot establish causality. The study's limitations include the use of just foreign undergraduate students and data gathering at a single international institution, which may limit generalizability. Another limitation of this study is the only use of the 5C psychological antecedents because there are many methods (models) available to measure the COVID-19 vaccine hesitancy.

### REFERENCES

- Alyami & Spiteri. (2015). (PDF) *International University Students' Online Shopping Behaviour*.  
[https://www.researchgate.net/publication/308515594\\_International\\_University\\_Students'\\_Online\\_Shopping\\_Behaviour](https://www.researchgate.net/publication/308515594_International_University_Students'_Online_Shopping_Behaviour)
- Askelson, N. M., Campo, S., Lowe, J. B., Smith, S., Dennis, L. K., & Andsager, J. (2010a). *Using the theory of planned behavior to predict mothers' intentions to vaccinate their daughters against HPV*. 26(3), 194–202. <https://doi.org/10.1177/1059840510366022>
- Askelson, N. M., Campo, S., Lowe, J. B., Smith, S., Dennis, L. K., & Andsager, J. (2010b). *Using the theory of planned behavior to predict mothers' intentions to vaccinate their daughters against HPV*. *The Journal of School Nursing: The Official Publication of the National Association of School Nurses*, 26(3), 194–202.  
<https://doi.org/10.1177/1059840510366022>
- Askelson, N. M., Campo, S., Lowe, J. B., Smith, S., Dennis, L. K., & Andsager, J. (2010c). *Using the theory of planned behavior to predict mothers' intentions to vaccinate their daughters against HPV*. *The Journal of School Nursing: The Official Publication of the National Association of School Nurses*, 26(3), 194–202.  
<https://doi.org/10.1177/1059840510366022>
- Bangkok Post. (2021). *Most willing to get Covid jabs, Pfizer preferred: poll*.  
<https://www.bangkokpost.com/thailand/general/2120223/most-willing-to-get-covid-jabs-pfizer-preferred-poll>
- Barello, S., Nania, T., Dellafiore, F., Graffigna, G., & Caruso, R. (2020). 'Vaccine hesitancy' among university students in Italy during the COVID-19 pandemic. *European Journal of Epidemiology*, 35(8), 781–783. <https://doi.org/10.1007/s10654-020-00670-z>

- Betsch, C. (2006). Präferenz für Intuition und Deliberation (PID). *Http://Dx.Doi.Org/10.1024/0170-1789.25.4.179*, 25(4), 179–197. <https://doi.org/10.1024/0170-1789.25.4.179>
- Betsch, C., Schmid, P., Heinemeier, D., Korn, L., Holtmann, C., & Böhm, R. (2018). Beyond confidence: Development of a measure assessing the 5C psychological antecedents of vaccination. *PLoS ONE*, 13(12). <https://doi.org/10.1371/journal.pone.0208601>
- Blanco, A., & Courant, H. (2020). *UConn places entire Storrs campus under quarantine as coronavirus cases rise; in-person classes continue but gatherings prohibited*.
- Brewer, N. T., Cuite, C. L., Herrington, J. E., & Weinstein, N. D. (2007). Risk compensation and vaccination: can getting vaccinated cause people to engage in risky behaviors? *Annals of Behavioral Medicine : A Publication of the Society of Behavioral Medicine*, 34(1), 95–99. <https://doi.org/10.1007/BF02879925>
- Bruder, M., Haffke, P., Neave, N., Nouripanah, N., & Imhoff, R. (2013). Measuring individual differences in generic beliefs in conspiracy theories across cultures: conspiracy mentality questionnaire. *Frontiers in Psychology*, 4, 225. <https://doi.org/10.3389/fpsyg.2013.00225>
- Clark, M. S., Ouellette, R., Powell, M. C., & Milberg, S. (1987). Recipient's mood, relationship type, and helping. *Journal of Personality and Social Psychology*, 53(1), 94–103. <https://doi.org/10.1037//0022-3514.53.1.94>
- Cokely ET, G. M. S. E. G. S. G.-R. R. (2012). Measuring risk literacy: The Berlin Numeracy Test. *Judgm Decis Mak*, 25–47.
- Cylus, J., & Papanicolas, I. (2015). An analysis of perceived access to health care in Europe: How universal is universal coverage? *Health Policy (Amsterdam, Netherlands)*, 119(9), 1133–1144. <https://doi.org/10.1016/j.healthpol.2015.07.004>
- Dixon, G., & Clarke, C. (2013). The effect of falsely balanced reporting of the autism-vaccine controversy on vaccine safety perceptions and behavioral intentions. *Health Education Research*, 28(2), 352–359. <https://doi.org/10.1093/her/cys110>
- Dubé, E., Laberge, C., Guay, M., Bramadat, P., Roy, R., & Bettinger, J. (2013). Vaccine hesitancy: an overview. *Human Vaccines & Immunotherapeutics*, 9(8), 1763–1773. <https://doi.org/10.4161/hv.24657>
- Fine, P., Eames, K., & Heymann, D. L. (2011). “Herd Immunity”: A Rough Guide. *Clinical Infectious Diseases*, 52(7), 911–916. <https://doi.org/10.1093/CID/CIR007>
- Fischer, P., Kastenmüller, A., Greitemeyer, T., Fischer, J., Frey, D., & Crelley, D. (2011). Threat and selective exposure: the moderating role of threat and decision context on confirmatory information search after decisions. *Journal of Experimental Psychology. General*, 140(1), 51–62. <https://doi.org/10.1037/a0021595>
- Holm EJ, H. K. (1992). The Daily Hassles Scale (Revised): Does it measure stress or symptoms? *Behav Assess*, 456–482.
- Horne, R., Weinman, J., & Hankins, M. (2007). *The beliefs about medicines questionnaire: The development and evaluation of a new method for assessing the cognitive representation of medication*. 14(1), 1–24. <https://doi.org/10.1080/08870449908407311>
- Hossain, M. B., Alam, M. Z., Islam, M. S., Sultan, S., Faysal, M. M., Rima, S., Hossain, M. A., & Mamun, A. al. (2021). Health Belief Model, Theory of Planned Behavior, or Psychological Antecedents: What Predicts COVID-19 Vaccine Hesitancy Better Among the Bangladeshi Adults? *Frontiers in Public Health*, 9. <https://doi.org/10.3389/fpubh.2021.711066>
- Johnson, J. G., Wilke, A., & Weber, E. U. (2004). *DOSPERS-G Bereichsspezifische Risikoskala-Deutsche Version Domain-specific Risk-taking Scale-German version*.

- 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>
- Khairulanwar Zaini and Hoang Thi Ha, 2021. (2021). 2021/115 “Understanding the Selective Hesitancy towards Chinese Vaccines in Southeast Asia” by Khairulanwar Zaini and Hoang Thi Ha - ISEAS-Yusof Ishak Institute. <https://www.iseas.edu.sg/articles-commentaries/iseas-perspective/2021-115-understanding-the-selective-hesitancy-towards-chinese-vaccines-in-southeast-asia-by-khairulanwar-zaini-and-hoang-thi-ha/>
- Lapsley, D. K., & Hill, P. L. (2009). Subjective Invulnerability, Optimism Bias and Adjustment in Emerging Adulthood. *Journal of Youth and Adolescence* 2009 39:8, 39(8), 847–857. <https://doi.org/10.1007/S10964-009-9409-9>
- Lucia, V. C., Kelekar, A., & Afonso, N. M. (2021). COVID-19 vaccine hesitancy among medical students. *Journal of Public Health (United Kingdom)*, 43(3), 445–449. <https://doi.org/10.1093/pubmed/fdaa230>
- Luszczynska, A., Scholz, U., & Schwarzer, R. (2005). The general self-efficacy scale: multicultural validation studies. *The Journal of Psychology*, 139(5), 439–457. <https://doi.org/10.3200/JRLP.139.5.439-457>
- MacDonald, N. E. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine*, 33(34), 4161–4164. <https://doi.org/10.1016/j.vaccine.2015.04.036>
- Marta, F., Elisa, G., Luisa, R., Marino, F., Sabrina, S., Alessandro, Z., & Peter J, S. (2017). Validation of a scale to measure parental psychological empowerment in the vaccination decision. *Journal of Public Health Research*, 6(2), 955. <https://doi.org/10.4081/jphr.2017.955>
- Petrocelli JV. (2003). *Factor validation of the Consideration of Future Consequences Scale: evidence for a short version*. 405–143.
- Petrocelli, J. v. (2003). Factor validation of the Consideration of Future Consequences Scale: evidence for a short version. *The Journal of Social Psychology*, 143(4), 405–413. <https://doi.org/10.1080/00224540309598453>
- Saied, S. M., Saied, E. M., Kabbash, I. A., & Abdo, S. A. E. F. (2021). Vaccine hesitancy: Beliefs and barriers associated with COVID-19 vaccination among Egyptian medical students. *Journal of Medical Virology*, 93(7), 4280–4291. <https://doi.org/10.1002/jmv.26910>
- Schwarzer R, F. R. (1996). Self-efficacy and health behaviours. *Predict Health Behav Res Pract Soc Cogn Models*, 163–196.
- Shulruf B, H. J. D. R. (2007). Development of a new measurement tool for individualism and collectivism. *J Psychoeduc Assess*, 385–401.
- Smith M. (2020). *Tracking the Coronavirus at U.S. Colleges and Universities - The New York Times*. <https://www.nytimes.com/interactive/2020/us/covid-college-cases-tracker.html>
- Spreng, R. N., McKinnon, M. C., Mar, R. A., & Levine, B. (2009). The Toronto Empathy Questionnaire: scale development and initial validation of a factor-analytic solution to multiple empathy measures. *Journal of Personality Assessment*, 91(1), 62–71. <https://doi.org/10.1080/00223890802484381>
- Synnott, C. K. (n.d.). *Vaccinating College Students for the Coronavirus is Crucial*. Retrieved February 26, 2022, from <https://ssrn.com/abstract=3746521>
- Tomagruz, S. (2021). *Sinovac, Pfizer top COVID-19 vaccines preferred by adult Filipinos*. <https://www.rappler.com/nation/top-covid-19-vaccines-preferred-by-adult-filipinos-sws-survey-may-2021/>



- Trimble, M. (2019). *WHO Names Vaccine Hesitancy As Top World Threat in 2019* | *National News / US News*. <https://www.usnews.com/news/national-news/articles/2019-01-16/who-names-vaccine-hesitancy-as-top-world-threat-in-2019>
- Wiseman R, W. C. (2004). *Measuring superstitious belief: Why lucky charms matter*. *Personal Individ Differ*. 533–1541.
- Yang, Z. J. (2012). Too Scared or Too Capable? Why Do College Students Stay Away from the H1N1 Vaccine? *Risk Analysis*, 32(10), 1703–1716. <https://doi.org/10.1111/J.1539-6924.2012.01799.X>
- Zingg, A., & Siegrist, M. (2012). Measuring people’s knowledge about vaccination: developing a one-dimensional scale. *Vaccine*, 30(25), 3771–3777. <https://doi.org/10.1016/j.vaccine.2012.03.014>