Influenza messaging is better than no messaging at all : an experimental assessment of the effects of goal framing and affected-person framing on influenza vaccination attitudes and intentions

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**INFLUENZA MESSAGING IS BETTER THAN NO MESSAGING AT ALL:
AN EXPERIMENTAL ASSESSMENT OF THE EFFECTS OF GOAL
FRAMING AND AFFECTED-PERSON FRAMING ON INFLUENZA
VACCINATION ATTITUDES AND INTENTIONS**

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A thesis submitted to the Nanyang Technological University
in fulfilment for the requirement for the degree of
Master of Communication Studies

2019

Statement of Originality

I certify that all work submitted for this thesis is my original work. I declare that no other person's work has been used without due acknowledgement. Except where it is clearly stated that I have used some of this material elsewhere, this work has not been presented by me for assessment in any other institution or University. I certify that the data collected for this project are authentic and the investigations were conducted in accordance with the ethics policies and integrity standards of Nanyang Technological University and that the research data are presented honestly and without prejudice.

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This thesis contains material from 0 paper(s) published in the following peer-reviewed journal(s) where I was the first and/or corresponding author.

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Abstract

Vaccination reduces viral transmission and protects unimmunized individuals against infection. However, current vaccine coverage among Singapore residents is below 20%. The framing of health messages plays a role in influencing perceptions about health issues. The persuasiveness of goal framing on preventive behaviors has been established in past research but its effect on vaccination is inconsistent, and highlighting recipients of health benefits or consequences was suggested to moderate framing effects. This experimental study introduces affected-person framing and draws on prospect theory to examine gain-loss framing with different affected individuals, furthering past research focused on health beneficiaries-gain-framed messages. Results found nonsignificant goal framing and affected-person framing effects on influenza vaccination attitudes and intentions. However, framed messages were found to bolster attitudes as compared to when there is no influenza vaccine communication. Effective influenza messages therefore may not need to be framed but to simply communicate about disease and vaccination.

Keywords: influenza, vaccine communication, goal framing, affected-person framing

Influenza Messaging is Better than No Messaging At All: An Experimental Assessment of
the Effects of Goal Framing and Affected-Person Framing on Influenza Vaccination
Attitudes and Intentions

Influenza is a communicable respiratory disease that causes significant global morbidity and mortality rates every year (Pan American Health Organization [PAHO], 2004; Viboud, Alonso, & Simonsen, 2006). The World Health Organization (WHO; 2018a) estimates a global burden of three to five million severe infection cases and 290,000 to 650,000 deaths resulting from yearly influenza epidemics. Patterns of influenza epidemics are less distinct in tropical regions as compared to temperate zones (Simonsen, 1999). Outbreaks in tropical countries with year-round activity such as Singapore are thus difficult to identify (Monto, 2004) and are estimated to cause sizeable impact on human and economic well-being (Ng, Pwee, Niti, & Goh, 2002). Influenza is a major cause of illness in Southeast Asia (Simmerman et al., 2004), with influenza viruses highly transmissible by human contact and may cause mild to severe health complications (Centers for Disease Control and Prevention [CDC], 2018).

Factors such as age, immunity status, medical conditions, and lifestyle affect the degree of influenza infection (Mauskopf, Klesse, Lee, & Herrera-Taracena, 2013). While most infected individuals do not require medical attention and recover within two weeks (PAHO, n.d.), others are at a higher risk of developing complications. Children and pregnant women are more likely to be affected differently by influenza than older adults and chronic patients. For instance, 9% to 20% of influenza-infected children aged five and below in the United States are likely to seek medical care; children aged two and below are particularly at higher risks of developing acute otitis media, lower respiratory tract disease, and requiring hospitalization following influenza infection (Neuzil et al., 2002). A systematic review reported that pregnant women accounted for 6.3% of hospitalizations, 5.9% of intensive care

unit admissions, and 5.7% of deaths during the 2009 H1N1 pandemic (Mosby, Rasmussen, & Jamieson, 2011). Of greater concern is that 76% of influenza-related deaths during the 1990–2001 influenza seasons occurred among elderly people aged 70 and above (Simonsen et al., 2005; Simonsen, Taylor, Viboud, Miller, & Jackson, 2007). Influenza infections are therefore not of the same severity for all individuals and can lead to potential deaths among at-risk individuals.

Influenza is easily transmitted when infected individuals expel droplets from coughing or sneezing into the air (WHO, 2016). Influenza viruses are also spread through direct contact with infected individuals and through indirect contact with contaminated objects (Brankston, Gitterman, Hirji, Lemieux, & Gardam, 2007). Influenza prevention and containment strategies outlined by WHO (2005a) involve minimizing human exposure to infection, creating antiviral drugs to treat infections, and developing vaccines to prevent infection.

Vaccination remains one of the most effective measures in preventing and controlling influenza (Nichol, 2008). Circulating influenza viruses are monitored year-round to ensure that the influenza vaccine is kept up to date (Nolan, 1981; WHO, 2011). Vaccines prompt the immune system into developing antibodies to provide timely protection against infections (CDC, 2017a). Influenza vaccines are widely available in Singapore (Ministry of Health Singapore [MOH], 2018a) and more affordable than treating infections (Khalik, 2013) but uptake continues to be suboptimal with “adult vaccination rates in Singapore generally hover at below 20 percent” (Gan, 2017).

Common misperceptions about the influenza vaccine as a travel vaccine and associating influenza with the common cold deter vaccine use (Chew, 2016; Cummings, Kong, & Orminski, n.d.; Tan, Lim, Teoh, Ong, & Bock, 2010). These barriers to vaccination increase individuals’ risk of infection and viral transmission to surrounding others (CDC, 2017a). Inadequate communication countering misperceptions can also undermine vaccine

acceptance and negatively affect vaccine uptake (MacDonald, 2015). An improved understanding of vaccination barriers will serve to improve targeted communication interventions (Jarrett, Wilson, O’Leary, Eckersberger, & Larson, 2015). Overcoming misperceptions about the influenza vaccine and fostering knowledge about vaccine benefits through communication efforts will consequently help to reduce vaccination barriers and encourage vaccine acceptance.

Goal framing, or the framing of outcomes resulting from the presence or absence of behaviors, generally have an influence on preventive behaviors (Gallagher & Updegraff, 2012; Krishnamurthy, Carter, & Blair, 2001; Rothman & Salovey, 1997). Yet the persuasiveness of goal framing in encouraging specific preventive behaviors such as vaccination is less consistent (O’Keefe & Jensen, 2007; O’Keefe & Nan, 2012; Pența & Băban, 2017). This study introduced the concept of affected-person framing and explored the interaction effect of goal framing and affected-person framing, as framed messages are suggested to vary in persuasiveness when behavioral outcomes are directed at oneself, close ones, and the perceived public at large (Kelly & Hornik, 2016; Pența & Băban, 2017). The present study extends recent works that tangentially or partially assessed affected-person framing effects (e.g., Fahy & Desmond, 2010; Kelly & Hornik, 2016; Lechuga, Swain, & Weinhardt, 2011).

This study employed prospect theory to assess the impacts of goal framing and affected-person framing on vaccination attitudes and intentions in a 2 x 3 factorial-design experiment. Findings inform how message framing influences vaccination-related outcomes. Framing effects on attitudes and intentions were separately investigated in this study given the complexity of vaccination. Attitudes are predicted and have been demonstrated to influence behavioral intentions, but vaccine studies have yet to exhaustively account for the influencing factors of attitudes as well as the barriers to the intention–behavior relationship.

Actual vaccination behavior was also not assessed in the scope of this experimental study. Pența and Băban's (2017) systematic review reported that previous vaccine message framing studies did not find significant goal framing effects on vaccine uptake and most studies measured vaccination intentions as the persuasive outcome, with some of these studies additionally assessed goal framing effects on vaccination attitudes. This study's enquiry into the effects of persuasive messages with different affected persons contributes to a theoretical understanding of how goal framing may be moderated by affected-person framing in the context of vaccination. It also helps to clarify the recipient of vaccination benefits or nonvaccination consequences in future vaccine messages. The study is relevant to strategic communication efforts with the end goal of curtailing the threat of widespread influenza outbreaks.

Literature Review

Influenza and Vaccination

Influenza is a serious viral disease that results in a high number of infected patients during epidemics (Kuszeński & Brydak, 2000). Influenza can lead to severe complications including bacterial pneumonia (CDC, 2018), accounting for approximately 12% of influenza-associated hospitalization cases between 2004 to 2008 and 2010 to 2012 in Singapore (Ang et al., 2014). Latest updates from MOH (2019) indicated a daily average of 2,995 patients seeking medical treatment for acute respiratory infections contributed by influenza. These figures reflect the severity of influenza.

Influenza emerges from three gene types A, B, and C (Cox & Subbarao, 2000; Suzuki & Nei, 2002). A and B viruses are the main agents of seasonal human influenza outbreaks and type C infections pose less significant health concerns (CDC, 2017b; Gerdil, 2003; Nicholson, Wood, & Zambon, 2003; WHO, 2018). These viruses undergo constant mutations in two different forms—*antigenic shifts* and *antigenic drifts*—producing glycoprotein

hemagglutinin (HA) and neuraminidase (NA) subtypes including the recently circulating H3N2 and H1N1 variants (Alexander & Brown, 2000; Neumann, Noda, & Kawaoka, 2009; Russell et al., 2008; Webster, Bean, Forman, Chambers, & Kawaoka, 1992).

Antigenic shifts are the mixing of different viral strains, producing novel influenza A subtypes not previously encountered or circulated among humans (Carrat & Flahault, 2007). The unexpected introduction and transmission of new strains precipitate population-wide pandemics (WHO, 2009). The 1918 Spanish flu, 1957 Asian flu, and 1968 Hong Kong flu are instances of such outbreaks that can cause high mortality rates (Gatherer, 2009; Jackson, 2009; Johnson & Mueller, 2002). WHO estimated a global burden of two million to 7.4 million deaths in the next influenza pandemic (2005b). Influenza exerts a constant health burden, as viruses emerged from antigenic shifts continue to undergo antigenic drifts (Carrat & Flahault, 2007).

Antigenic drifts are frequent, subtle alterations to the influenza gene structures that create variant influenza strains every two to eight years (Koelle, Cobey, Grenfell, & Pascual, 2006; Plotkin, Dushoff, & Levin, 2002; Smith et al., 2004; Treanor, 2004). These gene mutations allow the influenza viruses to constantly elude human immunity response and trigger seasonal epidemics among populations that had built up some resistance against previous drift variants but not against newly evolved subtypes (Carrat & Flahault, 2007; Nicholson et al., 2003; Webby & Webster, 2001). Populations are at risk of large-scale outbreaks when antigenic activities spread new viral strains (Dowdle, 1984; Guan et al., 2004; Webster et al., 1992). In response to the burden of seasonal influenza, WHO surveils influenza viruses throughout the year to identify virulent strains that are likely to predominate the next epidemic season and prepare a vaccine against the identified strains (Treanor, 2004).

Other influenza mitigation strategies proposed by WHO (2005a) are broadly categorized under non-pharmaceutical measures and antiviral development. Ferguson and

colleagues (2006) estimated non-pharmaceutical interventions such as border restrictions, internal travel restrictions and school closure to have little impact on containing influenza. Treatment antivirals were also estimated to be 40% to 75% effective in reducing spread but require early development after the first appearance of symptoms. Overall, while antivirals are suggested to have a greater impact on influenza control than non-medical measures, its development and distribution processes pose significant logistical challenges (Ferguson et al., 2006).

Vaccination is one of the most effective approaches in controlling influenza (Nichol & Treanor, 2006). Vaccine types and compositions are matched with the variant viruses predicted to circulate in subsequent epidemic seasons (WHO, 2016). The similarity between vaccine content and circulating viruses determines the protective efficacy of influenza vaccines (Fiore, Bridges, & Cox, 2009; Fiore et al., 2010). A mismatch results in less effective vaccines and leaves vaccine users remain exposed to viral infection (Cheung, 2015; Knapton, 2016). Users' age and health status also affect how well the vaccine protects against influenza (Fiore et al., 2009, 2010). Seasonal vaccines are generally 70% to 90% effective for healthy adults aged between 18 and 64 years but may not provide as much protection for older adults and people with chronic illnesses (Fiore et al., 2010; Lang et al., 2012; WHO, 2005c).

Lowering the risk of influenza infection among the latter group of individuals can also be achieved indirectly through *herd immunity* that is built with the presence of a substantial proportion of immunized individuals in a community (Anderson & May, 1985; Fine, 1993; Fine, Eames, & Heymann, 2011). Increasing individual immunity decreases opportunities for viral transmission between infected and noninfected individuals, protecting unimmunized at-risk individuals from influenza exposure (Metcalf, Ferrari, Graham, & Grenfell, 2015). Building herd immunity results in a reduction of infection incidence among unimmunized

populations following low virus communicability (John & Samuel, 2000). The prevention and elimination of epidemics rely on the maintenance of a sufficient level of herd immunity (May & Silverman, 2003). An estimated 60% to 80% vaccination coverage is necessary to achieve herd immunity against most infections (Gan, 2017). Promoting vaccination as a cost-effective preventive measure plays a critical role in managing the burden of influenza.

Influenza Vaccination Attitudes and Intentions

Despite the demonstrated effectiveness of vaccines in preventing against diseases, vaccine uptake rate is suboptimal and hindered in part by hesitancy toward vaccines. Vaccine hesitancy manifests as vaccination refusals or delays in acceptance regardless of the availability of vaccines, and poses as a global health threat (WHO, 2018b, 2019). Complacency (perceptions of disease risks and vaccines), confidence (trust in vaccines, healthcare infrastructure and policy), and convenience (accessibility) are group factors identified to influence levels of hesitancy toward vaccines (MacDonald, 2015). A systematic review of 470 influenza vaccine hesitancy studies further reported decreased disease risk perceptions, decreased positive vaccine attitudes, decreased vaccine effectiveness perceptions and increased vaccine safety concerns to be among the main barriers to influenza vaccination (Schmid, Rauber, Betsch, Lidolt, & Denker, 2017). Some of these barriers are also cited as reasons for nonvaccination within the Singapore population. Studies conducted among diabetic patients and healthcare workers (HCWs) in Singapore reported misperceptions about influenza and vaccination, dislike for injections, perceived vaccine side effects, uncertainty in vaccine efficacy and perceived good immunity (Hwang & Lim, 2014; Kyaw et al., 2019; Sundaram et al., 2018; Tan et al., 2010). Some local older adults similarly shared these beliefs in a recent qualitative study (Cummings et al., n.d.).

Unfavorable sentiments about vaccination have led to a low overall vaccination rate in Singapore at less than 20% among local adults (Gan, 2017) as well as an influenza

vaccination coverage of 32% among children aged six months to five years (Low et al., 2017) despite high daily number of local influenza infection cases. HCWs are also susceptible to misconceptions about influenza vaccination even while working in the healthcare sector (e.g., Hofmann, Ferracin, Marsh, & Dumas, 2006; Hollmeyer, Hayden, Poland, & Buchholz, 2009; Martinello, Jones, & Topal, 2003; Sundaram et al., 2018), with vaccine uptake ranging only between 51.7% and 82.4% (Kyaw et al., 2019; Lim, Lee, Kyaw, & Chow, 2017).

Misperceptions among HCWs may pose further public health concerns, as HCWs play an important role in encouraging vaccination behavior among the public (Cummings et al., n.d.; Low et al., 2017). Incorrect knowledge held by HCWs may contribute to a propagation of poor vaccine awareness or knowledge and vaccine hesitancy. This underscores and reinforces the need to improve our understanding and practice of strategic health communication in order to overcome vaccine misperceptions among both HCWs and the wider public that has less access to professional medical knowledge.

Goal Framing and Prospect Theory

How health issues are framed in messages influence how health issues are viewed and understood (Berry, Wharf-Higgins, & Naylor, 2007). Message framing strategy is widely used in health communication to motivate beneficial behaviors and discourage harmful ones, and has been a topic of interest in health communication research (Gallagher & Updegraff, 2012). Among the different framing types, the present study focuses on *goal framing* or the phrasing of messages in terms of outcome gains or losses (Fagley, 1993; Krishnamurthy, Carter, & Blair, 2001; Levin, Schneider, & Gaeth, 1998). The persuasive effect of goal framing on preventive behaviors is largely supported but its effect on vaccination outcomes is inconsistent, and highlighting recipients of health benefits or consequences was identified to potentially moderate framing effects (O’Keefe & Nan, 2012; Pența & Băban, 2017).

Available literature suggests possible differences in message influence when effects of

vaccination and nonvaccination are presented to affect oneself, their close ones, and the perceived public at large (Kelly & Hornik, 2016; Pența & Băban, 2017). This study focuses on the impacts of goal framing and affected-person framing on influenza vaccination attitudes and intentions.

Prospect theory (Kahneman & Tversky, 1979) posits that individuals' decision-making processes are guided by their understanding and evaluation of decision options that they assign with values of gains and losses. Gains are perceived advantages of a decision option and losses are perceived disadvantages of an option (Kahneman & Tversky, 1984). Individuals generally weigh the gains and losses of decision outcomes from a neutral reference point that shifts according to how those options are presented and by the individuals' outcome expectations (Kahneman & Tversky, 1979). An experiment by Tversky and Kahneman (1981) found that between outcome gains, participants preferred decision options that have higher probabilities of yielding gains, and conversely between outcome losses, participants chose options that have lower probabilities of resulting in losses. Therefore, prospect theory predicates that individuals tend to have a greater aversion for losses than for gains and exhibit attitudinal shifts between risk aversion and risk-taking when gains and losses are involved (Tversky & Kahneman, 1981, 1986).

The framing proposition of prospect theory proposes that individuals have varying responses to differentially framed messages (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; Rothman, Salovey, Antone, Keough, & Martin, 1993). Goal framing deals with two frame types: gain-frame and loss-frame. Gain-framed messages emphasize on the positive outcomes of performing a particular behavior and loss-framed messages focus attention on the negative consequences of not performing the behavior (Levin et al., 1998; Levin, Gaeth, Schreiber, & Lauriola, 2002). For instance, gain-framed messages may recommend vaccination as a means to preventing influenza and loss-framed messages may portray

influenza infection as a result of nonvaccination. Goal framing effects, according to prospect theory (Kahneman & Tversky, 1979), occur as individuals consider certainty over risks when behaviors are positively framed and risks over certainty when behaviors are negatively framed.

The perceived risks of health behaviors also influence framing effects. Rothman and Salovey (1997) suggested that behaviors that prevent the development of future illness present a desirable outcome of maintaining current healthy status. Performance of preventive behaviors is associated with less health risks and is motivated by a preference for less risky outcomes rather than more probabilistic undesirable outcomes from not performing the preventive behavior. In contrast, Rothman and Salovey proposed that detection behaviors function to identify the presence of potential illness and are perceived to entail higher risks with expectations of undesirable outcomes to be discovered. Performance of detection behaviors is prompted by a preference for riskier and more probabilistic outcomes rather than more certain undesirable outcomes from not engaging in the detection behavior. Therefore, detection behaviors such as mammography screening should adopt loss-framing to facilitate preference for risk-seeking behavioral options and preventive behaviors such as applying sunscreen are best communicated using gain-frames to promote risk-avoiding behavioral alternatives (Gallagher & Updegraff, 2012).

Yet empirical evidence contradicts this prospect-theoretic generalization (O’Keefe, 2012), and vaccination (i.e., a preventive behavior) was also noted to be inconclusively influenced by goal framing effects. A recent systematic review conducted by Pența and Băban (2017) reported no significant effect of framing on vaccination-related outcomes in 12 studies, a gain-framed advantage on vaccine attitudes in one study, a loss-framed advantage on vaccine attitudes or intentions in five studies, and significant main effects of both gain- and loss-frames on vaccination intentions in two studies. Therefore, neither gain- nor loss-

framed messages are suggested to be differentially persuasive in influencing vaccination intentions.

O’Keefe (2012) offered an explanation for the observed variances in framing effects: the conceptualization of risk in prospect theory does not take into account the dangerousness of outcomes. He argued that the prospect theory’s definition of risk as uncertainty is unclear, as individuals may perceive equal uncertainty in outcomes between preventive and detection behaviors as well as between compliance and noncompliance to recommended behaviors. O’Keefe proposed that risk should be redefined as danger—a more colloquial understanding of risk; preventive behaviors are thus understood as less risky because there is little danger in performing preventive behaviors, whereas detection behaviors are riskier with a higher level of perceived danger. While this conceptualization of risk may provide some explanation for the inconsistent empirical findings on framing effects (i.e., because individuals may understand risk more colloquially as danger rather than uncertainty), O’Keefe’s argument does not concur with the fundamental definition of risk, that is, the probabilistic occurrence of future undesirable outcomes (Fischhoff, Watson, & Hope, 1984). O’Keefe’s proposed conceptualization instead accounts for the physical manifestation of risky outcomes. For this reason, this study maintains the prospect theory’s definition of risk as probabilistic uncertainty.

In sum, goal framing effects on vaccination behavior remains unclear. Previous studies found that gain-framed messages were generally more persuasive for preventive behaviors that are often thought of as less risky (Gallagher & Updegraff, 2012; Rothman & Salovey, 1997). However, Gallagher and Updegraff’s study as well as other meta-analytic reviews (O’Keefe & Jensen, 2007; O’Keefe & Nan, 2012) congruously found nonsignificant framing effects on specifically vaccination-related persuasive outcomes. It becomes reasonable to question the need to differentiate between gain- and loss-framed appeals in

promoting vaccination (O’Keefe & Nan, 2012). At the same time, however, there is still insufficient evidence to counter prospect theory’s proposition of gain-framing effect on preventive behaviors. This study poses the following research hypotheses to examine the collective gain-loss framing effects on influenza vaccination attitudes and intentions in comparison with when there is no message, as well as the different effects of gain- versus loss-framing:

H1: Gain- and loss-framed messages will lead to (a) more positive vaccination attitudes and (b) higher vaccination intentions as compared to the control group.

H2: Gain-framed messages will lead to (a) more positive vaccination attitudes and (b) higher vaccination intentions as compared to loss-framed messages.

Affected-Person Framing

As message framing was empirically found to have limited main effects on vaccination outcomes, Pența and Băban (2017) suggested affective proximity as a moderator that may possibly augment and attenuate gain-loss framing effects. The use of affective proximity in framed messages is speculated to evoke anticipatory emotions that will motivate individuals to engage in recommended behaviors (O’Keefe & Nan, 2012). Addressing the recipients of health consequences is a relevant concept in vaccine communication (Kelly & Hornik, 2016), where individual immunity contributes to the protective affordance of herd immunity in the wider society.

This study introduces the concept of “affected-person framing” that refers to the portrayal of individuals who are impacted by behavioral decisions. This concept theorizes that decisions to engage in certain behaviors often impact the decision-maker as well as other people. For example, alcohol use during pregnancy may harm both mothers and unborn children, drink driving puts drivers, passengers, and others at risk, and poor investments or conspicuous spending may pose financial burdens on family members. Thus, affected-person

framing is a message framing strategy that focuses on the outcomes of decisions caused to the decision-maker themselves or other individuals. Decision-makers may be motivated to choose to behave differently when considering the impact of their decisions on themselves versus the impact on others with whom they may additionally have affective associations. For instance, some women may choose to stop consuming alcohol when they become pregnant but not prior to pregnancy. In this example the women's consideration of their unborn children's health plays an influencing role in their cessation decisions. Some decisions, however, may have more far-reaching effects. Environmentally unfriendly behaviors such as improper disposal of electronic products or chemical waste may result in human consumption or inhalation of contaminated water or air. Such environmental behaviors can also affect many other people outside of the decision-makers' social networks. An awareness that behavioral decisions can impact unknown individuals may also influence a decision-maker to engage in more pro-environmental behaviors such as recycling.

The operational definition of affected-person framing builds on previous research. Some studies investigated the persuasive impact of framing loved ones as affected persons (Fahy & Desmond, 2010; Gainforth, Cao, & Latimer-Cheung, 2012; Lechuga et al., 2011). One study compared the effects of framing oneself and others as affected persons (Yu & Shen, 2013), and another study compared across oneself, close ones and others (Kelly & Hornik, 2016). The present study thus operationalizes affected-person framing in three levels: oneself, loved ones, and others. This operational definition makes a distinction of non-self individuals into "loved ones" and "others" that differ in affective proximity. Message recipients may have different affective associations with loved ones and other people, that may in turn exert different levels of influence on their behavioral decisions. Therefore, there is a need to differentiate between these two groups of non-self individuals.

Affected-person framing is not a novel concept in practice. A recent study in the United States reported an increase in influenza vaccination intentions after attendees at a State Fair received information about herd immunity (Channel NewsAsia, 2018). In Singapore, the health campaign “F.I.G.H.T. The Spread Of Infectious Diseases” highlighted the benefits of good hygiene practices to loved ones: “Protect the ones you love” (MOH, 2018b). In Western Australia, an influenza vaccination campaign addresses the possibility of transmitting the influenza virus to loved ones: “Protect yourself and your family against the flu. Because you have better things to share.” (Department of Health Western Australia, n.d.; see Appendix A for campaign materials).

This study first questions the effect of affected-person framing. Individuals tend to be unrealistically optimistic about their health and consider themselves to be less vulnerable to illnesses than others because they perceive more personal control over risks than others do (Weinstein, 1989). This cognitive bias can be maladaptive and lead to a failure to take up protective measures for their health (Weinstein & Lyon, 1999). Previous research found that unrealistically optimistic individuals are less likely to cognitively assess health threats and consequently less likely to engage in recommended health behaviors (Davidson & Prkachin, 1997). More recent research has also found that optimistic bias is unaffected by risk communication (Cho, Lee, & Lee, 2013). These findings suggest that optimistic bias plays a role in hindering individual-level behavioral change.

Beyond the individual self, vaccination increases protection for other nonvaccinated individuals. Vaccination is thus an altruistic behavior because certain vaccines offer more benefits to the society than to the individual recipient (Pywell, 2000; Shim, Chapman, Townsend, & Galvani, 2012). Research has also shown that altruism is an important factor in individuals’ decision to vaccinate against influenza (Shim et al., 2012; Vietri, Li, Galvani, & Chapman, 2012; Wheelock, Thomson, & Sevdalis, 2013). Vietri and colleagues found that

individuals are likely to self-vaccinate for others' health benefit, but this altruistic motivation takes place under the condition that individuals themselves are not at risk of influenza infection. Further, Pența and Băban (2017) suggested the possibility of differential framing effects between "others" messages highlighting close ones and those highlighting unknown others. With individuals expected to have greater motivation to behave more altruistically for others with whom they have stronger social ties (Rachlin & Jones, 2008), it is reasonable to speculate that positive vaccination-related outcomes are likely to result less through messages focusing on oneself or others but more through messages focusing on loved ones. However, Kelly and Hornik's (2016) study noted different results: behavioral intentions were most induced from exposure to societal-others messages. The variations in affected-person framing effects thus lead to the second set of research hypotheses:

H3: Affected person-framed messages will lead to (a) more positive vaccination attitudes and (b) higher vaccination intentions as compared to the control group.

H4: Loved ones-framed messages will lead to (a) more positive vaccination attitudes and (b) higher vaccination intentions as compared to oneself- or others-framed messages.

Affected-Person Framing and Prospect Theory

Previous studies also provided evidence that affected-person framing moderates goal framing effects on vaccination. On vaccination and nonvaccination effects on oneself and others, messages on self-gains from vaccination (protecting oneself from influenza) and others-losses from nonvaccination (exposing others to influenza) were found to strengthen persuasive effects more than self-losses (exposing oneself to influenza) and others-gains (protecting others from influenza; Yu & Shen, 2013). Other studies examined gain-loss framed messages about vaccinating family members (Fahy & Desmond, 2010; Gainforth et

al., 2012; Lechuga et al., 2011). Only Lechuga and colleagues' study had significant findings: both gain- and loss-frames were equally effective among non-Hispanic white mothers, but loss-frames had a greater impact among non-Hispanic African-American and Hispanic mothers on their intentions to vaccinate their daughters. O'Keefe and Nan (2012) suggested that loss-frames may be more persuasive as individuals are motivated to vaccinate their close ones to protect their health and out of anticipated negative emotions such as guilt and regret from failing to vaccinate them. The most recent study by Kelly and Hornik (2016) explored the inclusion of affective proximity in gain-framed messages and referred to this framing strategy as "benefit-target framing," that involves the manipulation of recipients of health benefits in messages such as oneself and family members. Their results indicated that societal others-framed messages were more effective in encouraging vaccination intentions. However, Kelly and Hornik's study did not assess the influences of loss-frames despite previous research noting the persuasiveness of loss-framed messages on exposing others to harm from non-behavioral compliance (Yu & Shen, 2013). The absence of a theoretical framework was also observed in Kelly and Hornik's study and a lack of theoretical underpinnings limits the functionality of new insights (Grant & Osanloo, 2014; Sarter, 2006). The present study differs from Kelly and Hornik's "benefit-target framing" (2016) such that benefit-target framing addresses only positive health effects to oneself or others, while this study addresses both positive and negative health effects to oneself or others. The present study examines gain- and loss-framed messages with different affected persons (oneself, loved ones, and others) rooted in prospect theory to better identify effective message content that will strengthen vaccination attitudes and intentions. Table 1 summarizes the experimental conditions of the above cited studies.

Table 1.
Summary of study conditions

Studies	Frame	Oneself-frame	Loved ones-frame	Others-frame
Fahy & Desmond (2010), Lechuga et al. (2011), Gainforth et al. (2012)	Gain-frame		X	
	Loss-frame		X	
Yu & Shen (2013)	Gain-frame	X		X
	Loss-frame	X		X
Kelly & Hornik (2016)	Gain-frame	X	X	X
	Loss-frame			

Note. X denotes the experimental conditions tested.

This study next aims to examine the combined effects of goal framing and affected-person framing that have yet to be extensively tested. It is not yet clear how gain-frames and affected-person framing would interact such that there is a clear hierarchical order in gain-framed message effects on vaccination attitudes and intentions. On one hand, Yu and Shen's (2013) cultural appeals study found that some individuals held higher behavioral intentions when gain-framed messages are directed toward oneself rather than toward others. Kelly and Hornik's (2016) study findings, on the other hand, showed that different affected-person frames moderated gain-frames to the extent that vaccination-related intentions were enhanced with messages addressing vaccination benefits to society as compared to those addressing vaccination benefits to oneself. The discrepancy in both studies' findings may be attributed to their different operationalizations of "others." Yu and Shen's others-frame implicitly included both oneself and others ("A Flu Shot Can Protect Many," p. 137), whereas Kelly and Hornik explicitly differentiated other individuals into loved ones and societal others. The present study thus builds on and seeks to confirm Kelly and Hornik's study findings:

H5: Others gain-framed messages will lead to (a) more positive vaccination attitudes and (b) higher vaccination intentions as compared to oneself gain- or loved ones gain-framed messages.

Current literature on the interactive effects of goal frames (gain versus loss) and cultural appeals (individualistic versus collectivistic) noted that self-loss messages (i.e., loss-frames with an individualistic focus) resulted in the least positive vaccination attitudes and intentions (Yu & Shen, 2013). The failure of oneself loss-frames to encourage engagement in recommended protective measures may be accounted by defensive message processing (Liberman & Chaiken, 1992) and avoidant coping (Ruiter, Abraham, & Kok, 2001) triggered by threatening messages that are personally relevant. O’Keefe and Nan (2012) pointed out the possibility that loss-frames may instead be more compelling in encouraging individuals to engage in protective measures for someone whom those individuals feel responsible toward because individuals are likely to engage in recommended behaviors to avoid negative emotions such as guilt from not protecting their loved ones. This implies that loved others’ state of health forms a more substantial consideration in individuals’ decision to self-vaccinate as compared to the consequences of vaccination received by individuals themselves and others, which leads to the following hypothesis:

H6: Loved ones loss-framed messages will lead to (a) more positive vaccination attitudes and (b) higher vaccination intentions as compared to oneself loss- or others loss-framed messages.

Methods

Design

This study expands on previous message framing works and features a 2 (goal framing: gain or loss) $\times$ 3 (affected-person framing: oneself or loved ones or others) between-subjects factorial design. A no-treatment control group is included in the design to provide baseline data for statistical comparisons. An additional level of manipulation (“flu/flu shot” or “influenza/influenza vaccine”) in the questionnaire and stimulus materials is also included as part of a separate study that investigates the impact of medical terms on vaccination-

related outcomes. The entire experiment was embedded within a cross-sectional, web-based survey to assess how goal framing and affected-person framing influence vaccination attitudes and intentions.

This study is part of a larger grant project funded by the Ageing Research Institute for Society and Education (ARISE) under its Social Integration and Education research thrust¹. The grant project titled “Improving Influenza Vaccination among Older Adults in Singapore” is headed by Dr. Christopher L. Cummings and seeks to understand influenza knowledge and vaccine communication needs or barriers among Singapore elderly. In line with this grant project objective, this thesis explores how influenza vaccine communication may be improved to promote vaccine uptake.

Sample

Quantitative data was collected through the online research panel Qualtrics. 1,031 complete responses were gathered from Singapore citizens and permanent residents—this sample size consists of both pools of participants exposed to the “flu/flu shot” questionnaire and “influenza/influenza vaccine” questionnaire to increase statistical power. Sixteen responses were removed due to straightlining ($n = 7$) and not fulfilling the age criteria (i.e., at least 22 years of age; $n = 9$). Another 119 pilot responses were excluded from analyses. The remaining sample of 896 responses yielded approximately 128 participants per condition and an estimated three percent margin of error that allowed for a lower probability of study results differing from the actual population.

The final sample pool has a mean age of 42.6 years ($SD = 13.88$), an equal gender distribution (50.4% males), a median household income of S\$50,000 to S\$75,000 (before taxes and other deductions), and a median education level of “Degree.” Participants are

¹ This research was supported by a two-year grant funding from the Ageing Research Institute for Society and Education (ARISE) at Nanyang Technological University, Singapore, under Project No. M4082069

composed of 87.7% Chinese, 4.9% Malays, 4.6% Indians, 1.2% Eurasian and 1.6% Others.

With respect to religion, there are 30.1% Buddhists, 25.4% non-Catholic Christians, 5.6% Muslims, 5.2% Taoism, 5% Catholics, 3.1% Hindus, 1.1% Others, and 24.3% Freethinkers or No Religion.

Stimuli

Participants were randomly assigned to conditions, and those in the treatment groups were exposed to one of six vaccine message stimuli (see Appendix B for experimental stimuli). Aside from the manipulated variables, diction on influenza severity (transmission and health complications) as well as vaccine effectiveness, safety and cost were maintained across conditions. Each experimental stimulus had two variables: 1) gain- or loss-framing and 2) oneself-, loved ones-, or others-framing.

Goal framing

Goal framing is concerned with gain- and loss-framing, or the presentation of outcome in terms of gains or losses. Gain-framed messages emphasize on the positive outcomes of performing a particular behavior and loss-framed messages focus attention on the negative consequences of not performing the behavior (Levin et al., 1998, 2002). Thus, the gain-framed message stimuli focus on the positive consequences of vaccination and the loss-framed message stimuli on the negative consequences of nonvaccination. Sample diction were as such (see Table 2):

Table 2. Gain-loss framed vaccine messages

Gain-frame	Loss-frame
<ul style="list-style-type: none"> • Vaccinating yourself protects you against flu. • Getting the vaccine prevents the spread of influenza. • Vaccinating yourself also protects you from risks of hospitalization and death. 	<ul style="list-style-type: none"> • Not vaccinating yourself exposes you to flu. • Failing to get the vaccine promotes the spread of influenza. • Not vaccinating yourself also puts you at risks of hospitalization and death.

Affected-person framing

Affected-person framing involves the portrayal of individuals who are impacted by behavioral decisions. The experimental stimuli with affected-person framing portray the effect of self-vaccination on different individuals including oneself, loved ones, and others (see Table 3):

Table 3. Affected-person framed vaccine messages

Oneself-frame	Loved ones-frame	Others-frame
<ul style="list-style-type: none"> Flu is highly contagious and you can easily get or pass on the flu virus. 	<ul style="list-style-type: none"> Flu is highly contagious and you can easily get or pass on the flu virus to your family. 	<ul style="list-style-type: none"> Flu is highly contagious and you can easily get or pass on the flu virus to others.

Goal framing & Affected-person framing

This study explores the interplay between goal framing and affected-person framing. Therefore, the gain-framed message stimuli highlight the positive consequences of vaccination on oneself, loved ones, or others. The loss-framed messages emphasize on the negative consequences of nonvaccination on oneself, loved ones, or others. Sample messages read as such (see Table 4):

Table 4. Gain-loss framed and affected-person framed vaccine messages

	Oneself-frame	Loved ones-frame	Others-frame
Gain-frame	<ul style="list-style-type: none"> • Vaccinating yourself protects you against flu. • If you are vaccinated against flu, you are protected from developing severe health complications of influenza. 	<ul style="list-style-type: none"> • Vaccinating yourself protects your family against flu. • If you are vaccinated against flu, your family is protected from developing severe health complications of influenza. 	<ul style="list-style-type: none"> • Vaccinating yourself protects others against flu. • If you are vaccinated against flu, others are protected from developing severe health complications of influenza.
Loss-frame	<ul style="list-style-type: none"> • Not vaccinating yourself exposes you to flu. • If you are not vaccinated against flu, you are at risk of developing severe health complications of influenza. 	<ul style="list-style-type: none"> • Not vaccinating yourself exposes your family to flu. • If you are not vaccinated against flu, your family is at risk of developing severe health complications of influenza. 	<ul style="list-style-type: none"> • Not vaccinating yourself exposes others to flu. • If you are not vaccinated against flu, others are at risk of developing severe health complications of influenza.

Procedure

Randomly selected Qualtrics panel members were invited to the online study with information provided on data confidentiality, the study purpose, and researcher's contact. Access to the questionnaire was made available only after participants had given their informed consent to take part in the study. The IRB-approved² questionnaire was completed in two parts. Participants were first randomly assigned to one of the study's seven conditions. Participants randomly assigned to an experimental condition were presented with a message stimulus that had either a gain- or loss-frame with compliance benefits accruing to oneself, loved ones, or others. Randomly assigned control group participants did not receive any stimulus. After the experimental or control conditions, the participants answered questions on their attitudes toward vaccination and vaccination intentions. Participants who completed the

² IRB reference number: IRB-2018-06-004

study were incentivized by the research panel with e-points exchangeable for prizes or products.

Measures

The survey contained a battery of questions measuring the study's independent and dependent variables to predict how goal framing and affected-person framing influence influenza vaccination attitudes and intentions. The full list of question items can be referred to in Appendix C.

Manipulation checks

Prior to research question analyses, the effectiveness of experimental manipulations was examined. Initial Likert-scale manipulation checks on 98 pilot study responses were nonsignificant⁴ and hence question items were changed to categorical response options⁵ following Kelly and Hornik's (2016) study. The final goal framing manipulation check question item was adapted from Hull (2012) that used a 7-point scale. Modified categorical response options include "I can gain health benefits if I receive the influenza vaccine," "I can lose health benefits if I do not receive the influenza vaccine," and "None of the above." Similar categorical response options were created for affected-person framing manipulation check: "Vaccination protects myself," "Vaccination protects my loved ones," "Vaccination protects others around me," and "None of the above."

⁴ Initial manipulation check questions include:

1. The article I have just read highlights the positive implications of getting the influenza vaccine. [Framing: $F(1, 96) = .023, p = .88$]
2. The article I have just read highlights the negative implications of getting the influenza vaccine. [Framing: $F(1, 96) = .25, p = .62$]
3. The article I have just read highlights how getting the influenza vaccine protects myself. [Targeting: $F(2, 95) = .19, p = .83$]
4. The article I have just read highlights how getting the influenza vaccine protects my loved ones. [Targeting: $F(2, 95) = .17, p = .84$]
5. The article I have just read highlights how getting the influenza vaccine protects other people. [Targeting: $F(2, 95) = .24, p = .79$]

⁵ IRB reference number for protocol amendment: IRB-2017-08-004-02

Dependent variables

Attitudes toward Vaccination were measured on a 7-point scale (1 = *Strongly disagree*, 7 = *Strongly agree*) with five items adapted from Yu and Shen's (2013) study that used a semantic differential scale. Modified items include "I think getting the influenza vaccine/flu shot to prevent influenza/flu is good" and "I think getting the influenza vaccine/flu shot to prevent influenza/flu is necessary." A higher score on the composite index formed with these five items reflected more favorable attitudes toward vaccination (Cronbach's $\alpha = .95$, $M = 5.09$, $SD = 1.11$).

Vaccination Intentions were measured with three items adapted from previous vaccine studies (Gerend & Shepherd, 2007; Gerend, Shepherd, & Monday, 2008) on a 7-point scale (1 = *Very unlikely*, 7 = *Very likely*). Example items include "How likely is it that you will consider getting the influenza vaccine/flu shot?" and "How likely is it that you will try to get the influenza vaccine/flu shot?" These three items formed a composite measure for vaccination intentions, and a higher score reflected stronger intentions to self-vaccinate (Cronbach's $\alpha = .95$, $M = 4.88$, $SD = 1.41$).

Analytical Approach

The framing manipulations were assessed with Pearson's Chi-Square Test given the categorical nature of the manipulation check data that has more than one degree of freedom and some expected counts greater than five (Cochran, 1952). All research hypotheses were tested with four sets of planned contrasts conducted via one-way ANOVA (Analysis of Variance) on SPSS (Statistical Package for the Social Sciences) with *attitudes toward vaccination* and *vaccination intentions* as the dependent variables in each ANOVA model. Tables 5 below presents the contrast coefficients for each hypothesis.

Table 5. Planned Contrast Coefficients

Contrast	Goal Framing			Hypothesis
	Control	Gain-frame	Loss-frame	
C1	-2	1	1	H1
C2	0	-1	1	H2

Contrast	Affected-Person Framing				Hypothesis
	Control	Oneself-frame	Loved ones-frame	Others-frame	
C1	-3	1	1	1	H3
C2	0	-1	1	0	H4
C3	0	0	-1	1	H4

Contrast	Goal Framing & Affected-Person Framing						Hypothesis
	Gain, Oneself	Gain, Loved ones	Gain, Others	Loss, Oneself	Loss, Loved ones	Loss, Others	
C2	1	-1	0	0	0	0	H5
C3	0	1	-1	0	0	0	H5
C2	0	0	0	1	-1	0	H6
C3	0	0	0	0	1	-1	H6

Results

Manipulation Checks

The revised manipulation checks demonstrated that both goal frames and affected-person frames did not achieve the desired level of manipulation. 72.6% of participants assigned to the gain-frame condition perceived the stimulus message to highlight the positive implications of vaccination but only 17.5% participants in the loss-frame condition perceived the stimulus message to highlight the negative implications of nonvaccination (Pearson $\chi^2 = 1.95$, $df = 2$, $p = .38$). In the affected-person framing conditions, participants perceived how getting vaccinated protects themselves (58.6% in the oneself condition), their loved ones (28.4% in the loved-ones condition), or other people (47.2% in the others condition; Pearson $\chi^2 = 67.38$, $df = 6$, $p < .001$).

Given that many previous studies had successful goal framing and affected-person framing manipulations, it is reasonable to presume that the weak experimental manipulations

in this study are attributable to its stimulus messages. The failed goal framing in this study may be due to an inadequate salience of positive and negative frames, where only approximately one-third of the stimulus message content was related to vaccination benefits or consequences that were also located at the end of the stimulus. The other two-thirds of the content on influenza severity and susceptibility were not directly related to vaccination or goal framing (see Appendix B). The goal framed content was thus unlikely to be salient to the participants.

With respect to affected-person framing, it is possible that the nonsignificant manipulation checks were a result of the different “loved ones” operationalizations in the stimulus messages (“family”) and questionnaire (“loved ones”). Participants could hence have had different personal definitions of “loved ones” when responding to the post-stimulus questionnaire—some participants may only regard family members as loved ones, while others may include close friends. The term “loved ones” may also prompt a more affect-based perception rather than one that is based on spatial distance, which may have introduced a confounding perception that differs from the function of vaccines to protect other unimmunized individuals within physical proximity.

Planned Contrasts

The first set of hypotheses was posed to address the lack of definitive evidence of goal framing effects on vaccination behavior: if gain-loss framing has collectively more impact on vaccination attitudes and intentions as compared to the control condition (H1), and if gain-frame is more effective than loss-frame (H2). Results from the first ANOVA model showed a significant effect of goal framing on vaccination attitudes [$F(2, 893) = 4.90, p < .01$, partial $\eta^2 = .011$] but a nonsignificant effect of framing on intentions [$F(2, 893) = 1.04, p = .35$]. The contrasts on vaccination attitudes further showed a significant difference [$t(893) = 3.07, p < .01$] between gain-loss framing ($M_{\text{gain}} = 5.12, SD = 1.04$; $M_{\text{loss}} = 5.17, SD = 1.13$) and the

control condition ($M = 4.82$, $SD = 1.19$) but not between gain- and loss-framing [$t(893) = .65$, $p = .52$]. Therefore, only H1a is supported, whereas H1b and H2 are not supported.

The second set of hypotheses explored the persuasive effect of affected-person framing: if affected-person framing is generally more effective on vaccination attitudes and intentions than the control condition (H3), and if loved ones-frame has the most impact as compared to oneself- or others-frame (H4). The second ANOVA model similarly found a significant effect of affected-person framing on vaccination attitudes [$F(3, 892) = 3.24$, $p < .05$, partial $\eta^2 = .011$] but not intentions [$F(3, 892) = .98$, $p = .40$]. The contrasts on vaccination attitudes showed a significant difference [$t(892) = 3.07$, $p < .01$] between affected-person frames ($M_{\text{oneself}} = 5.11$, $SD = 1.07$; $M_{\text{loved ones}} = 5.17$, $SD = 1.15$; $M_{\text{others}} = 5.15$, $SD = 1.04$) and control condition ($M = 4.82$, $SD = 1.19$) but not within specific affected-person frames [C2: $t(892) = .58$, $p = .56$; C3: $t(892) = -.20$, $p = .84$]. Therefore, results only support H3a, but not H3b or H4.

The last set of hypotheses enquired into the combined effect of goal framing and affected-person framing on vaccination attitudes and intentions that has yet to be extensively examined. H5 posited that others gain-framed messages will lead to more positive vaccination attitudes and intentions than other affected-person gain-framed messages, while H6 similarly posited that among loss-frames, loved ones-framing will be more effective than oneself- or others-framing. The ANOVA models revealed nonsignificant framing effects on vaccination attitudes [$F(6, 889) = 1.69$, $p = .12$] and intentions [$F(6, 889) = .57$, $p = .75$] for both gain- and loss-frames. Therefore, both H5 and H6 are not supported.

Discussion

The low vaccination uptake rate in Singapore signals a need for improved strategic vaccine communication to prevent influenza-associated deaths among at-risk populations including the elderly, young children, and pregnant women. Message framing is a widely

used strategy in health communication and has been demonstrated as an effective persuasion technique. However, goal framing effects have not been consistent in the context of vaccination behavior as noted by Pența and Băban (2017) and framing behavioral outcomes caused to others was proposed to moderate framing effects (O’Keefe & Nan, 2012; Pența & Băban, 2017). Yet enquiries into this framing approach thus far have not provided clear evidence of its moderating effect on vaccination intentions (e.g., Kelly & Hornik, 2016; Yu & Shen, 2013). The present study furthers recent works by introducing affected-person framing and assessing how goal framing and affected-person framing may jointly influence vaccination attitudes and intentions.

Data suggests no difference between manipulated levels of gain-loss framing and affected-person framing. However, results demonstrate that goal framing and affected-person framing conditions differ from the control group. This indicates message framing to have some effect on improving vaccination attitudes when compared with the control group that had no influenza message at all, but these framed messages may not have influence on vaccination intentions. Influenza messaging is therefore better than no messaging at all.

While the absence of significant gain-loss framing effects can also be attributed to the failed goal framing manipulations possibly due to inadequate framing salience, results indicate that goal framing, regardless of gain- or loss-framing, may foster positive attitudes toward influenza vaccination. Specific gain-loss frames are suggested to not influence vaccination attitudes or intentions. These results add to the current literature that did not find significant specific gain-loss framing effects on vaccine uptake, such as those identified in Pența and Băban’s (2017) systematic review. Bartels, Kelly, and Rothman (2010) attributed the inconsistency of goal framing effects on health behaviors to the failure to take into consideration message recipients’ perceived behavioral risk. Latimer, Salovey, and Rothman (2007) further explained that framed messages should be constructed to match recipients’ risk

perceptions about the behavior rather than the objective risks of the behavior. Future framing studies should thus consider subjective risk judgements of vaccination behavior.

Affected-person framed messages are similarly more effective in promoting favorable vaccination attitudes than the no-framing control group, despite the weak experimental manipulations of affected-person framing. It is speculated that identifying persons affected by one's self-protective behavior, regardless if those affected persons are oneself, loved ones or others, triggers cognitive associations and affect toward the affected persons. Further testing of this message strategy of identifying affected persons in other infectious disease contexts is warranted to validate the effectiveness and persuasive mechanisms of affected-person framing. This message framing approach may also be used in practice for other health behaviors such as human immunodeficiency detection and prevention.

Affected-person framing was proposed as a possible moderator given the inconclusive evidence of goal framing effects on vaccination outcomes. Yet this study's findings failed to yield evidence to support the rejection of the null hypothesis that a combination of goal framing and affected-person framing influences vaccination attitudes or intentions. This also does not support the hypothesis proposed by O'Keefe and Nan (2012) as well as by Pența and Băban (2017) who queried if "framed messages are strengthened or attenuated according to the affective proximity between the decision maker and the people who could be affected by the decision" (p. 12). Null findings in this study also do not add support to Kelly and Hornik's (2016) significant study results. It is likely that a single experimental influenza vaccine message is not sufficient to create awareness of herd immunity and bolster positive attitudes and intentions to vaccinate, given the complexity of vaccination behavior that is influenced by multiple internal and external factors (MacDonald, 2015) existing on the individual, interpersonal, organizational, community, and structural levels (Dubé & MacDonald, 2016). The experimental stimuli did not exhaustively address all possible

determinants of vaccination behavior and were thus unlikely to influence vaccination attitudes and intentions. Vaccine communication campaigns may need to be multifaceted and extensive in order to promote favorable attitudes and intentions. Null findings in this study may also be associated to the failed experimental manipulations and future study replications should additionally consider nonvaccination contexts to assess if goal framing and affected-person framing may influence other health behavioral intentions—health behaviors that affect surrounding others such as smoking cessation are proposed for future consideration.

Practical Implications for Health Communication

Findings in this study suggest that neither goal framing nor affected-person framing is adequate in increasing influenza vaccination intentions. With respect to practical implications, this could signal that sole portrayals of vaccination benefits or consequences or the sole portrayals of affected individuals in influenza vaccine messages are unlikely to prime intentions to vaccinate. However, it is noted that message exposure primes and facilitates promotion of favorable vaccination attitudes. Influenza vaccines messages may therefore not necessarily require goal framing or affected-person framing but should instead focus on communicating about influenza severity and vaccine efficacy.

In terms of practice, message designers have a choice between portraying influenza vaccination as a beneficial behavior and portraying nonvaccination as a disadvantageous act. Message designers can also focus on vaccine recipients or other individuals such as young children and older adults impacted by vaccination. Any of these six portrayals is more persuasive in encouraging positive vaccination attitudes than no portrayals. Communicating about the influenza and vaccine response is therefore still important and should be maintained to improve attitudes toward vaccination and ultimately, intentions to vaccinate.

Limitations and Future Directions

The nonsignificant findings in this study reveal two main methodological limitations. First, the weak framing manipulations limit the internal validity of the study findings. Nonsignificant manipulation checks denote that participants were unable to recognize the content of the stimulus messages, which may have impeded or weakened the intended message effects on participants' vaccination attitudes and intentions. Goal framing and affected-person framing manipulations will thus need to be improved in their salience (gain vs. loss, oneself vs. loved ones vs. others) such as with the use of visual cues and portrayals. Pilot testing of message frames should also be considered to ensure that frames are detected and distinct.

Second, this study was conducted using an online survey platform among Singapore participants who volunteered into the panel and thus results from this non-probability sampling approach are not generalizable. While a web-based study offers access to large samples that increase the statistical power of data analyses (Reips, 2000) and the study's experimental design with random assignment and inclusion of a control group strengthens the internal validity of this study to some degree, replications on probability samples remain warranted to assess the persuasive effects of goal framing and affected-person framing. Other societies may also be considered in future research given that influenza is a public health concern in many other nations.

Several areas of future research directions are also identified through this study. First, this study investigated framing effects on two separate dependent variables (attitudes and intentions) because of the complexity of vaccination. Existing literature has yet to fully establish factors influencing vaccination attitudes and factors contributing to the intention-behavior gap. Statistical tests such as mediation analysis may be considered to assess if goal framing or affected-person framing may have an indirect impact on vaccination intentions

through attitudes. In other words, do vaccination attitudes mediate the effect of message framing on vaccination intentions?

Second, this study notes that goal framing and affected-person framing may have limited direct impact on vaccination intentions. It may be worthwhile to take into account the influence of past vaccination history or personality traits such as consideration of future consequences and altruism on message framing effects. For example, previous studies found goal framing to be mediated by consideration of future consequences (CFC) such that individuals with high levels of CFC are more responsive to gain-frames and individuals with low CFC levels are more responsive to loss-frames (O'Connor, Warttig, Conner, & Lawton, 2009). Altruistic motives were also suggested in previous studies to strengthen intentions to self-vaccinate (Shim et al., 2012; Vietri et al., 2012) and could thus be primed with affected-person framing. These factors may be considered as control variables to assess for audience segmentations in goal framing and affected-person framing effects in future studies.

Third, the nonsignificant main effect of affected-person framing is likely to also be influenced by misperceptions about influenza as a non-serious disease. Various studies found that residents and HCWs in Singapore have a low perception of influenza severity and susceptibility (e.g., Cummings et al., n.d.; Sundaram et al., 2018). It is therefore probable that the perceived low severity of influenza spread to even friends and family may not encourage vaccination. Instead, it can be speculated that affected-person framing may have an effect for vaccines targeting infectious diseases that are perceived to be more severe such as polio or pneumonia. Individuals are likely to have a stronger motivation to avoid infecting themselves or others from severe diseases preventable by vaccination as compared to diseases that can be easily treated. The question of “how does disease severity influence affected-person framing effects?” can be considered for future research.

Last, future works interested in furthering this study's line of research may also consider using behavioral theories as a framework. The theory of planned behavior is one such theory that has demonstrated predictive value (Armitage & Conner, 2001) and has been used to explain vaccination behaviors (e.g., Askelson et al., 2010; Juraskova et al., 2012). This theory may therefore be an appropriate theoretical framework to identify effective message content that enhances vaccine acceptance and vaccination intentions.

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Appendix A

Singapore F.I.G.H.T. health campaign

(source: HealthHub, Ministry of Health Singapore)

Western Australia influenza immunization campaign

(source: Government of Western Australia, Department of Health)

Appendix B

Message condition: Gain-frame, oneself-targeted

Influenza vaccination: getting the shot to protect yourself from the flu bug

BY THE ASSOCIATED PRESS (HEALTH)
PUBLISHED: JANUARY 09, 2018

WHAT IS INFLUENZA?

Influenza, also known as the “flu”, is a contagious respiratory illness that infects the nose, throat, and lungs. Symptoms of flu include body aches, cough, fatigue, fever, headaches, sore throat, and stuffy or runny nose.

In some cases, the symptoms develop into more severe complications such as ear infections, upper and lower respiratory tract infections, pneumonia, inflammation of the heart, brain or muscle, sinus infections, multi-organ failure, worsening of chronic conditions, and even death.

Highlights

You can get infected easily with influenza and spread the flu virus

Taking the flu shot highly protects you against influenza

Photo: A doctor administering the influenza vaccine
(Source: Getty Images)

WHO'S SUSCEPTIBLE?

Anyone can get influenza and developments of severe complications can happen to people of any age. Flu viruses spread through direct or indirect means. You can get the virus through droplets expelled from infected people when they sneeze, cough, or talk. You can also get infected when you touch surfaces that are contaminated with influenza. People around you may be potential carriers without them knowing that they are sick. Healthy adults can infect others 1 day before symptoms develop and up to five to seven days after becoming sick. Flu is highly contagious and you can easily get or pass on the flu virus.

HOW TO PREVENT INFLUENZA?

The influenza vaccine, commonly referred to as the “flu shot”, is a highly recommended way to prevent illness. Vaccinating yourself protects you against flu. If you are vaccinated against flu, you are protected from developing severe health complications of influenza. Vaccinating yourself also protects you from risks of hospitalization and death. Dr. Travis Sloan from Centers for Disease Control and Prevention said that “getting the vaccine prevents the spread of influenza.” Vaccination is safe and does not cause flu. You can get the flu shot at a low cost at most clinics and hospitals.

“Getting the vaccine prevents the spread of influenza.”

- Dr. Travis Sloan,
Centers for Disease Control and Prevention

Message condition: Gain-frame, loved ones-targeted

Influenza vaccination: getting the shot to protect your loved ones from the flu bug

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Highlights

You can get infected easily with influenza and spread the flu virus to your family

Taking the flu shot highly protects your family against influenza

Photo: A doctor administering the influenza vaccine
(Source: Getty Images)

WHO'S SUSCEPTIBLE?

Anyone can get influenza and developments of severe complications can happen to people of any age. Flu viruses spread through direct or indirect means. Your family can get the virus through droplets expelled from infected people when they sneeze, cough, or talk. They can also get infected when they touch surfaces that are contaminated with influenza. People around them may be potential carriers without them knowing that they are sick. Healthy adults can infect others 1 day before symptoms develop and up to five to seven days after becoming sick. Flu is highly contagious and you can easily get or pass on the flu virus to your family.

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Photo: A doctor administering the influenza vaccine
(Source: Getty Images)

“Getting the vaccine prevents the spread of influenza.”

- Dr. Travis Sloan,
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Message condition: Loss-frame, oneself-targeted

Influenza vaccination: not getting the shot exposes you to the flu bug

BY THE ASSOCIATED PRESS (HEALTH)
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Highlights

You can get infected easily with influenza and spread the flu virus

Not taking the flu shot puts you at risk of influenza

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Photo: A doctor administering the influenza vaccine
(Source: Getty Images)

“Failing to get the vaccine promotes the spread of influenza.”

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Message condition: Loss-frame, loved ones-targeted

Influenza vaccination: not getting the shot exposes your loved ones to the flu bug

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Not taking the flu shot puts your family at risk of influenza

Photo: A doctor administering the influenza vaccine
(Source: Getty Images)

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Appendix C

Manipulation Checks:

1. Which of the following best describes the content of the article you have just read?
 - a. I can gain health benefits if I receive the influenza vaccine
 - b. I can lose health benefits if I do not receive the influenza vaccine
 - c. None of the above
2. Which of the following best describes the content of the article you have just read?
 - a. Vaccination protects myself
 - b. Vaccination protects my loved ones
 - c. Vaccination protects others around me
 - d. None of the above

Attitudes toward Vaccination:

(1 = *Strongly disagree*, 7 = *Strongly agree*)

1. I think getting the influenza vaccine/flu shot to prevent influenza/flu is good.
2. I think getting the influenza vaccine/flu shot to prevent influenza/flu is favorable.
3. I think getting the influenza vaccine/flu shot to prevent influenza/flu is necessary.
4. I think getting the influenza vaccine/flu shot to prevent influenza/flu is beneficial.
5. I think getting the influenza vaccine/flu shot to prevent influenza/flu is desirable.

Vaccination Intentions:

(1 = *Very unlikely*, 7 = *Very likely*)

1. How likely is it that you will consider getting the influenza vaccine/flu shot?
2. How likely is it that you will try to get the influenza vaccine/flu shot?
3. What is the likelihood that you will get the influenza vaccine/flu shot if a healthcare provider offers it to you in the next 12 months?