HPV Vaccination Campaigns in the Netherlands

Improving the information for the online campaign of the RIVM HPV Twitter campaign

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Preface

This thesis was written as part of the Master Public Administration with a specialisation in Communication and Media. When I heard that there was an option to write my thesis about a campaign in the field of public administration, I was excited due to my growing interest in the designing process of public information campaign during my Bachelor thesis. Now that the project has come to an end, I am more interested in designing campaigns in the public sector than ever. I have also enjoyed dealing with the HPV vaccine as my campaign topic since the vaccine has a divided picture within society.

I would like to thank my supervisors Mirjam Galetzka and Ariana Need for their time, great assistance and support during the time I worked on my thesis. Thank you a lot for your patience. I am also grateful for the help of Peter Noort, to whom I could always go when I had questions about the mini-systematic literature review. Finally, I would like to thank my family and friends for supporting me with my thesis and getting me relaxed when I needed it.

I hope you enjoy reading my thesis!

Sarah Forster, February 2020

Abstract

Introduction: Since its introduction in the National Immunisation Programme (NIP) in 2009, the Human Papillomavirus vaccine (HPV) had a low uptake in the Netherlands. Research has shown that the HPV Twitter campaign of the National Institute for Public Health and Environment (Rijksinstituut voor Volksgezondheid en Milieu; RIVM) failed at its communication with the Dutch citizens. The RIVM failed to inform citizens, with no prior knowledge of the HPV vaccine, sufficiently. This resulted in Dutch citizens worrying about the vaccine efficacy, safety and unknown side-effects.

Objective: This study aims to improve the information used in the HPV vaccination campaign of the RIVM on the social media platform Twitter. The following research questions have been developed: *(1a.) Which message frames positively affect vaccination attitude and vaccination intention, and (1b.) which moderators influence the effect of message frames on vaccination attitude and vaccination intention and (2) how can these frames be used in the Twitter HPV vaccination campaign of the RIVM?*

Methods: In this study, a mini-systematic literature review is conducted to investigate which message frames, and under which conditions these frames, are affecting the individual's vaccination intention and vaccination attitude. A total of 26 studies are included in this study. The health communication guide from the U.S. Department of Health & Human Services is consulted for the development of the design implication.

Results: The findings of the mini-systematic review show that gain-, loss-, temporal-, and attribute-framing affect the individuals' vaccination intention and attitude. Furthermore, the findings show that the included studies found more moderating factors influencing message frames than the theory suggested, being: vaccine efficacy, ethnic groups, text vs. image support, colour combination, media channel, prior-knowledge about the vaccine, consideration of future consequences, temporal distance and behavioural frequency. The findings also show that a limited amount of literature discusses the effect of temporal- and attribute framing on vaccination intention and vaccination attitude. The design implications for the RIVM HPV Twitter campaign show that all four message frames (Gain-, loss-, temporal- and attribute framing) can be used to derive six new campaign messages which should improve the information of the RIVM HPV Twitter campaign.

Discussion/ Conclusion: In conclusion, gain-, loss-, temporal-, and attribute framing can be applied to persuade people to get vaccinated and/or to change their attitude towards vaccination. Furthermore, several moderators influence the effectiveness of gain- and loss- framed messages in vaccination messages. Gain-, loss-, and temporal framed messages are designed to inform the parents about the infectious disease Human Papillomavirus and to explain why this vaccine is necessary. The most effective moderators that the RIVM should consider for effective implementation of the message frames are: perceived risk, vaccine efficacy, ethnic groups and prior-knowledge about the vaccine.

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1.0. Introduction

For a democracy to operate efficiently, the government needs to communicate with the citizens of the country (OECD, 1996). Citizens have the right to know how the current government ministers and how other public organisations are performing and why certain decisions are made. The information from the government has to be credible and presented in time, to ensure that citizens are properly informed. In general, there are three primary functions of the communication of governments towards citizens; persuading/advocating for policies or reforms, informing the citizens and engaging the citizens with political issues (The George Washington University, 2009). These functions of communication are essential for the government to increase its *accountability* (explaining governments actions and providing a way to hold the government accountable), *responsiveness* (through communication, governments recognise citizens needs and can respond to them), and it can improve the *effectiveness* of the government (by building citizen support and legitimacy for the programs governments establish) (The George Washington University, 2009). All in all, for a state to function properly, the communication coming from the government towards citizens is crucial.

Governments started to deploy public information campaigns to advertise certain issues and causes (Wigley, 2011). Governmental organisations often set up public information campaigns in order to raise public's awareness regarding social problems (Henry & Gordon, 2003). They also use the campaigns to influence citizens' opinions, attitudes or their behaviour (Henry & Gordon, 2003). Within the scope of this study, the focus is on health behaviour. Health behaviour is compromised out of a variety of social (for instance educational level, exposure to violence and access to health care), cultural and personal factors (Maibach, Flora & Nass, 1991). Public information campaigns are used by public health organisations to encourage health awareness and to change behaviour towards a healthier lifestyle (Wigley, 2011). Even though regulatory approaches are applied to change the health behaviour, public health workers have no direct means to enact these changes or the ability to persuade the people (Maibach et al., 1991). To counter this, health information campaigns are strategically used to ensure behavioural change (Maibach et al., 1991)

In this study, the focus is on the public health campaign regarding the Human Papilloma Virus (HPV) vaccine in the Netherlands. Each year in the Netherlands, around 600 to 850

women are diagnosed with cervical cancer and approximately 200 women die due to the disease (Schurink & Melker, 2017). The Human Papilloma Virus (HPV), mostly genotypes 16 and 18, is widely perceived as the leading cause of cervical cancer and is mainly transmitted via sexual activities (Schurink & Melker, 2018). Aside from cervical cancer, the HPV genotypes are also connected to other types of cancer which often affect men. Around 70% of oropharyngeal cancers, 90% of anal cancers and 60% of penile cancers are linked to the oncogenic HPV strains (Patty et al, 2017). However, HPV does not only lead to cancer. According to Perez et al. (2018), the oncogenic HPV genotypes 6 and 11 are responsible for 85% of genital warts. To this day, there are three vaccines to prevent HPV related diseases: (1) a nonavalent vaccine, called Gardasil 9vHPV, which is against the HPV genotypes: 6, 11, 16, 18, 31, 33, 45, 52 and 58; (2) a quadrivalent vaccine called Gardasil 4vHPV, which is against the HPV genotypes: 6, 11, 16 and 18; (3) bivalent vaccine called Cervarix 2vHPV, which is against the most serious types that are causing about 70% of all cervical cancer cases: 16 and 18 (Schurink & Melker, 2018; Steens et al., 2013). Currently, in the Netherlands, the bivalent vaccine Cervarix 2vHPV is used (Schurink & Melker, 2017).

In 2006, the first vaccines against the Human Papilloma Virus were approved by the European Medicines Agency (Patty et al., 2017). The Netherlands was among the first European countries to introduce the HPV vaccine in its National Immunisation Programme (NIP). In 2009 the Netherlands launched a HPV vaccination catch-up campaign for girls who were born between 1993 and 1996 and a routine HPV vaccination for 12 year old girls was added to the NIP in 2010 (Schurink & Melker, 2017). Despite the active recruitment campaign (the catch-up campaign for girls between 13 and 16), the number of participants for the first doses was only 41% rather than the expected 70% (van Keulen et al., 2013). In 2012 the vaccination rate was still low with 56% and it did not pass 60% in the years after (Schurink & Melker, 2017). In general, it can be said that the HPV vaccine has a low participation rate in the Netherlands.

Graef (2019) studied responses to HPV vaccinations campaigns in the Netherlands, analysing the Twitter discussion. Graef (2019) analysed Tweets from 2011 till 2016 mentioning HPV, furthermore she examined the Tweets from the National Institute for Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milieu; RIVM)[1] and the Community

[1] The RIVM (Rijksinstituut voor Volksgezondheid en Milieu) is a Dutch national institute that has a central role in infectious disease control, national prevention and population screening programmes. The institute aims to

health service GGDTwente[2]. Graefs (2019) analysis revealed that the RIVM and GGDTwente did not become active on Twitter regarding the HPV vaccine until 2015. She also found that the tweets of the GGDTwente only entailed vaccination schedules, whereas, the tweets of the RIVM sometimes entailed links to information on their website. However, neither of the public health organisations actively tried to explain the virus and the vaccine to the public, nor did they try to assure the public that the vaccine was safe. Unfortunately, the safety concern was the biggest concern of the citizens according to Graef (2019). At the same time, Graef (2019) found out that certain websites and Twitter users were successful in spreading misinformation regarding serious side-effects coming from the vaccine. An example of such misinformation is the claim that "after receiving the HPV vaccine, girls would fall severely ill and would end up in the emergency room (ER)" (Graef, 2019, p.25). In 2015 and 2016, the posts from "anti-vaxxers" like the website 'wanttoknow.nl' and the 'Dutch Association Critical of Vaccines' went viral (Graef, 2019). Posts from these "anti-vaxxers" gained attention on Twitter which led to people becoming confused and causing an increase in the fear of side-effects of vaccinations (Graef, 2019). Graef (2019) concluded that the GGDTwente and RIVM should have done more in countering these misinforming messages, meaning that the RIVM came short to inform the public sufficiently through their social media campaign. The RIVM did not counter the misinformation about the side-effects which was found as one of the highest concerns regarding the vaccine (Graef, 2019). The public health campaign of RIVM missed out on its communication with the public, causing people to be poorly informed about the new vaccine, which is a major problem. The aim of this study is to counter the aforementioned problems by providing design implications for the RIVM HPV Twitter campaign.

1.1 Explaining vaccination uptake

To identify how a population is protected from a disease after vaccination, herd immunity is calculated (Oxford Vaccine Group, 2016). According to the theory of herd immunity (Oxford Vaccine Group, 2016), when a lot of people in an area are vaccinated, fewer people of this area will get sick since fewer germs can be spread. Even people that are not vaccinated are, in some way, protected more when the majority of the population is vaccinated (Oxford Vaccine Group, 2016).

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improve public health and to safeguard a healthy environment by organizing, for instance, cancer-screening programs or the NIP (National Immunisation Program). (rivm.nl/en/about-rivm)

[2] The GGD (Gemeentelijke GezondheidsDienst) consists of different local departments that aim likewise as the RIVM but carry outs the more practical tasks in order to achieve the aims. For instance, the GGD is giving advice on sexual behaviour and is providing vaccinations (ggdtwente.nl/over-de-ggd/wat-we-doen)

Nevertheless, for herd immunity to function in regards to the HPV vaccine, 80% of boys and girls need to be vaccinated (Barisson et al., 2016). This is difficult to achieve, due to the collective action problem (Olson, 1971). According to the theory of the collective action problem, established by Mancur Olson (1971), people would be better off if everyone would get vaccinated. However, Olson (1971) mentions that people who are rational and self-interested will not get vaccinated to achieve the common good. People can be considered rational when they take into account; all the available information, potential costs/benefits in determining the preferences they have, and probabilities of events and then choose and act on the option which is best for them (Olson, 1971). When interests are shared, rational actors prefer to free-ride, in other words, let the other people get vaccinated and still get the benefit (Olson, 1971). This depends on the assumption people have about the behaviour of others (Olson, 1971). If no one is vaccinated, or hardly anyone, it is rational to get vaccinated in order to protect yourself (Olson, 1971). But only if it's assumed that, in case of the HPV vaccine, 80% of the population gets vaccinated, it becomes rational to free-ride (Olson, 1971).That is why in societies with very high vaccination rates, the uptake of vaccinations drops at a certain point.

Marwell and Oliver (1993) do not assume that people who are in a group with the same interest are performing in complete isolation. They presume interdependence among the members. Interdependence, in this case, is defined as "behaviour that takes account of the effect of one´s participation in collective action on the participation of others" (Marwell & Oliver, 1993, p.9). In other words, once a critical mass engages in the actions, others will follow. Therefore, public health campaigns can be useful to ensure that the critical mass who vaccinates is reached. This critical mass theory relates to the diffusion of innovations theory by Rogers (1962).

The diffusion of innovation theory (Rogers, 1962) is about the explanation how over time an idea has gained momentum and diffusion, or has spread through a particular population group or social system, resulting in the adoption of a new idea or behaviour. In this case, adoption means that the individual does something different when a new idea has been introduced to society, such as acquiring and performing a new behaviour (Rogers, 1962). The HPV vaccine can also count as an innovation since it is a relatively new vaccine and is unknown by the population. Rogers (1962) found that people fall into one of five different adopter groups based on how early or quickly they are adopting an innovation, in this case a vaccine. If the aim is to promote the adoption of a product in society, one needs to introduce it to each group

differently by using distinct communication channels and messages (Rogers, 1962). To show how adoption works within societies, the 'S' curve model is created (Rogers, 1962). This model states that, the 'Innovators' learn about the innovation first and will try out the innovation immediately after it has been released (Rogers, 1962). The next group contains the early adopters, who are trendsetters which are endorsed by the innovated friends (Rogers, 1962). The next group are the early majority and late majority groups start using the product or innovation because they see that people they trust are using it, they start using it (Rogers, 1962). When the level of late majority is reached, the adoption rate is relatively high (Rogers, 1962). To ensure that the whole society is adopting the innovation, it needs to hit a critical mass, which represents most people from society (Rogers, 1962). At this point, the innovation is considered to be a new and accepted social norm (Rogers, 1962). Campaigns can be useful to bridge the gap between the different groups and their acceptance of the introduced vaccine.

1.2. Message Frames in Campaigns

Message framing is a crucial aspect of health communication (Updegraff & Rothman, 2013). Message frames, according to Goffman (1974), are referring to the way how a message is described and presented. Campaign designers may frame messages in order to guide the reaction of the audience towards a specific end-goal by either emphasising or not including certain issues about the topic (Andersen, Wylie, & Brank, 2017). According to Rothman et al. (2006), this emphasis can then, manipulate or distort the understanding of the topic by the audience, and can even impact the memory of the audience regarding the topic. Therefore, message framing has the ability to have wide-reaching implications for how a campaign message is delivered, heard by the audience and how they act upon it.

1.3. Purpose of the study

The purpose of the study is to improve the public health information vaccination campaign of the RIVM regarding the HPV vaccine on Twitter. The focus is on enhancing the messages and content for the tweets to better inform the public about the vaccine. In order to improve the Twitter campaign of the RIVM, the following research questions have been developed:

(1a.) Which message frames positively affect vaccination attitude and vaccination intention, and (1b.) which moderators influence the effect of message frames on vaccination attitude and vaccination intention and (2) how can these frames be used in the Twitter HPV vaccination campaign of the RIVM?

In order to answer the first question, a mini-systematic literature review is conducted; the design implications are derived from the results of the mini-systematic literature review.

1.4. Contribution of the study

This study contributes to the HPV vaccination literature which has been on the rise since the HPV vaccine's world-wide introduction (e.g. Rondy et al., 2010; Lee& Cho, 2017). In this literature, the main focus is on why people reject the vaccine and what factors play a role in the rejection. There is a lack of research on campaigns of HPV vaccinations discussing design implications in order to improve an online HPV campaign of a public health organisation. Framing methods and useful platforms for campaigns have been studied extensively. This study will bring new ideas on how public health organisations, like the RIVM in the Netherlands, can communicate the HPV campaign through the online micro-blogging platform Twitter. Furthermore, this research gives a concrete overview of the moderating characteristics which influence the effectiveness of message frames in vaccination campaigns.

The societal importance of this research is that vaccinations are a public good and crucial for society since vaccines prevent the spread of dangerous diseases such as the Human Papillomavirus. It has become critical that, due to misinformation, people have become more concerned regarding the vaccine as shown by Graef (2019). Public health information campaigns which inform the public efficiently about the vaccine and refer to the concerns of the people are needed to tackle this problem. The next chapter will provide the theoretical framework regarding message frames and campaigns. In Chapter 3, the methodology used for this study is described. The analysis and results of the mini-systematic review are presented in Chapter 4, followed by the design implications in Chapter 5. In Chapter 6 the discussion can be found and lastly, in Chapter 7 the overall conclusion.

2.0. Theory

In this chapter the theoretical framework of this study is addressed. Existing theories from scientific literature relevant for this study are discussed. First, four different message frames that are used in health campaigns are introduced and conceptualised. The overview of message frames is needed to conduct the analysis of the mini-systematic literature review in regards to vaccination messages. Followed by the explanation of the prospect theory and the moderating characteristics in relation to message frames in health campaigns, which is needed for analysing the moderating characteristics in relation to vaccination messages. Last, the concepts of health campaigns, the role of social media in health campaigns and campaign planning are defined, all of which will be used to improve the information of the online HPV Twitter campaign of the RIVM.

2.1. Message frames

Health communication plays an important role in shaping people's decisions to engage in certain health behaviours (Gerend & Shepherd, 2007). Message frames, acting as a persuasion tool, have been an important focus in health communication research (Vorpahl & Yang, 2018). Framing is closely tied to the Prospect Theory of Tversky and Kahneman (1981) and offers a specific way for the audience to interpret and understand the information (Scheufele, 1999). According to Rothman and Salovey (1997), message framing has the ability to significantly influence people's intentions to engage in certain health behaviours. Empirical evidence shows that message framing has the ability to impact health decision making like the intention of parents to get their child vaccinated (Haydarov & Gordon, 2015), the use of sunscreen (Detweiler et al., 1999) and disease screening (Finney & Iannot, 2002).

Most health messages are framed either in terms of gains or losses (Gerend, Shepherd & Monday, 2008). A gain-framed message highlights the benefits of engaging in the recommended health behaviour (Gerend & Shepherd, 2007). For instance, in case of vaccination persuasion messages, a gain-framed message could be: "By getting the HPV vaccine, you may make it less likely for you to develop genital warts and/or cervical cancer" (Nan, 2012, p. 13). A loss-framed message emphasises the costs of not engaging in the advocated health behaviour (Gerend & Shepherd, 2007) and could be framed in regards towards the promotion of vaccination as: "By not getting the HPV vaccine, you may make it more likely for you to develop genital warts and/or cervical cancer" (Nan, 2012, p. 13).

Health messages can also be persuasively framed by attributing the recommended health behaviour in a positive or negative way (attribute framing) (Gamliel & Peer, 2010). Through attribute framing, people's judgement regarding an event or object is influenced by either describing it in a negative or positive way, while the objective value is constant (Gamliel & Peer, 2010; Bigman, Cappella & Hornik, 2010). An event or an object is positively evaluated by the people when the event or object is presented in a positive message frame since a positive labelling of a message is evoking more positive associations in the people`s memories (Gamliel & Peer, 2010). A negatively framed message does the opposite and evokes negative associations in the people's memories (Gamliel & Peer, 2010). In the health sector, attribute framing is applied for describing "efficacy rates, side effects and other outcomes for surgical treatments, vaccines, contraceptives, diagnostics, or medications" (Bigman et al., 2010, p. 71). Examples for attribute- framed messages regarding vaccination could be: "The vaccine is effective against HPV strains that cause 70% of cervical cancers" (positively framed) and "The vaccine is ineffective against HPV strains that cause 30% of cervical cancer" (negatively framed) (Bigman et al., 2010, p. 73).

Often health behaviours involve either a long-term or a short-term consequence (Kim & Nan, 2016). With temporal framing, a health message can either highlight the long- or short-term consequences of an associated health behaviour or unhealthy behaviour (Kim & Nan, 2016). Temporal framing indicates that short-term messages have greater persuasive impacts than long-term messages (Kim & Nan, 2016). According to the construal level theory (Liberman & Trope, 1998), individuals tend to view near/immediate events as more concrete than future/distance events. Future/distance events are more likely to be viewed in abstract terms (Kim & Nan, 2016). The reason for this is that, according to the construal level theory (Liberman & Trope, 1998), the individual's mental representation of near vs. future events is affected by temporal distance (Kim & Nan, 2016). An example of a present-oriented message that highlights the benefits of obtaining the vaccine in the short-term could be framed as: "The HPV vaccine works fast to protect your body. Imagine the huge sense of relief you will feel immediately after you have received the HPV vaccine!"(Kim & Nan, 2016, p. 1092). A future-oriented message emphasising the benefits to be achieved in the long-term could be: "The HPV vaccine provides long-lasting protection to your body. Imagine the huge sense of relief you will feel years after you have received the HPV vaccine!" (Kim & Nan, 2016, p. 1092).

Gain-, loss-, temporal- and attribute- framing are proven to be effective in health communication (Gerend et al., 2008; Gerend & Shepherd, 2007; Gamliel & Peer, 2010; Bigman et al., 2010; Kim & Nan, 2016). In case of vaccination messages, the aforementioned frames should be effective as well, as vaccination is a type of health behaviour. The focus in health communication is mostly on gain- or loss-framed messages, rather than on attribute framing or temporal-framing. Scholars have argued that small variations in how a health message is presented (in terms of gain- or losses) can lead to different preferred courses of health actions by the individual (Rothman & Salovey, 1997; Rothman, Bartels, Walschin, & Salovey, 2006). In regards to vaccination campaigns, this could imply that different courses of action by individuals (e.g. increased intention to vaccinate) are based on how the messages of the RIVM HPV Twitter campaign are framed. The following paragraph will show how small variations in framed health messages can lead to different preferred courses of actions by the individual.

2.1.1 The Prospect Theory and the moderating characteristics

According to the Prospect Theory (Tversky & Kahneman, 1981), identical information can have different effects on the choice people make depending on whether the information highlights gains or losses. Tversky and Kahneman (1981) state that when the same information about risk is presented in different ways, it alters people's actions, perspectives and preferences about the information. In other words, when a person is faced with two choices - one posing a higher risk and one that poses little risk- the preference of the person for one of the two options is influenced by the way the two options are framed (Gallagher & Updegraff, 2012). It is assumed that, if one of the choices contains a certain loss, people are more willing to choose the riskier option in order to avoid any losses (Gallagher & Updegraff, 2012). Whereas, when a message contains a potential gain for the person, it is assumed that the person is less willing to go for an option that contains risk in order to secure the potential gains (Gallagher & Updegraff, 2012). When people believe that gains are certain or more salient, they prefer to avoid the risk and go for a certain option (Gallagher & Updegraff, 2012). Applied to vaccination campaigns, the campaign designer needs to be aware of the perception people have about the provided information (being lower or higher risk). If people perceive "getting vaccinated" as taking a high risk, the message should be framed in terms of losses in order to affect the choice people are making regarding vaccination. It is assumed that when vaccination is viewed as an uncertain and risky behaviour, people are more likely to be persuaded by messages saying that they will get the disease if they do not get vaccinated, since they want to avoid any losses. Whereas, when "getting vaccinated" is perceived as a

health behaviour that poses little risk, the gains of getting vaccinated should be highlighted in the vaccination campaign messages. Furthermore, it is important to state that the vaccine is a certain option to tackle the diseases so that people avoid the risky option of not getting vaccinated.

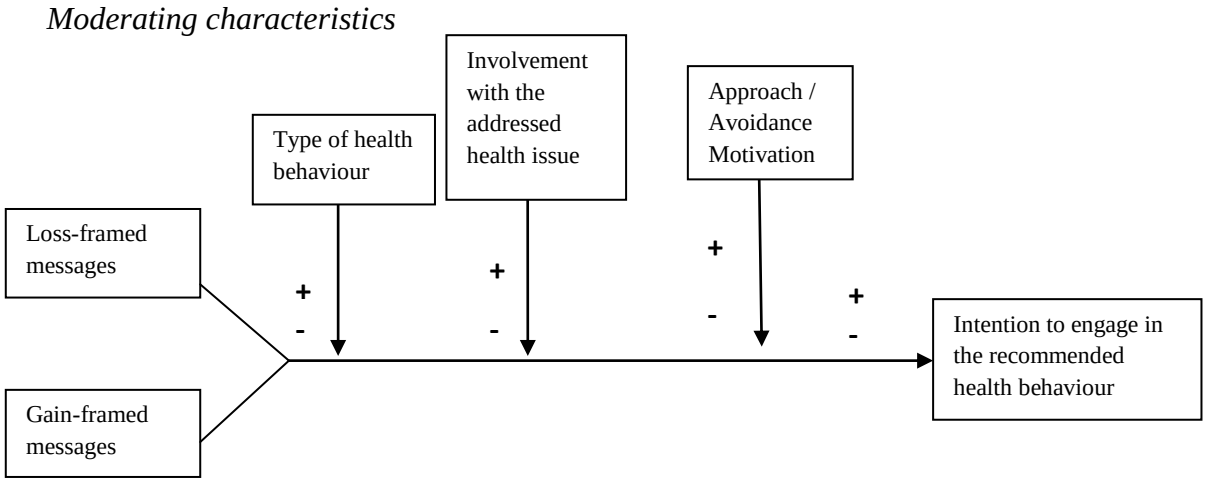

Figure 1. *Moderating characteristics positively/negatively influencing the effectiveness of gain- or loss-framed messages on the intention to engage in the recommended health behaviour*

Figure 1 shows the possible effect (either positive, negative or no effect) of loss- and gain-framed messages on the intention to engage in the recommended health behaviour, and the moderating characteristics that can either positively or negatively influence the effect of both frames on the intention to engage in the recommended health behaviour.

Rothman and Salovey (1997) widely applied the Prospect Theory in behavioural decision making in the health sector. Rothman and Salovey (1997) argued that the effects of gain- or loss-framed messages were moderated by the promoted health behaviour (see the overview in Figure 1). Rothman and Salovey (1997) made a distinction between prevention behaviours (performed in order to prevent a health problem through, for instance, vaccinations) and detection behaviours (performed in order to detect a health problem through, for instance, screening), and suggest that loss-framed messages apply to the promotion of detection behaviours and gain-framed messages to prevention behaviours. Rothman and Salovey (1997) argue that the difference between the performance of prevention behaviour and detection behaviour is explained through the degree of perceived risk the person is associating with engaging in the proposed behaviour. Generally, detection behaviours are more likely to be

related to higher risk, since there is a possibility that a serious illness could be discovered (Rothman & Salovey, 1997). Because people are willing to take risks when they face potential losses, loss-framed messages should be more effective compared to gain-framed messages in promoting detection behaviour (Rothman & Salovey, 1997). In contrast, people view prevention behaviours not as risky, since they perform this behaviour in order to prevent any health problems in the near future (Rothman & Salovey, 1997). Performing prevention behaviour is seen as risk-averse, and risk-averse options are often preferred when the individuals are considering gains through their actions (Abhyankar, O'connor & Lawton, 2008). Therefore, gain-framed messages are more likely to lead to prevention behaviour than loss-framed messages (Abhyankar et al., 2008).

Another moderator influencing the impact of message framing on health behaviour is the "characteristic of the message recipient", which contains two characteristics (Gerend & Shepherd, 2007). (1) The first characteristic of the message recipient which plays a crucial role in the success of the message framing is the individual involvement with the addressed health issue in the health message (Gerend & Shepherd, 2007; Rothman at al., 2006). Research has shown that framing effects are of significance, when the message is perceived as highly relevant (Millar & Millar, 2000). For instance, Rothman, Salovey, Antone, Keough and Martin (1993) revealed that gain-framed messages discussing sun protection raised more awareness towards using sunscreen protection compared to loss-framed messages. However, growing awareness could only be identified through individuals who are anxious about skin cancer, such as women (Rothman et al., 1993). On the contrary, when the individual does not feel involved with the health issue addressed, the framing effect is lower (Millar & Millar, 2000). Thus, it is assumed that message frames are only effective when aimed at people that see the health issue as personally relevant. (2) The second characteristic of the message recipient is approach-avoidance motivation (Gerend & Shepherd, 2007). According to Gerend and Shepherd (2007), people have different types of motivation. Some people are "sensitive to reward cues and seek to approach positive outcomes" (Gerend & Shepherd, 2007, p. 747), those people are called approach oriented individuals. Then there are avoidance oriented people who are more "sensitive to threat cues and are motivated to avoid negative outcomes" (Gerend & Shepherd, 2007, p. 747). Gerend and Shepherd (2007) suggest that people are more approachable to messages that go along with their motivational direction. Therefore, individuals that are approach-oriented seem to be affected by gain-framed messages, while individuals who are avoidance-oriented seem to be affected by loss-framed messages (Gerend & Shepherd, 2007).

To sum up, the relative effectiveness of gain- or loss-framed messages in health campaigns is expected to be influenced by different types of moderating factors. As it can be seen in Figure 1 these are; (1) type of health behaviour, (2) Individuals involvement with the addressed health issue, and (3) approach/ avoidance motivation. The Prospect Theory (Rothman & Salovey, 1997; Tversky & Kahneman, 1981) would indicate that, considering the type of health behaviour, gain-framed messages are presumed to be more persuasive than loss-framed messages, as it is shown in Figure 3. Because vaccination is characterised as a prevention behaviour, therefore defined as a behaviour that forestalls health problems and is generally riskless, it is suspected that individuals are more likely to be persuaded by messages which highlight the benefits of getting vaccinated. With regards to the approach/ avoidance motivation moderator, the study of Gerened and Shepherd (2007) examined the effects of message framing on the intention to get vaccinated against HPV. Their results show that participants who are high avoidance-motivated, are more influenced by loss-framed messages as compared to gain-framed messages (Gerend & Shepherd, 2007). While approach-motivated participants are equally influenced by both gain- and loss-framed messages (Gerend & Shepherd, 2007). As the overview in Figure 2, it is assumed that both avoidance and approach motivation positively influences the effect of loss-framed messages on the intention to get vaccinated and the attitude towards vaccination. While only approach motivation positively influences the effect of gain-framed messages on the intention to get vaccinated and the attitude towards vaccination (see Figure 3). However, only limited studies have investigated this moderating effect regarding vaccines, therefore deviations can occur. The individual's involvement with the addressed health issue has an influence on the effectiveness of message frames in health campaigns (Gerend & Shepherd, 2007). Whether this moderating effect is also applicable to message frames in vaccination campaigns is unclear.

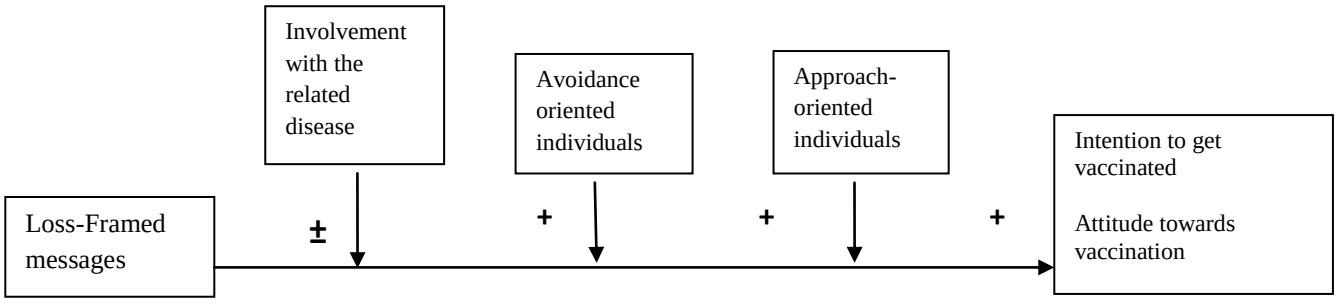

Figure 2. *Moderating characteristics which positively affect the influence of loss-framed messages on the intention of individuals to get vaccinated and/ or to have a positive attitude about vaccinations*

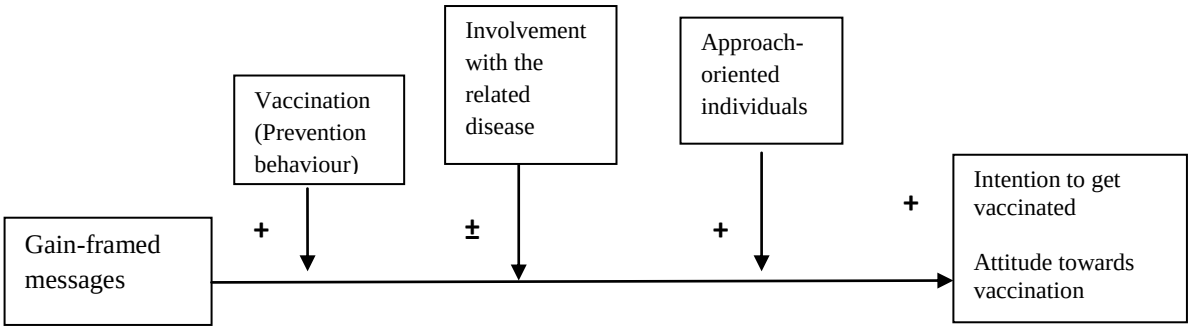

Figure 3. *Moderating characteristics which positively affect the influence of gain-framed messages on the intention to get vaccinated and/ or the attitude towards vaccination*

Figure 2 and 3 give an overview of the moderating characteristics that positively influence the effectiveness of either loss- (Figure 2) or gain-framed (Figure 3) on the intention to get vaccinated and the attitude towards vaccination. All moderators have a positive influence on the effectiveness of both loss- and gain-framed messages, except for 'involvement with the related disease' which can either have a positive or negative influence on the loss- or gain-framed messages.

2.2. Campaigns

2.2.1. Health Communication Campaigns

Convincing people to adopt healthy behaviours, or convincing health professionals to introduce changes in their practice in support of better health, has never been a simple task (Schiavo, 2007). Immunization is one of the greatest medical successes because, many diseases that were once a threat to peoples lifes have become rare or are eradicated entirely (Schiavo, 2007). Still, changing the minds of the public to get vaccinated has taken a multidisciplinary effort (Schiavo, 2007). Health communication campaigns have played a central role in this effort (Schiavo, 2007). In general health communication campaigns can be defined as " *A multifaceted and multidisciplinary field of research, theory, and practice concerned with reaching different populations and groups to exchange health-related information, ideas, and methods in order to influence, engage, empower, and support individuals, communities, health-care professionals, patients, policymakers, organizations, special groups, and the public so that they will champion, introduce, adopt, or sustain a health or social behaviour, practice, or policy that will ultimately improve individual, community and public health outcomes"* (Schiavo, 2007, p. xxi)

Communication regarding the promotion of public health and prevention of the spreading of dangerous health risks has become an integral communication function in society nowadays (Encyclopedia of Communication and Information, 2019). Public health campaigns need to strategically spread the information to encourage people to adopt behaviours that influence their health positively, so that people are more resistant against possible health threats (Encyclopedia of Communication and Information, 2019). The main function of health campaigns is to increase the awareness of possible health threats and to motivate the target audience to behave in a way that supports their own health (Encyclopedia of Communication and Information, 2019). Healthy behaviours can include that people practice a healthier lifestyle through exercising or nutrition, avoid dangerous substances such as poisons and go for screenings early to diagnose serious health problems (Encyclopedia of Communication and Information, 2019).

It seems that health communication campaigns play an important role in convincing people to adopt a healthy behaviour. For the RIVM this means that they have the ability to convince the Dutch people to get vaccinated against the Human Papillomavirus, through the HPV campaign. The RIVM is able to raise awareness of how important the vaccine is for the Dutch people's health. Health communication has transformed with the rise of the internet and social networking sites Andersen et al., 2015). What that means for the RIVM HPV campaign, the following chapter will show.

2.2.2. Social media and its meaning to health campaigns

In the last decade, the internet changed from information created by experts to content which is developed through audience interaction and participation (Andersen et al., 2015). Through this change, linked with the rise of global access to the internet, new opportunities have been created for public health campaigns to get the attention of the public (Andersen et al., 2015). Different health campaigns, such as tobacco controlled communication, have used blogs or social media to promote their message (Andersen et al., 2015). The social media platforms, such as Twitter and Facebook, are online communities where individuals gather in order to interact with their friends, family, co-workers or other people who have the same interests. Another internet platform called 'Blogs' can be described as interactive journals, where the readers can interact with the author by leaving a comment under the blog article.

Using Social media as a campaign promotion platform brings many advantages (Andersen et al., 2015). Campaign designers can seek audience's attention, false information about health topics can be corrected, a conversation with the public can be initiated and there is the option

to work with social media influencers in order to promote the campaign (Andersen et al., 2015). Another advantage of the use of social media is that it is a relatively low-cost strategy to spread the information for the health campaign, since social media platforms are taking no fees for placing a message. In general social media strategies can be important for health campaigns since they can (Andersen et al., 2015, p. 9):

- "Increase the potential impact of messages"
- "Share information across networks of people"
- "Personalize health messages and tailor them for a particular audience"
- "Share health and safety information quickly"
- "Empower people to make healthier decisions"

All in all, it can be seen that placing/advertising the RIVM HPV vaccination campaign on Twitter brings the RIVM the chance to seek audience attention, to correct the false information about the side-effects and efficacy of HPV vaccine and to start a conversation with the Dutch people by answering their questions about the vaccine.

Health campaigns are designed to influence the public's behaviour, knowledge and attitude; achieving this is not a simple matter (Andersen et al., 2015). Because people interpret and respond to received messages differently, campaign planners have to design and implement the campaigns strategically (Andersen et al., 2015). Designing and implementing the campaign in a strategic way is important to the RIVM as they have failed with their first campaign. How a campaign is strategically designed and implemented is shown in the next section.

2.2.3. Campaign planning

To design effective health communication campaigns, the U.S. Department of Health & Human Services developed a health communication guide (U.S. Department of Health & Human Services, 2010). In the following, characteristics of an effective health communication campaign are partially derived from the health communication guide from the U.S. Department of Health & Human Services (2010) are presented (p.5). The focus of this study is mainly on characteristics (1) – (3), due to the scope of the study.

(1) Define the communication campaign goal

To start a campaign, a clear goal needs to be defined. Thereby, the campaign designer needs to identify the larger goal, determine to what extent the larger goal could be achieved through

the health campaign, and the campaign designer needs to describe the explicit objectives of the campaign.

(2) Define the intended audience

The group to whom the campaign designer wants to communicate the message needs to be identified, the designer needs to take into account that the target audience is probably an average person and not a health specialist (Atkin & Freimuth, 2001). Also, subgroups to which the messages could be tailored should be considered. The campaign designer should learn as much as possible about the intended audience, such as; information about beliefs, demographic information, current action and social and physical environment.

(3) Create messages

The campaign designer needs to brainstorm about messages that suit with the intended audience and the health campaign goal. According to the European Centre for Disease Prevention and Control (2012), the key messages should be "evidence-based, referring to relevant medical research and studies that lend strong support to the content" (p. 16). The messages should not include complex information or technical details, but should be clearly worded, straight forward and should try to engage the people and increase the interest in the topic (The European Centre for Disease Prevention and Control, 2012). Criteria for good key messages are (The European Centre for Disease Prevention and Control, 2012, p.16):

- "Accessible language, no jargon or scientific terms"
- "Simple and easy to say aloud"
- "Hold one idea"
- "Easy to understand and to remember"
- "Persuasive"
- "Non-judgmental"
- "Relevant to the intended audience"

Key messages should be limited to three messages in total, to ensure a clear overall message (The European Centre for Disease Prevention and Control, 2012). The messages are mostly defined by health professionals or communication professionals but are aimed to appeal to a wide-audience who does not have scientific knowledge. Not using appropriate and understandable language might lead to misinformation. Not just the wording of the messages are important, also the channels/sources need to be credible and influential towards the

intended audience. The campaign designer needs to consider the best times to reach the audience and prepare messages accordingly.

(4) Pre-test and revise messages and materials

To select pretesting methods that fit with the budget and timeline of the campaign. After the methods are defined, pre-test the messages and the materials with an audience that shares the attributes of the intended audience. Revise the messages and materials based upon the retrieved pre-test findings.

(5) Implement the campaign

As a final step towards an effective health communication campaign, the campaign designer has to follow the plans he developed at the beginning of the campaign planning. Communicating with parents and the media in order to ensure a smooth running campaign is most important here. When the campaign is implemented, the campaign plan and process should be evaluated as soon as possible.

2.3. Conclusion of the Theory

The objective of this research is to identify which message frames positively affect vaccination intention and vaccination attitude and which moderators influence the effect of vaccination intention and vaccination attitude and how message frames can be used in the Twitter HPV vaccination campaign of the RIVM. The theory has given a broad overview of which message frames are generally used in health communication. The literature revealed that there is gain-, loss-, attribute- and temporal framing, whereby, the focus in health communication has been on gain- and loss-framing (Kim & Nan, 2016; Bigman et al., 2010). Furthermore, moderators have been identified that are assumed to have an influence on message framing persuasion (Gerend & Shepherd, 2007; Rothman & Salovey, 1997). With regards to vaccination it is assumed that gain-framed messages are most effective, and avoidance and approach oriented individuals are more likely to be influenced by loss-framed messages in case of vaccines (Rothman & Salovey, 1997; Gerend & Shepherd, 2007).

Regarding the design principles, the theory has provided a description of health communication campaigns, the role of social media in health campaigns and the campaign guidelines from the U.S. Department of Health & Human Services. The literature has shown that health communication campaigns play an important role in convincing people to engage with healthy behaviour (Encyclopedia of Communication and Information, 2019; Schiavo,

2007). The campaign guidelines from the U.S. Department give a clear overview of how to develop an effective campaign plan, which can be useful to improve the information of the RIVM HPV Twitter campaign.

The next chapter provides detailed information on how the mini-systematic literature review is conducted, which gives an overview about which message frames positively affect the intention to get vaccinated and/or ensure a positive attitude towards vaccination, and which moderators influence this effect.

3.0. Method

In the theory section, message framing in relation to general health messages are discussed. The mini-systematic literature review focuses on message framing in relation to vaccination campaigns, since the aim of the mini-systematic literature review is to answer Research Question 1 (RQ1): *(1a.) Which message frames positively affect vaccination attitude and vaccination intention, and (1b.) which moderators influence the effect of message frames on vaccination attitude and vaccination intention?"* The mini-systematic-literature review is conducted based on the mini-review protocol of Griffiths (2002). The search strategy, study selection inclusion and exclusion criteria and evaluation of the quality of the studies are described below.

3.1. Search strategy

The information sources used for conducting the mini-systematic literature review were the online databases 'Scopus', 'Web of Science' and 'PubMed'. Scopus is from Elsevier's (A Dutch publishing and analytics company) and is the largest abstract and citation database containing peer-reviewed literature in the top fields of technology, medicine, social sciences, arts, humanities, and science (Scopus, n.d.). The subject field of Scopus matches the purpose of this study and was used to select literature for the mini- systematic literature review. Web of Science is the most trusted publisher-independent global citation database and consist of multidisciplinary fields and high-quality journals (Web of Science Group, 2019). PubMed was used for the mini-systematic literature review, since it is the US National Library of Medicine National Institutes of Health, and consists of more than 30 million citations of life science journals, online books and biomedical literature from MEDLINE (PubMed,n.d.).

Regarding RQ1, the search strategy entailed three elements, each element including following search terms: (a) "Message frames" OR "Framing"; (b) "Effective" OR "Effectiveness" OR "Influence" OR "Effect"; (c) "Vaccination" OR "Vaccination Campaign" OR "Vaccine". Combinations of all three elements were made in the literature search. The results for the RQ1 were narrowed down by documentation type (articles only), by source type (only journals) and by language (English, and German). The initial search generated 106 studies (Scopus), 89 studies (Web of Science) and 73 studies (PubMed). All these studies were selected for further analysis and were screened based on the title, abstract and full text. The eligibility of the studies was screened by one reviewer.

3.2. Study selection

The studies chosen for further analysis had to meet the inclusion criteria shown in Table 1. The inclusion and exclusion criteria's were developed based on initial searches of existing academic literature.

Table 1.

Inclusion and Exclusion criteria

Inclusion criteria	**Exclusion criteria**
- Children/ teenagers, boys and girls, parents, pregnant women - Vaccination/Vaccines - Reported outcomes reveal information about the effect or influence of message frames on the intention, or attitude of getting vaccinated - Study design: Qualitative studies, Quantitative surveys, Factorial Experiments, Experiment studies, Randomized Controlled Trials - The article is written in English, Dutch and German	- Professional health care workers - No vaccination - Reported outcomes provide no information about the effect or influence of the message frame on the intention or attitude of getting vaccinated - Study design: Systematic reviews, Content Analysis - The article is written in a language other than English, Dutch and German. - Abstract or full-text not found - Duplicates

3.3. Critical appraisal

The aim of the critical appraisal is to discover whether the used methods and results of the included studies are valid. To judge the quality of the selected articles, the following checklists are used: the randomized controlled trial checklist and the quantitative checklist from the Critical Appraisal Skills Programme (2018), the critical appraisal of a survey checklist from the Center for Evidence-Based Management (n.d.) and the quasi-experimental studies checklist from the Joanna Briggs Institute (Tufanaru et al., 2017).

The different checklists include 9 to 12 questions, depending on what type of research design (e.g. RCT, Questionnaire) is assessed. The critical appraisal checklist questions from the

Joanna Briggs Institute assess the methodological quality of a study and aim to determine the extent to which a study has addressed the possibility of bias in it's; design, conduct and analysis (Tufanaru et al., 2017). The checklists from the Critical Appraisal Programme (2018) and from the Center for Evidence-Based Management are divided into three parts. The internal validity of the article is judged, followed by the judgment about the results and the generalisation of the study. Scores of 6 to 8 or higher (depending on which checklist is used) are viewed as the threshold for reasonable quality. Score 6 or higher were applied for the quantitative and quasi-experimental checklists. Score 7 or higher for randomized controlled trial checklist and score 8 or higher for the survey checklist.

The included literature studies selected for the analysis were judged based on validity, results and generalisation. To get an overview of the critical appraisal of the selected article, see Appendix A. All the articles that were included for the review were considered to be of good quality (threshold 6 to 8). The selection process of appropriate literature for the mini-systematic literature review resulted in N= 26 included studies. Figure 4 shows a simplified overview of the selection process. Table 2 shows important information about the included studies.

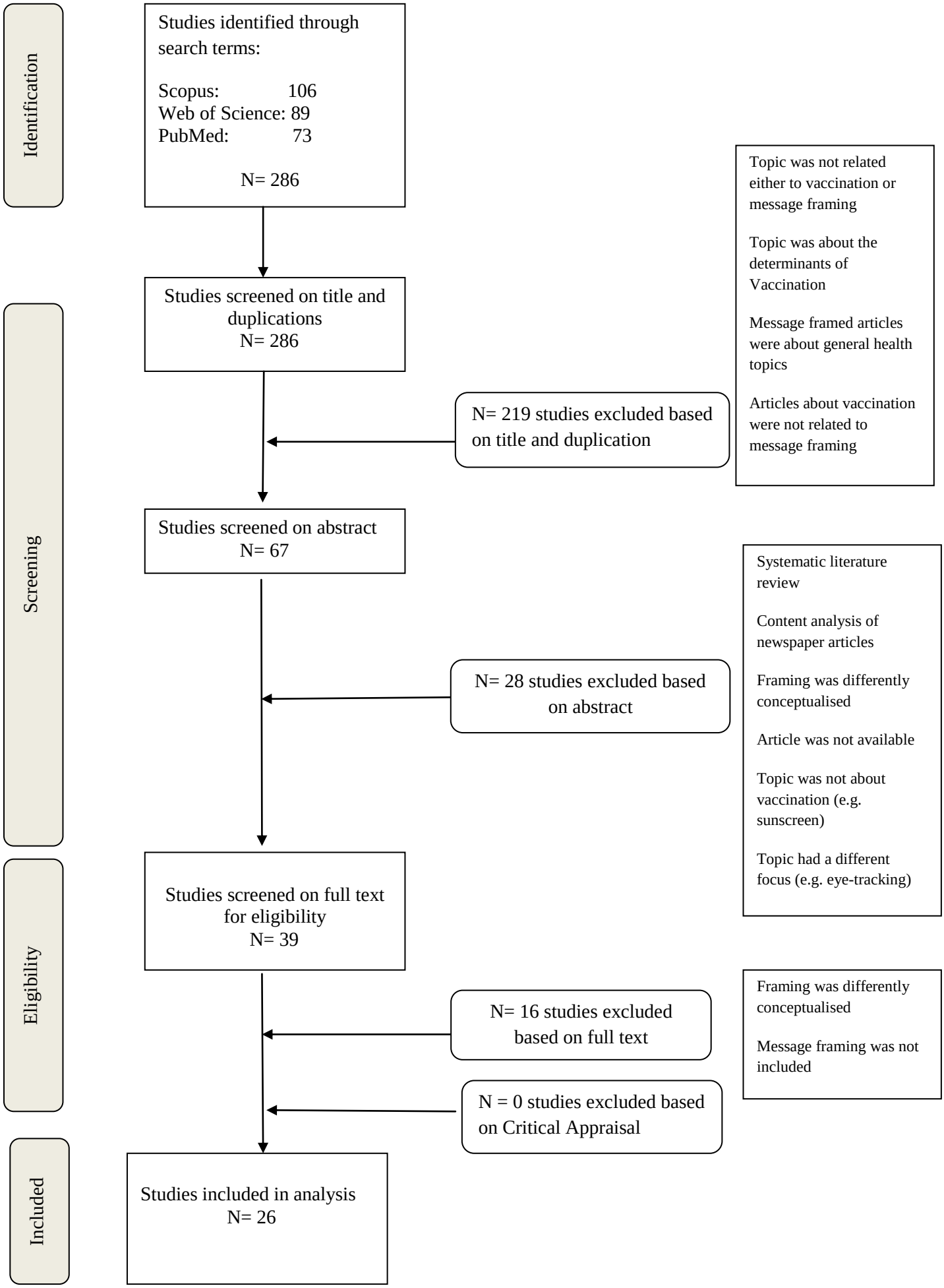

Figure 4. *Flow-chart of the selection process*

Table 2.

Characteristics of the included studies

Author	**Objective of the study**	**Study design**	**Study sample (n)**	**Country**	**Effectiveness of message frames**	**Moderator of message frames functioning**	**Vaccine**
Nan et al. (2019)	Aim of the study was to conduct research if parent's support for mandating HPV vaccination for their adolescent children was influenced how the policy advocacy message was framed	Pre- and Post-test survey questionnaires	N= 211 African American parents who had a child between the age of 9 and 17	USA	Loss-framed messages are more effective among parents with low in CFC (Present minded people). Gain-framed messages are more effective among parents with high CFC (Future-oriented people)	Consideration of Future Consequences (CFC)	Human Papillomavirus Vaccine (HPV)
Kasting et al. (2019)	Aim of the study was to study the association of message framing and healthcare provider recommendation on uptake of adult hepatitis B virus vaccination in a high-risk population.	3 X2 block design randomized controlled trial	N= 1747 Participants from STD Clinics	USA	No significant difference between gain- and loss-framed messages. Both message frames are effective.	No	Hepatitis B Vaccination (HBV)
Kim et al. (2019)	Aim of the study was to examine the effects of framing in promotional health messages on the intention to get vaccinated against seasonal influenza virus	Experimental study; One factor,	N= 86 College Students	USA	Gain-framed messages are more effective compared to gain-framed messages with risk disclosure.	No	Influenza vaccine

		two conditions design					
Liu et al. (2019)	Aim of the study was to examine the impacts of gain vs. loss-framed messages and narrative messages on Chinese women's intentions to get HPV vaccines for their children	Survey experiment	N= 453 Chinese women (mothers and non-parents)	China	No significant difference between Gain-and Loss-framed messages persuasive effects. Both are effective. Participants in the loss-framed group stated that they have a slightly stronger intention to get their daughter vaccinated.	No	Human Papillomavirus Vaccine
Tu et al. (2019)	Aim of the study was to identify the effects of gain- and loss-framed messages regarding HPV related cervical cancer awareness and vaccination intention.	Quasi-Experimental Design	N= 565 college students (women)	Taiwan	Both framed messages (gain and loss-framed messages) significantly improve the participants HPV knowledge, attitude toward the vaccine and intention to receive the publicly funded HPV vaccination.	No	Human Papillomavirus Vaccine
Lee et al. (2018)	Aim of the study was to examine how framing and the use of text or image support about influenza vaccination, influences college-attending young adults beliefs and intentions regarding influenza vaccination.	Online Questionnaire	N= 122 college students	USA	Gain-framed brand promise with image support and Loss-framed promise with text-support produce the most positive effects on	Message support approach: Text or Image Support	Influenza Vaccination

					participant's confidence, interested effect towards the PSAs, and positive attitude toward the flu vaccine and flu vaccination intention		
Guidry et al. (2018)	Aim of the study was to identify effective communication strategies to promote uptake of a new vaccine, particularly among women of reproductive age	Experimental study; 2 x2 between-subjects experiment was performed through an online survey	N= 339 women	USA	Gain-framed messages are more effective in increasing subjective norms related to the Zikka vaccine uptake. Also, gain-framed messages were more effective in increasing the perceived benefits of future Zikka vaccine. Loss-framed messages have no effect.	No	Zikka Virus vaccine
Lee & Cho (2017)	Aim of the study was to investigate the effects of message framing and media channel on young adults perceived severity of human papillomavirus, perceived barriers and benefits of getting HPV vaccination and behavioural intention to get vaccinated	Online Experiment (Questionnaire)	N= 142 college students	USA	Loss-framed messages increase the perceived severity of HPV among young adults and their intention to get vaccinated. However, this loss-framed effect is only found under	Media channel where the message is presented (Facebook vs. online	Human Papillomavirus Vaccine

					the Facebook condition and not under the online-newspaper condition. Gain-framed messages have no effect.	newspaper)	
Kim & Nan (2016)	Aim of the study was to examine how individual difference in consideration of future consequences (CFC) and temporal framing interact to influence the persuasive outcomes of a health message promoting HPV among young adults	Experimental study; Two-group randomized experimental design	N= 416 undergraduate students	USA	Presented oriented messages are more effective on the intention to get vaccinated among High-CFC individuals. On Low-CFC individuals, temporal framing has no effect.	CFC	Human Papillomavirus Vaccine
Wen & Shen (2016)	Aim of this study was to investigate the influence of message framing and temporal distance on the intention of HPV vaccination	2x2x2 between-subjects factorial experimental design	N= 156 Chinese undergraduates	China	Loss-framed messages are effective in generating perceived severity of HPV infection among Chinese people. Loss-framed messages are particularly effective when the message highlights long-term costs of not receiving the HPV vaccine among participants who have no prior knowledge about the vaccine. Gain-framed messages are effective regarding short-	Temporal distance, prior knowledge regarding HPV vs. Non-prior knowledge about HPV	Human Papillomavirus Vaccine

					term benefits.		
Nan et al. (2016)	Aim of the study was to investigate the interaction effect of message framing and perceived susceptibility on African American Parents intentions to get their child against HPV vaccinated	Pre- and Post-survey questionnaires and pamphlet about HPV	N= 193 African American Parents	USA	Gain-framed messages are effective among parents who think that their child is at high risk of contracting HPV. Loss-framed messages are effective among parents who believe that their child is at low risk contracting HPV	Perceived susceptibility (e.g. perceived likelihood that one's child is at risk of contracting HPV)	Human Papillomavirus Vaccine
Frew et al. (2014)	Aim of the study was to evaluate the effects of randomized exposures to messages which emphasized positive outcomes of vaccination or messages which emphasised negative outcomes of forgoing vaccination on pregnant minority women	Longitudinal Study / Postpartum questionnaires	N= 276 pregnant women	USA	Neither gain- or loss-framed messages have a significant effect on the intention to receive immunization during pregnancy	No	Influenza Immunization
Marsh et al. (2014)	Aim of the study was to examine attitudes, opinion and concerns of African American women regarding influenza vaccination during pregnancy by using framed messages	Semi-structured in-depth interviews	N= 21 Pregnant African American Women, which had not received an influenza vaccine	USA	Gain-framed messages which emphasised the benefits to the infant are effective. Loss-framed messages are not effective.	No	Influenza Vaccination
Frew et al.	Aim of the study was to examine pregnant women's likelihood of	Survey	N= 261 pregnant women	USA	Gain-framed messages are more effective in	No	Maternal Influenza

(2013)	vaccinating their infants against seasonal influenza				influencing women's intention to vaccinate their infants, compared to controlled messages. Loss-framed messages have no effect.		
Chien (2013)	Aim of the study was to assess the effectiveness of message framing and colour configuration on banners in order to persuade young people to get vaccinated.	Experimental design; 2x3 between-subjects factorial design	N= 180 college students who never had received H1N1 flu vaccine before	Taiwan	No significant effect between message framing and colour configuration is found.	Colour configuration of the banner	Flu Vaccination H1N1
Gainforth et al. (2012)	Aim of the study was to investigate the effect of framed messages on parents intentions to have their child vaccinated against HPV	2x2x3 between-groups, quasi-experimental design	N= 367 parents	Canada	Gain-framed messages are effective in persuading mothers of sons to speak with a doctor about the vaccine. No significant effect was found in this study of message frames on parents' intentions to get their child vaccinated. No effect of loss-framed messages.	No	Human Papillomavirus Vaccine
Park (2012)	Aim of this study was to investigate the effects of framing and risk perception,	2x2 betwee	N= 108 college students	USA	Loss-framed messages are effective in generating	Perceived Risk	Human Papillom

	and their interaction effect on HPV vaccination	n-subjects randomized experimental study			positive attitudes towards the acceptance of the HPV vaccine. In context to perceived risk: Loss-framed messages are effective among women with high risk, to get them motivated to get vaccinated. Gain-framed messages are effective among women with a low-risk perception of HPV, to get vaccinated		avrius Vaccine
Gainforth & Latimer (2012)	Aim of this study was to examine factors affecting women's threat and coping appraisals of the HPV vaccine and ultimately their protection motivation for HPV vaccination by examining three factors: the content of messages about the vaccine, the frame of messages about the vaccine and the sexual status of women receiving the information about the vaccine	2x2 experimental study	N= 286 university students (women)	Canada	Loss-framed messages are effective among women with high-risk to get them motivated to get vaccinated. Gain-framed messages are more effective among women with low-risk, to get motivated to get vaccinated.	Perceived Risk	Human Papillomavirus Vaccine
Nan et al. (2012)	Aim of the study was to examine the relative effectiveness of using gain vs. loss-framed messages to promote H1N1 vaccination among older adults, focusing on the moderating roles of perceived vaccine safety and efficacy	Experimental Study	N= 222 older adults	USA	Loss-framed messages are effective in increasing intention to get vaccinated and also the attitude towards the vaccine increased, by adults who	Perceived Vaccine safety and efficacy	Influenza Vaccine H1N1

					perceive low vaccine efficacy. By adults who perceive high vaccine efficacy, the loss-framed messages are attenuated. For adults who believe the vaccine is effective, gain- and loss-framing have equally an effect.		
Nan (2012)	Aim of the study was to examine the influence of message framing, motivational orientation and gender on intentions to receive HPV vaccine among young adult's ages 18-26 years.	Survey	N= 229 undergraduate students (18-26 years)	USA	Loss-framed messages are significantly effective in increasing the intention to get receive vaccination free of costs. Loss-framed messages are more persuasive for avoidance-oriented individuals. By approach-oriented individuals, both frames are equally effective.	Avoidance-oriented individuals vs. Approach-oriented Individuals	Human Papillomavirus Vaccine
Lechuga et al. (2011)	Aim of this study was to investigate the mother's intention to vaccinate their daughters against HPV as a function of message framing across three cultural groups: Hispanic, non-Hispanic white, and non-Hispanic African American	Repeated-measures experiment	N= 150 mothers	USA	For African American and Hispanic loss-framed messages are more effective in increasing the intention to get vaccinated. For Non-Hispanic white participants, either gain- or	Ethnic Groups	Human Papillomavirus Vaccine

					loss-framed messages are equally effective in promoting the intention to get vaccinated.		
Chien (2011)	Aim of the study was to investigate if the framing of the message and colour combination can influence the persuasiveness of televised vaccination information and viewers willingness to be vaccinated.	Experimental study; 2x2 between-subjects factorial design and questionnaire	N= 120 University Students	Taiwan	Significant effect of loss-framed messages on white text on a red background. No effect of gain- framed messages.	Colour combination	H1N1 Influenza Vaccine
Biegman et al. (2010)	Aim of the study was to experimentally test dif presenting logically equivalent, but differently valences effectiveness information affects the perceived effectiveness of the HPV vaccine, vaccine-related intentions and policy opinions	Survey-based experiment	N = 334 participants (52% females, average age 50)	USA	Positive attribute frames are effective in generating, that people view the vaccine effectiveness positive. Negatively attributed frames generate that people view the vaccine as inefficient.	No	Human Papillomavirus Vaccine
Gerend et al. (2008)	Aim of the study was to investigate whether behavioural frequency (operationalized as the number of shots required) moderated the effect of	Experimental study; 2x2	N= 237 undergraduate women	USA	Loss-framed messages are effective in increasing participant's intention to receive the HPV vaccine.	Behavioural frequency	Human Papillomavirus Vaccine

	framed health messages on women's intentions to receive the HPV vaccine	betwee n-subjects design			However, this is only evident when one shot is required to be vaccinated. When the vaccination is framed as frequent, 6 shots, the loss-framed message effect disappears. Gain-framed messages have no effect.		
Abhayan kar et al. (2008)	Aim of the study was to examine the effects of message framing on intentions to obtain measles, mumps, and rubella vaccine for one's child and to investigate whether Theory of Planned Behaviour and perceived outcome efficacy variables mediate and/or moderate message framing effects	Experi mental study; Betwee n-subjects design	N= 142 women with a child or without a child	UK	Loss-framed messages are more effective in encouraging mother's intentions to obtain an MMR vaccine for their children. Gain-framed messages have no effect.	Perceived outcome efficacy	MMR (Measles, mumps, rubella) vaccine
Gerend & Shepher d (2007)	Aim of the study was to examine the relative effectiveness of gain- vs. loss-framed messages in promoting acceptance of the HPV vaccine	Experi mental study	N= 121 undergraduate women	USA	Loss-framed messages are effective in greater HPV vaccine acceptance, but only among women who engage in risky sexual behaviour and women high in avoidance motivation. No framing effects are identified among women without a history of risky sexual behaviour. Gain-framed messages no effect.	Sexual behaviour, Individual avoidance motivation	Human Papillom avirus Vaccine

4.0. Results

4.1. Description of the studies identifying the effectiveness of message frames in vaccination campaigns

The first question of this study is about identifying which message frames are effective at influencing the attitude towards vaccination or the intention to get vaccinated, and which moderators influence this effect. To answer this question a total of 26 studies, published between 2007 and 2019, are included in the narrative analysis. All the included studies are published in peer-reviewed journals with an SJR (SCImago Journal Rank) indicator between 0.213 and 1.962 as pointed out by SCIMAGOJR in 2018. The included study designs are various experimental studies (n=14) (including; between –subjects factorial experimental designs (n=3), between-subjects designs (n=2), quasi-experimental studies (n=2), and a randomized controlled trial (n=1)), questionnaires/surveys (n=10), and a semi-structured in-depth interview (n=1).

A wide range of study samples are identified throughout the different studies. Two studies contain a sample size between 20 and 90 participants, ten studies contain a study sample between 100-200 participants, ten studies have a study sample between 201- 400 participants and four studies have more than 400 participants in their study sample. The largest study sample includes 1747 participants and the smallest study sample includes 21 participants. Participants within the different studies are divided between parents and non-parents (n=8), college students (n=6), undergraduates (n= 5), pregnant women (n= 3), university students (n= 2), older adults (n=1) and one study includes participants from STD clinics (n=1). Regarding the gender, 15 studies include men and women and 11 studies include only women. A wide range of the location where the studies are conducted has been identified; the majority of the studies are conducted in the USA (n= 18), three studies in Taiwan, two studies in China, two in Canada and one study in the UK.

All the included studies are vaccine specific and none of the study addresses multiple vaccines. 15 studies focus on the HPV vaccine (1 study was conducted before the licensure of the HPV vaccine: Gerend & Shepherd, 2007), 8 on the influenza/flu vaccine, 1 on Hepatitis B, 1 on the Zika virus (which was conducted before the licensure of the Zika vaccine: Guidry et al., 2018), and 1 study on the measles, mumps and rubella vaccine (MMR vaccine).

4.2. Key findings

The key findings of this study focus on the effectiveness of message frames, and the conditions (moderators) that influence the effectiveness, within vaccination messages. We speak of effectiveness when individuals increase the intention to get vaccinated (whether for themselves, or for their children), and/or when individuals positively change their attitude towards the vaccine, is achieved.

4.2.1. Message frames

The first part of the research question is about which message frames influence the intention to get vaccinated and/or which message frames positively change the attitude towards vaccination. Table 3 gives an overview of the studies in which a positive significant effect, and no significant effect, of message frames on vaccination intention and/or vaccination attitude is found. The studies listed in Table 3 have proven that; loss-framed messages, gain-framed messages, temporal-framed messages and attribute-framed messages have an influence on the intention to get vaccinated and/or to positively change the attitude towards vaccinations. However, some of the included studies have found no significant effect of gain-framed and loss-framed messages (see the "no significant effect" headings in Table 3).

Table 3.

Overview of the significance of message frame effects regarding vaccination messages

Significant Effect of Loss-framed messages	**No significant effect of loss-framed messages**	**Significant effect of Gain-framed messages**	**No significant effect of gain-framed messages**	**Significant Effect of Temporal Framing**	**No significant effect of temporal framing**	**Significant Effect of Attribute Framing**	**No significant effect of attribute framing**
Nan et al. (2019)	Guidry et al. (2019)	Nan et al. (2019)	Lee & Cho (2017)	Kim & Nan (2016)	-	Bigman et al. (2010)	-
Kasting et al. (2019)	Frew et al. (2014)	Kasting et al. (2019)	Frew et al. (2014)		-		-
Liu et al. (2019)	Marsh et al. (2014)	Kim et al. (2019)	Chien (2013)		-		-
Tu et al.	Frew et al.	Liu et al.	Gainforth				

(2019)	(2013)	(2019)	et al. (2012)	-
Lee et al. (2018)	Chien (2013)	Tu et al. (2019)	Chien (2011)	
Lee & Cho (2017)	Gainforth et al. (2012)	Lee et al. (2018)	Gerend et al. (2008)	
Wen & Shen (2016)		Guidry et al. (2018)	Abhayankar et al. (2008)	
Nan et al. (2016)		Wen & Shen (2016)	Gerend & Shepherd (2007)	
Park (2012)		Nan et al. (2016)		
Gainforth & Latimer (2012)		Marsh et al. (2014)		
Nan et al. (2012)		Frew et al. (2013)		
Nan (2012)		Park (2012)		
Lechuga et al. (2011)		Gainforth & Latimer (2012)		
Chien		Nan et al.		

(2011)	(2012)
Gerend et al. (2008)	Nan (2012)
Abhayankar et al. (2008)	Lechuga et al. (2011)
Gerend & Shepherd (2007)	

24 studies examined the influence of gain-framed messages on the intention to get vaccinated and/or the influence of gain-framed messages on vaccination attitude. 16 studies found an effect of gain-framed messages on vaccination intention and attitude (see Table 3 for the authors and the year of publication). The influence of loss-framed messages related to vaccination was tested in 23 studies, 17 of which found an influence of loss-framed messages on the intention and attitude towards vaccinations (see Table 3 for the authors and the year of publication). Also, in some studies no effects of gain- and loss-framed messages were identified. In 6 studies out of 23 including loss-framed messages, and in 8 studies out of 24 including gain-framed messages, no significant effect on intention and/or attitude towards vaccination was found (see Table 3). Regarding temporal framing, only one study was conducted that found a positive influence of temporal framing on the intention to vaccinate and the vaccination attitude (see Table 3 for the authors and the year of publication). The same applies for attribute framing; one study examined the effect of attribute framing in regards to vaccination and found that there is an effect on vaccination intention and/or vaccination attitude (see Table 3 for the authors and the year of publication). Hence, gain-, loss-, temporal-, and attribute framing can all be effective in regards to vaccination messages to influence individuals vaccination intention and/or vaccination attitude.

Table 4 gives an overview of the studies entailing different types of message frames and the frames' effect on the intention to get vaccinated and the attitude towards vaccinations.

Table 4.

Overview of studies that found an influence of message frames on the intention to get vaccinated and/or the attitude towards vaccination

	Loss Framing	**Gain Framing**	**Temporal Framing**	**Attribute framing**
Intention to get vaccinated	Tu et al. (2019) Kasting et al. (2019) Liu et al. (2019) Lee et al. (2018) Lee & Cho (2017) Nan et al. (2016) Gainforth & Latimer (2012) Nan et al. (2012) Nan (2012) Lechuga et al. (2011) Chien (2011) Gerend et al. (2008) Abhayankar et al. (2008)	Kim et al. (2019) Tu et al. (2019) Kasting et al. (2019) Liu et al. (2019) Kim et al. (2019) Lee et al. (2018) Guidry et al. (2018) Wen & Shen (2016) Nan et al. (2016) Marsh et al. (2014) Frew et al. (2013) Gainforth & Latimer (2012) Nan et al. (2012) Nan (2012) Lechuga et al. (2011)	Kim & Nan (2016)	
Attitude towards	Nan et al. (2019)	Nan et al. (2019)		Bigman et al. (2010)

vaccination	Tu et al. (2019) Lee et al. (2018) Park (2012) Nan et al. (2012) Gerend & Shepherd (2007)	Tu et al. (2019) Lee et al. (2018) Wen & Shen (2016) Park (2012)

Most studies listed in Table 4 focused on the effectiveness of loss- and gain-framed messages on the intention to get vaccinated rather than on the attitude towards vaccination. For temporal and attribute framing, less research is conducted so far (see the listed studies in Table 4 under "Temporal Framing" and "Attribute Framing"). Only one study investigated the effect of temporal framing on vaccination intention and one study researched the effect of attribute framing on the attitude towards vaccination. A reason for this finding might be that researchers have, until now, mainly focused on crafting messages that are based on attaining (gain-framed messages), or failing to attain (loss-framed messages), the goal related to the promoted health prevention and detection behaviour (Bigman et al., 2010).

4.2.2. Moderators influencing the effect of message frames in vaccination attitude and vaccination intention

The second part of the first research question is to identify under which moderators have an influence on the effect of message frames on vaccination attitude and vaccination intention. In Table 5, several moderators are listed which influence the effect of message frames on vaccination intention and attitude.

Table 5.

Types of message frames and the moderators that influence their effect on vaccination intention and/or vaccination attitude

Loss Framing	**Gain Framing**	**Temporal Framing**	**Attribute Framing**
Perceived Vaccine Efficacy (Nan et al., 2012)	Consideration of Future Consequences (CFC) (Nan et al., 2019)	Consideration of Future Consequences (Kim & Nan, 2016)	

Behavioural frequency (Gerend et al., 2008)	Text vs. Image support (Lee et al., 2019)
Different media channels (Lee & Cho, 2017)	Temporal Distance (Wen & Shen, 2016)
Ethnic Groups (Lechuga et al., 2011)	Prior Knowledge about the vaccine (Wen & Shen, 2016)
Approach-Avoidance Motivation (Nan, 2012)	Perceived Risk (Nan et al., 2016; Park, 2012; Gainforth& Latimer, 2011)
Risky sexual behaviour (Gerend & Shepherd, 2007)	Approach Motivation (Nan, 2012)
Consideration of Future Consequences (CFC) (Nan et al., 2019)	
Text vs. Image support (Lee at al., 2019)	
Temporal Distance (Wen & Shen, 2016)	

Prior Knowledge about vaccine (Wen & Shen, 2016)
Perceived Risk (Nan et al., 2016; Park, 2012; Gainforth & Latimer, 2011)
Colour combination (Chien, 2011)

Perceived Risk. Three studies investigated the effect of gain- and loss-framed messages on vaccination intention and vaccination attitude under the influence of perceived risk (Nan et al., 2016, Park, 2012; Gainforth & Latimer, 2011). Perceived risk is defined as "the belief that individuals can get affected by the disease or illness" (Park, 2012, p. 286). Nan et al. (2016) researched the interactive effect of message framing and perceived susceptibility (that one's child is at risk of contracting HPV) on African American parents' intention to get their child vaccinated. They found that when the degree of perceived risk is low (parents thought that their child would not be at risk of getting HPV), loss-framed messages have an influence on the parents. Contrary, when the degree of perceived risk is high (parents thought that their child would be at high risk of contracting HPV), gain-framed messages have an influence on parents' intention to get their child vaccinated (Nan et al., 2016). These results might be understood in regards to the prospect theory, which assumes that loss-framed messages should have a persuasive advantage when the promoted health behaviour is perceived as risky (Rothman et al., 2006). Whereas, gain-framed messages are assumed to be more effective when the promoted health behaviour is perceived as a low risk for the individual (Rothman et al., 2006). Nan et al. (2016) assumes that the degree of perceived risk determines how parents view the HPV vaccine as general health behaviour. The HPV vaccine is seen as risky health behaviour due to the possibility of side-effects and due to parents believing that their child is not at risk of getting HPV and not seeing the benefit of getting the vaccine (Nan et al., 2016). On the contrary, the HPV vaccine can also be viewed as harmless health behaviour, and if parents believe that their child is at high risk of getting HPV, they might see the considerable benefits in getting the vaccine (Nan et al., 2016).

Interestingly, Park (2012) and Gainforth and Latimer (2011) found different results in their studies about the effect of gain- and loss-framed messages under the moderating influence of perceived risk. Park (2012) investigated the effects of gain- and loss-framing and risk perception and their interaction effects on HPV vaccination. Park (2012) found that loss-framed messages have an influence on generating positive attitudes towards the HPV vaccine. Under the moderating influence of perceived risk the study revealed that loss-framed messages have an effect on vaccination intention and vaccination attitude among individuals who have a relatively high degree of perceived risk (Park, 2012). Whereas, individuals who have a low degree of perceived risk of contracting a disease, gain-framed messages are more effective in persuading the individual (Park, 2012; Gainforth & Latimer, 2011). Gainforth and Latimer (2011) examined the "effect of response cost information, message framing and past behaviour on women's coping appraisal and motivation to be vaccinated against the Human Papillomavirus" (p. 896). Their results revealed that women who received high-risk information with loss-framed messages and women who received low-risk information in combination with gain-framed messages were motivated to get vaccinated. These findings are consistent with the study of Rothman and Salovey (1997), which assumes that loss-framed messages are more likely to have an effect on health behaviours that are viewed as risky and gain-framed messages have an effect on low risk behaviours.

The differences in the results might come due to different types of study participants. Nan et al. (2016) conducted their study among black or African American parents, whereas, Park (2012) and Gainforth and Latimer (2011) conducted their study among white university/college students with a mean age of 20/21. It could be that the degree of perceived risk has a different influence on the effectiveness of gain- and loss-framed messages among white young adults compared to black or African American adults. Young adults might (to some extent) know whether they are at risk or not, depending on their sexual activities and whether they use contraceptives like condoms. Parents on the other hand might not know how the sex life of their child is and whether their child uses contraceptives like condoms.

Consideration of Future Consequences (CFC). Consideration of Future consequences positively influences the effect of message frames on the intention and attitude towards vaccination (Nan, Daily, Richards & Holt, 2019). Nan, Daily, Richards and Holt (2019) researched how message frames influence parents' policy positions regarding mandated HPV vaccination, in accordance to their tendencies to consider future consequences (CFC). The study shows that parents with high CFC, being future-oriented, are influenced through gain-

framed messages. On the other hand, loss-framed messages have a greater influence on the attitude towards vaccination among parents who are present-oriented (low in CFC). Nan et al. (2019) assume that parents who are low in CFC, privilege immediate hazards associated with vaccination and are persuaded by messages that emphasize the costs of not getting vaccinated. Whereas, parents who are high in CFC, privilege the future benefits that are associated with vaccination and are more likely to be persuaded by messages that are emphasizing the advantages of receiving the vaccine (Nan et al., 2019).

The CFC moderator is also found to have an impact regarding the effect of temporal-framed messages (present oriented messages vs. future oriented messages) on vaccination intention (Kim & Nan, 2016). Kim and Nan (2016) argue that CFC influences the effect of temporal framed messages on health messages promoting the HPV vaccine. Kim and Nan's (2016) results show that people high in CFC have a strong intention to get vaccinated after seeing a present-oriented message. The authors assume that people who are high in CFC are likely to consider their long-term consequences if they do not get vaccinated. For people with high CFC, present oriented messages focusing on the short-term outcomes seem to be more novel and persuasive compared to future-oriented messages, which are emphasizing long-term consequences (Kim & Nan, 2016). On people who are low in CFC, no temporal framing effect is found (Kim & Nan, 2016).

Temporal Distance and Prior-Knowledge about the vaccine. Wen and Shen (2016) conducted a study about the communication of HPV towards young Chinese. They examined the impact of message frames, temporal distance and prior knowledge about the vaccine. Gain-framed messages are effective when the message highlights short-term benefits with the effect that people with non-prior knowledge are eliciting attitudinal and behavioural changes (Wen & Shen, 2016). Loss-framed messages have an influence on vaccination intention and attitude when the messages highlight long-term costs of not receiving the HPV vaccine to people who have no prior-knowledeg of the vaccine (Wen & Shen, 2016). Wen and Shen (2016) assume that young Chinese people might perceive that they have sufficient self-control over their current health state and underestimate the imminent risks that might occur. However, Wen and Shen (2016) argue that of the young Chinese people, the perceived control over the future health state is decreasing. Furthermore, young Chinese people are perceiving an increased likelihood of getting a disease in the future (Wen & Shen, 2016). Thus, messages emphasizing the risk in the long-run are more likely to attract the young people and to motivate them to respond and get vaccinated (Wen & Shen, 2016). Regarding the effect of

gain-framed messages, Wen and Shen (2016) argue that if people read about potential gains, they want them immediately; gains that are in the future tend to be of less psychological impact.

Text vs. Image support. Lee, Yin and Nowak (2019), studied the intention of getting vaccinated and beliefs of young adults towards the influenza vaccine, by analysing the effect of public service advertising message framing and text versus image support. Their study revealed that loss-framed messages with text support are more effective in motivating young adults to get vaccinated than loss-framed messages with image support. In regards to gain-framed messages, Lee et al. (2019) found that gain-framed brand promise messages with image support are more effective than text supported gain-framed messages, among young adults.

Approach- Avoidance Motivation and Risky Sexual Behaviour. Approach-avoidance motivation is conceptualised as people either seeking to approach positive outcomes or avoid negative outcomes (Nan, 2012). Nan (2012) investigated the interaction between message frames and motivational orientation (approach-avoidance). The study showed that loss-framed messages have an influence on the vaccination intention of avoidance-oriented people. Whereas, loss- framed messages and gain-framed messages have an influence on the vaccination intention of approach-motivated individuals (Nan, 2012). Interestingly, the assumption that approach-oriented individuals (seeking to approach positive outcomes) are more likely to be influenced by gain-framed messages is not supported by the study of Nan (2012) in the context of vaccination. A reason for this might be that, approach-oriented individuals reduce their sensitivity to losses and are more focused on positive outcomes; however, in case of vaccination their reduction of sensitivity is not sufficient (Nan, 2012). Therefore, approach-oriented people are not only focused on the positive outcomes, they also consider avoiding negative outcomes, because individuals view vaccination as a risky health behaviour (Nan, 2012). This result means that gain-framed messages have no persuasive advantage over loss-framed messages on approach-oriented people; instead loss-framed messages also have an influence on approach-oriented people as well (Nan, 2012).

Gerend and Shepherd (2007) found that avoidance-oriented people are persuaded by loss-framed messages. Gerend and Shepherd (2007) studied the relative effectiveness of gain- and loss-framed messages in promoting HPV acceptance. Their results show that messages describing the cost of not getting vaccinated against HPV (loss-framed messages) lead to greater vaccine acceptance among women who are high in avoidance motivation and who

engage in risky sexual behaviour. Gerend and Shepherd (2007) argue that people who are avoidance-oriented tend to be more responsive to threat cues, which is the fundamental emphasis of loss-framed messages. Hence, the persuasive advantage of loss-framed messages on avoidance-motivated people may come from the fact that loss-framed messages make the outcomes which avoidance-oriented people try to avoid more salient (Gerend & Shepherd, 2007). Loss-framed messages have a greater impact on people who engage in risky sexual behaviour because those participants are less likely to practice safer sex by using condoms (Gerend & Shepherd, 2007). Hence, according to Gerend and Shepher (2007) people who engage in risky sexual behaviours are influenced more through loss-framed messages compared to gain-framed messages.

Perceived vaccine efficacy. Loss-framed messages have an influence on people who are low in *vaccine efficacy* (How people perceive a vaccine to be effective in preventing the disease) (Nan, Xie & Madden, 2012). According to the study of Nan, Xie and Madden (2012), which studied the acceptability of the H1N1 Vaccine among older adults by investigating the interplay between message framing and perceived vaccine safety and efficacy, loss-framed messages are effective on older adults who perceive low vaccine efficacy. The loss-framed messages increase the intention of the older adults to get vaccinated and positively change the attitude towards the vaccine (Nan et al., 2012). However, loss-framed messages have an attenuated influence on adults who perceive high vaccine efficacy (Nan et al., 2012).

Behavioural frequency. Another condition that moderates the effect of loss-framed messages on the intention to get vaccination, is behavioural frequency (health behaviour that requires regular and repeated action vs. single-event prevention behaviour) (Gerend, Shepherd and Monday, 2008). Gerend et al. (2008) investigated whether framed health messages on womens intentions to receive the HPV vaccine, could be moderated by behavioural frequency. Their results demonstrate that loss-framed messages have an influence on womens intentions to get vaccinated, when the frequency for the vaccination is low; e.g. to get immune, only one shot of the HPV vaccine is necessary (Gerend et al., 2008). However, when vaccination requires more shots, loss-framed messages lose their influence on the intention to get vaccinated (Gerend et al. 2008). Gerend et al. (2008) argue that low-frequency behaviours are more likely to be associated with feelings of uncertainty, than regular/repeated behaviour. Therefore, loss-framed messages (linked to feelings of uncertainty) might lead to the adoption of low-frequency behaviour (Gerend et al., 2008).

Different media channels. Loss-framed messages have an influence on the intention to get vaccinated, moderated by the medium where the message is presented (Lee & Cho, 2017). Lee and Cho (2017) studied how framed messages interacted with *different media channels* (Social Networking Sites or Newspapers). Their results show that loss-framed messages are effective in increasing the perceived severity of HPV among young adults and their intention to get vaccinated, but only when the message is presented on Facebook rather than in an online-newspaper article. Lee and Cho (2017) assume that loss-framed messages circulating on Facebook reduce the perceived barriers of getting the HPV vaccine, because the information is shared by friends which might reduce anxiety.

Ethnic groups. Loss-framed messages are effective among different *ethnic groups* (Lechuga, Swain and Weinhart, 2011). The study of Lechuga, Swain and Weinhart (2011), researched the effect of framed messages on the mothers intentions to get their daughter vaccinated against HPV across three different cultural groups: Non-Hispanic white, Hispanic, and non-Hispanic African-American. Their findings demonstrate that loss-framed messages have an influence on mothers intention to get their daughter vaccinated among African-American and Hispanic groups (Lechuga et al., 2011). Lechuga et al. (2011) argue that individuals from so-called 'collectivist cultures' seek to fit in by fulfilling obligations and roles, therefore, they assume that individuals from such a culture are more oriented towards preventing losses. Regarding Non-Hispanics, the findings demonstrate that gain- and loss-framing are equivalently effective on the intention to get vaccinated (Lechuga et al., 2011).

Colour combination. Chien (2011) investigated if framing and colour combination would influence the persuasiveness of televised vaccination information. The results revealed that gain- and loss-framed messages alone do not have a significant effect. Only in combination with colour, Chien (2011) found, that loss-framed messages on a white text on a red background have a significant effect on the intention to get vaccinated. Chien (2011) assumes that red background is interpreted as a warning which is equivalent to loss-framed messages, because they are also emphasizing the cost of not getting vaccinated which can be seen as a warning.

4.3. Conclusion of the mini-systematic literature review

The aim of the mini-systematic literature review is to analyse which message frames positively affect vaccination attitude and intention, and which moderators influence the effect of message frames on vaccination attitude and intention. Two main results are identified. First, the results of the mini-systematic literature review show that gain-, loss-, temporal- and

attribute framed messages can have an influence on peoples' intention to get vaccinated and on their attitude towards vaccination. Noticeable is that loss-, and gain-framed messages are researched to a greater extent, as compared to temporal- and attribute-framing. In total 16 studies found a significant effect of gain-framed messages and 17 studies found an effect of loss-framed messages. Only one study examined the effect of temporal-framing, and one study the effect of attribute-framing. Both the studies including temporal- and attribute-framing found an effect on vaccination intention and attitude. Furthermore, the results revealed that more studies, which analysed gain- and loss-framed messages, focused on the intention to get vaccinated compared to the attitude towards vaccination.

Figure 5-7 give an overview of the moderators, found in the included studies, which influence the effect of loss- (Figure 5), gain- (Figure 6) and temporal-framing (Figure 7) on the intention to get vaccinated and the attitude towards vaccination. Interestingly, a growing number of moderators are found throughout the years in different studies on the effectiveness of gain- and loss-framed messages. For temporal-framing only one moderator is found within the included studies, being Consideration of Future Consequences. Concerning attribute-framing, no moderator is identified in the inclu

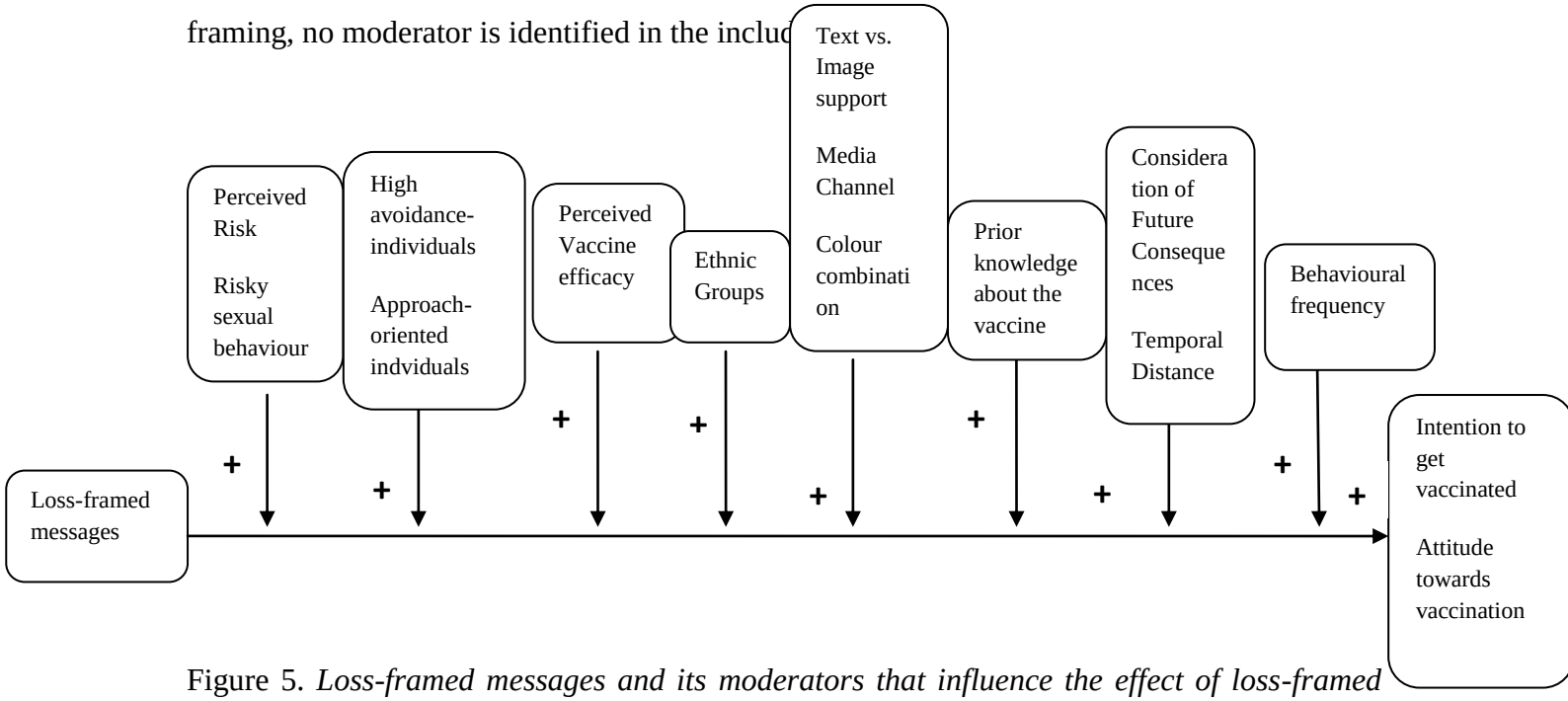

Figure 5. *Loss-framed messages and its moderators that influence the effect of loss-framed messages in regards to vaccination intention and/or vaccination attitude*

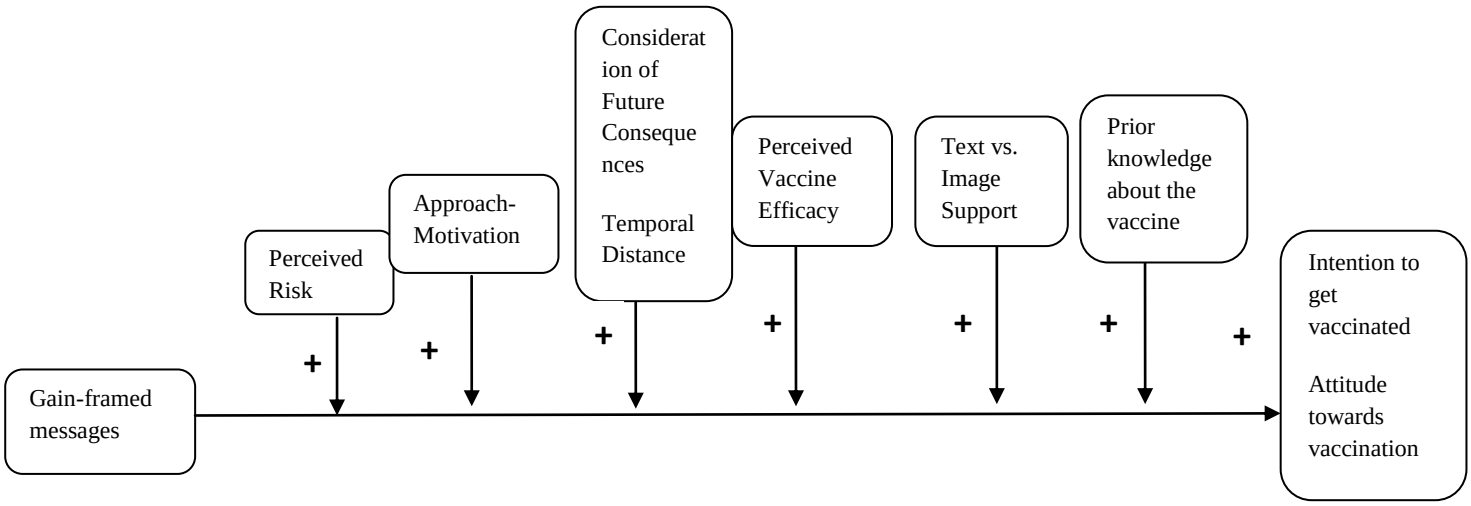

Figure 6. *Gain-framed messages and its moderators that influence the effect of gain-framed messages in regards to vaccination intention and/ or vaccination attitude*

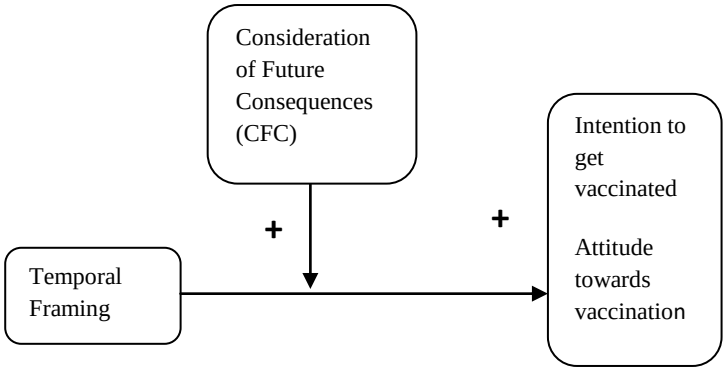

Figure 7. *Temporal Framing and its moderator that influences the effect of temporal framing messages in regards to vaccination intention and/or vaccination attitude*

Regarding the amount of moderators it is noticeable that loss-framed messages have more moderators than gain-framed messages. However, there are studies which examine the effect of gain- and loss-framed messages without the inclusion of moderators. 8 out of the 24 studies which examined gain-framed messages, and 8 out of the 23 studies which examined loss-framed messages, in relation to vaccination intention and vaccination attitude did not include any moderators.

To sum up, to some extent gain-, loss-, temporal- and attribute- framing are all effective in vaccination messages. Furthermore, several moderators can have an influence on the effect of gain-, loss-, and temporal- framed messages. These results are embedded in the design implications. The following chapter will provide a detailed description of the design implications.

5.0. Design Implications

In this section, the second research question "H*ow can message frames be used in the Twitter HPV vaccination campaign of the RIVM?"* is answered. The answer to that will be derived from the findings of the mini-systematic literature. In the following text, the three steps from the U.S. Department of Health & Human Services health communication guidelines are used to structure the design implications that were described in Chapter 2 (Theory). The design implications target group contains both boys and girls, as from 2021 boys in the Netherlands can be vaccinated against the Human Papillomaviurs as well. The contexts of the sub-steps are derived from the analysis of the mini-systematic literature review and from the theoretical framework.

Step 1. Define the communication campaign goal

a. Identify the larger goal

The larger goal of the RIVM HPV campaign is to increase the vaccination uptake of the HPV vaccine in the Netherlands, since the vaccination rate is relatively low compared to other vaccinations (e.g. mumps, diphtheria, hepatitis B, Hib diseases, whooping cough, measles, meningitis C, pneumococcal infection, polio, rubella and tetanus) in the Netherlands (Schurink & Melker, 2017, p.35). This could imply that until now, no heard immunity is created in the Netherlands regarding HPV. Therefore, there might be a higher risk to get HPV. Another goal is to decrease the influence of determinants which hamper the parents to get their daughters and sons vaccinated. Ideal would be that parents trust in the vaccine efficacy and safety and that they are better informed about HPV by authorities.

b. Determine which part of the larger goal could be met by a communication campaign

The future RIVM HPV vaccination campaign should alleviate the concerns of parents regarding the HPV vaccine. The campaign should give better and more concrete information, details and facts that can be understood by the parents and teenagers. This should lead to expanded knowledge of the vaccine for both parents and teenagers. Another goal that might be reached via the future HPV campaign of the RIVM is that parents and teenagers generate greater trust in the efficacy and safety of the vaccine through the newly introduced information about the HPV vaccine.

c. Describe the specific objectives of the campaign; integrate these into a campaign planning

According to Schulenburg (2019) teenagers want to receive information about vaccines regarding: the safety of the vaccinations, vaccinations importance for someone's health, what happens with the health of people who do not vaccinated based on religious or cultural reasons and the risk for getting the vaccine related disease, how well the vaccination protects against getting the disease, and they want to receive information about the risk of side effects coming from the vaccine. Therefore, the specific objectives of the new campaign are (1) to clarify the HPV virus by giving clear information about what HPV is and why vaccination is necessary; and (2) to decrease the fear of side-effects by giving detailed information, written in plain language, about HPV vaccines efficacy and safety.

Step 2. Define the intended audience

a. Identify the group to whom you want to communicate your message

A crucial element when designing a campaign is collecting information about the intended audience (Atkin & Freimuth, 2001). This is especially important for governmental organisations which are promoting campaigns for health and social progress (Atkin & Freimuth, 2001). When designing a campaign, one has to take the intended audience into consideration as an "average person", instead of a specialist such as a health specialist (Atkin & Freimuth, 2001). The diffusion of innovation theory by Rogers (1962) can be applied in this regard. The HPV vaccine, being relatively new, is not commonly known which makes that people do not know much about the vaccine (Graef, 2019). As shown in Chapter 1, Rogers (1962) makes a distinction between five different groups that adapt to the innovation in different time phases. In case of the HPV vaccine, different vaccination adapting groups can be discerned that decide to get (themselves or their child) vaccinated in different time phases, as the following will show.

In case of the HPV vaccine in the Netherlands, Graef (2019) described the different adapting groups. Graef (2019) made a distinction between four different groups, starting with those who have a positive attitude towards the HPV vaccine and simply get vaccinated. According to Graef (2019), this is the easiest group to persuade for the government since this group requires only little attention. The second group is the so-called "on-the-fencers" group (Graef, 2019, p. 32). In this group the individuals are not sure about vaccines or about a specific vaccine, which is caused by the influence of scare stories (Graef, 2019). Therefore, this group

is the one group that should receive the most attention by the campaign designers, since they are still open for additional information and willing to change their mind (Graef, 2019). Additionally, fewer resources will be needed to convince this group compared to the next two following groups (Graef, 2019). The third group is not against vaccines per se, but do not feel comfortable with the HPV vaccine due to it being relatively new and the uncertainty of the long-term effects the vaccine might have (Graef, 2019). However, compared to the aforementioned group "on-the-fencers" group, the third group is more sceptical concerning horror stories which go viral on social media (Graef, 2019). Graef (2019) states that campaign designers should still put their focus on this group, despite their negative sentiment towards vaccines, since their opinion might change through the evidence of safety and proved effectiveness of the vaccine. The last group is the hardest group to reach, as in this group the individuals have a strong negative attitude towards vaccines in general (Graef, 2019). This group is called the anti-vaxxers (Graef, 2019). The group's attitude is mostly based on, religious beliefs, belief in conspiracy theories or their preference for homeopathic alternatives (Graef, 2019). Graef (2019) mentions that campaign designers with limited resources should not focus on anti-vaxxers from the start, but rather at the end, as this group is difficult to persuade.

b. Consider identifying subgroups to whom you could tailor your message

The most suitable and most important group to tailor messages towards is the 'on-the-fencers' group (Graef, 2019). As Graef (2019) explained this group is not sure about specific vaccines due to the influence via scare stories, however this group is still willing to change their mind. The HPV campaign should be tailored to parents who have a girl and/ or a boy between the age of 9-13 years. According to the study of Schulenburg (2019), teenagers mainly want to be informed by their parents/guardians about vaccinations. That is why it is important to get the relevant information to the parents, which in turn can inform their children. Interestingly, according to Dubè et al. (2018), most aspects (e.g. trust in mainstream medicine and health care providers and trust in information about vaccines and its risk perceptions about the vaccines) which influence parent's decisions about vaccination, also influence teenager's intention to get vaccinated. Therefore, providing tailored information to the parents through the HPV campaign can directly influence the opinion or intention of the teenagers.

c. Learn as much as possible about the intended audience; add information about beliefs, current action, and social and physical environment to demographic information

Since the release of the HPV vaccine, much research has been focused on the determinants of the HPV vaccine uptake worldwide. Researchers mostly focused on socio-psychological determinants (related to beliefs, perception, or attitude towards the vaccine), socio-demographic determinants (related to the background and residence of the individuals) and organizational-determinants (related to how and where the vaccination program was organised). Research has also been conducted in the Netherlands, where most researchers focused on socio-psychological determinants (Hofman et al., 2013; Van Keulen et al., 2013). The following determinants will help to learn as much as possible about the intended audience.

Socio-psychological determinants

Dutch parents are mostly concerned about the safety of the vaccine, referring to the perceived fear of unknown side-effects, which caused Dutch parents not to get their child vaccinated (Korfage, Essink-Bot, Daamen, Mols & Ballegooijen, 2008; Hofman et al., 2013; Graef 2019). Another concern for parents is the perceived effectiveness of the vaccine (Van Keulen et al., 2013; Patty et al., 2017; Pot et al., 2017). Some parents are convinced that if their child practice safe sex and lives a healthy lifestyle, the HPV vaccine will be less effective (Pot et al., 2017). Furthermore, different studies found that the lack of information or knowledge regarding the HPV vaccine plays a role in the decision-making of parents, as following will show. Van Keulen et al. (2013) and Patty et al. (2017) showed that this lack of knowledge and/or information lead to parents feeling insufficiently informed about the newly introduced vaccines effectiveness and safety; leading to parents not being able to make an educated decision. Trust in the responsible authorities is another socio-psychological determinant in the Netherlands (Genefaite et al., 2012). Parents stated that they had "no trust that the government would stop the vaccinations if there was evidence of serious side-effects" (Genefaite et al., 2012, p. 5). Based on the aforementioned research, the fear of serious side-effects, too little information about the vaccine and the effectiveness of the vaccine are the most common socio-psychological determinants among Dutch parents for not getting their daughter and/or their son vaccinated.

Socio-demographic determinants

Looking at the socio-demographic determinants, the most common determinant regarding HPV is religion. Mollers et al. (2014) found that the HPV vaccination rate is lower among Orthodox Protestants compared to different Christian religions and atheists. Alberts et al

(2017) found that parents who have a non-Christian background (e.g. Moslems) are less likely to get their daughter vaccinated compared to non-Protestant Christians and atheists. For instance, Turkish parents consider the vaccine as irrelevant, as their daughter is expected to have sexual contact only when she is married and as soon as that is the case, only with their husband (Hofman et al., 2013).

Different studies found different results regarding the socio-economic status determinants. Hofman et al. (2013) show that a higher level of education is connected with a lower level of intention to get vaccinated. Pot et al. (2017) found that parents with a high level of education have a higher intention to get their daughter vaccinated, compared to lower education parents. Pot et al. (2017) also show that parents with a middle level of education have lower intentions to get their daughter vaccinated. Whereas, Rondy, van Lier, van de Kassteele, Rust & de Melker (2010) found a positive relation between high socio-economic status and the intention to get the daughter vaccinated. Concerning the country of birth determinant, the study of Keulen et al. (2013) showed that the vaccination intention is lower when one of the two parents is born in another country than the Netherlands. Rondy et al. (2010) showed that parents with a Turkish or Moroccan background are less likely to get their daughters vaccinated. Lastly, Mollers et al. (2014) research found that highly urbanized regions in the Netherlands have a lower vaccination intention than lower urbanized regions.

Organisational/ practical determinants

Regarding the organisational and practical determinants, less research was found compared to other determinant categories. The study by Rondy et al. (2010) observed the first-year vaccination rate in different areas in the Netherlands, and found that the distance between the home of the to be vaccinated girls and the vaccination centre is significantly associated with the intention to get vaccinated. Rondy et al. (2010) found a connection between organized information meetings for parents at schools, meetings with a gynaecologist, and the uptake of the vaccination rate. Furthermore, the study revealed that when Community Health Services use local media to communicate the campaign or use incentives (e.g. win an Ipad if you receive all doses), the vaccination uptake is lower (Rondy et al., 2010). Lack of information provided by the government is seen as a critical determinant, since parents do not feel informed enough by the government (Hofman et al. 2013; Genefaite et al., 2012).

Step 3. Create messages

a. Brainstorm messages that fit with the communication campaign goal and the intended audience(s)

The mini-systematic literature review results show that gain-, loss-, temporal-, and attribute framing are effective in regards to vaccination messages. As clarified before, two specific objectives of the campaign have been identified: (1) Clarify what the Human Papillomavirus vaccine is, by providing clear information what HPV is about and why vaccination is necessary; and (2) decrease the fear of side effects by providing detailed information about HPV vaccines efficacy and safety. To translate both goals into HPV campaign messages; gain-, loss-, temporal and attribute framed messages are designed. For objective 2, attribute framing can be helpful since attribute framed messages are often used for describing efficacy rates, or side-effects treatments (Bigman et al., 2010).

Below, two gain-framed messages and one loss-framed message are presented based on the results of this study. These messages can be used by the RIVM for their HPV Twitter campaign. An English version is shown first, with a second version below that is translated in Dutch.

Box 1.

Example of gain-, and loss-framed messages for the RIVM HPV Twitter campaign

(I.) Gain-framed message

(a) "You make decisions that impact your child's future every day. Having your child vaccinated against the most common infectious disease (HPV), will be the most effective way to protect it from cancer caused by HPV and genital warts. Protecting your child will ensure that he/she will not become one of the 970 Dutch women or 500 Dutch men who are diagnosed with cancer caused by HPV every year, and will prevent your child dying from it. 310 women and 200 men die because of cancer as a result of HPV each year. It is your choice. Get informed. Get your child vaccinated. Get the facts: https://www.rivm.nl/hpv-humaan-papillomavirus"

Translated into Dutch:

"U neemt elke dag beslissingen die de toekomst van uw kind beïnvloeden. Uw kind laten vaccineren tegen de meest voorkomende infectieziekte (HPV) is de meest effectieve manier om

het te beschermen tegen kanker als gevolge van HPV en genitale wratten. Door uw kind te beschermen wordt het niet één van de 970 Nederlandse vrouwen of 500 Nederlandse mannen die elk jaar de diagnose kanker als gevolge van HPV krijgen en wordt voorkomen dat uw kind eraan overlijdt. Jaarlijks sterven 310 vrouwen en 200 mannen aan kanker als gevolge van HPV. Het is uw keuze. Laat u informeren. Laat uw kind vaccineren. Krijg de feiten: https://www.rivm.nl/hpv-humaan-papillomavirus "

(b) "You make decisions that impact your child's future every day. 970 women and 500 men in the Netherlands are diagnosed with cancer caused by HPV every year. 310 women and 200 men die because of the disease each year. Having your child vaccinated against the most common infectious disease (HPV) will be the most effective way to save it from cancer caused by HPV and genital warts. It is your choice. Get informed. Get your child vaccinated. Get the facts: https://www.rivm.nl/hpv-humaan-papillomavirus"

Translated into Dutch:

"U neemt elke dag beslissingen die de toekomst van uw kind beïnvloeden. Jaarlijks wordt bij 970 vrouwen en 500 mannen in Nederland de diagnose kanker als gevolge van HPV gesteld. Jaarlijks sterven 310 vrouwen en 200 mannen aan de ziekte. Het laten vaccineren van uw kind tegen de meest voorkomende infectieziekte (HPV) is de meest effectieve manier om het te redden van kanker als gevolge van HPV en genitale wratten. Het is uw keuze. Laat u informeren. Laat uw kind vaccineren. De feiten: https://www.rivm.nl/hpv-humaan-papillomavirus "

(II.) Loss-framed message

"You make decisions that impact your child's future every day. Having your child not vaccinated against the most common infectious disease (HPV), increases the chance that your child will get cancer caused by HPV or genital warts. 970 women and 500 men in the Netherlands are diagnosed with cancer caused by HPV each year; your child could be one of it. It is your choice. Get informed. Get your child vaccinated. Get the facts: https://www.rivm.nl/hpv-humaan-papillomavirus"

Translated into Dutch:

"U neemt elke dag beslissingen die de toekomst van uw kind beïnvloeden. Als u uw kind niet laat vaccineren tegen de meest voorkomende infectieziekte (HPV), vergroot u de kans dat uw kind kanker als gevolg van HPV of genitale wratten krijgt. 970 vrouwen en 500 mannen in

Nederland krijgen elk jaar de diagnose kanker als gevolge van HPV; uw kind kan er één van zijn. Het is uw keuze. Laat u informeren. Laat uw kind vaccineren. De feiten: https://www.rivm.nl/hpv-humaan-papillomavirus"

The intention of both messages (gain; loss) is that the parents get "notified" about HPV and how many women are actually affected from the virus each year in the Netherlands. Through the gain-framed message, parents are persuaded to protect their child from getting cervical cancer/ genital warts and from dying due to the cervical cancer.

(III) Temporal-framed message

Temporal-framed messages are about highlighting the long- or short-term consequences of a healthy behaviour or unhealthy behaviour. Below, two examples of temporal-framed messages are presented:

Box 2.

Example of temporal-framed messages for the RIVM HPV Twitter campaign

(a)Message highlights short-term consequence of getting vaccinated

"You make decisions that impact your child every day. Vaccinate your child against the most common infectious disease (HPV) right now, and your child will immediately be immunized against a number of viruses and has immediate protection from repeated infections of HPV. It is your decision. Get informed: https://www.rivm.nl/hpv-humaan-papillomavirus "

Translated into Dutch:

"U neemt beslissingen die elke dag invloed hebben op uw kind. Vaccineer uw kind nu tegen de meest voorkomende infectieziekte (HPV) en uw kind is onmiddelijk immuun voor een aantal virussen en is beschermd tegen herhaalde HPV-infecties. Het is uw beslissing. Laat u informeren: https://www.rivm.nl/hpv-humaan-papillomavirus "

(b)Message highlights long-term consequences of getting vaccinated

"You make decisions that impact your child every day. Not vaccinating your child against the most common infectious diseases (HPV), will increase your child's risk of increased infections of a number of viruses in the future and risks of repeated infections of HPV in the long-run. It is your choice. Get informed. Get your child vaccinated. Get the facts here: https://www.rivm.nl/hpv-humaan-papillomavirus"

Translated into Dutch:

"U neemt beslissingen die elke dag invloed hebben op uw kind. Als u uw kind niet vaccineert tegen de meest voorkomende infectieziekten (HPV), verhoogt u het risico dat uw kind in de toekomst besmet raakt met een aantal virussen en dat uw kind op de lange termijn meer kans heeft op herhaalde HPV-infecties. Het is uw keuze. Laat u informeren. Laat uw kind vaccineren. Bekijk hier de feiten: https://www.rivm.nl/hpv-humaan-papillomavirus "

(IV.) Attribute-framed message

Bigman et al. (2010) show that, positive attributed messages are mostly effective in influencing individuals to get vaccinated against the Human Papillomavirus. Therefore, the following positive framed message has been developed (some statements have been used out of Bigman et al., 2010 study):

Box 3.

Example of attribute- framed message for the RIVM HPV Twitter campaign

"You make decisions that impact your child's future every day. Get your child vaccinated against the Human Papillomavirus. The Human Papillomavirus is one of the most common infectious diseases. Many people will get the disease during their lifetime. Young and old people can get infected. In most cases, HPV leads to no dangerous symptoms and can clear up on its own without any treatment. However, some strains of the virus might lead to high-risk cancer caused by HPV. Get your child vaccinated. The vaccine is effective against HPV strains that cause 70% of high-risk cancer. It is your choice. Get informed. Get the facts here: https://www.rivm.nl/hpv-humaan-papillomavirus."

Translated into Dutch:

"Je neemt elke dag beslissingen die de toekomst van je kind beïnvloeden. Laat uw kind vaccineren tegen het menselijke Papillomavirus. Het menselijke Papillomavirus is een van de meest voorkomende infectieziekten. Veel mensen zullen de ziekte tijdens hun leven krijgen. Jonge en oude mensen kunnen besmet raken. In de meeste gevallen leidt HPV niet tot gevaarlijke symptomen en kan het vanzelf verdwijnen zonder enige behandeling. Sommige stammen van het virus kunnen echter leiden tot kanker als gevolg van HPV met een hoog risico. Laat uw kind vaccineren. Het vaccin is effectief tegen HPV-stammen die 70% van de

kanker veroorzaken. Het is uw keuze. Laat je informeren. Bekijk de feiten hier: https://www.rivm.nl/hpv-humaan-papillomavirus."

b. Identify channels and sources that are considered credible and influential by the intended audience(s)

As explained in Chapter 2 (Theory), through the rise of the internet and the worldwide access to the internet, new opportunities have been created for public health campaigns to get the attention of the public (Andersen et al., 2015). Different health campaigns have used social media to promote their campaigns (Andersen et al., 2015). The advantage of using social media as the promoting platform of the health campaign is that social media seeks audience's attention, through social media false information about health issues can be corrected (which is important for the RIVM in regards to their HPV campaign) and a conversation with the public can be initiated (Andersen et al., 2015).

For this study, Twitter is chosen as the channel. Twitter is a micro-blogging founded in 2006 (Small, 2011). Micro-blogging is a way of blogging, only smaller. Twitter grants its users to post up to 140-long text-based messages, which are also known as *tweets*. Twitter includes millions of users around the world (Castillo, Mendoza & Poblete, 2018; Small, 2011). In 2019, 2, 8 million people used Twitter to either send or read Tweets on a monthly basis in the Netherlands (Mirck, 2019). The advantage of Twitter is that Tweets of individuals can be seen without being friends with that person. Tweets are accessible for everyone and therefore the platform is able to reach many people, not just its users. Another advantage of Twitter is the hashtags (#). Through the hashtags, there is an option to make a topic trending, which increases the chance to get more attention from the media or the public. Twitter users can interact under a post and a conversation can be started. This has the advantage that, for instance, the RIVM could directly interact with individuals who have a question or remark regarding the HPV vaccine. 26% of the Twitter users are between 20 to 39 years old and 21% between 40-64 years old in the Netherlands (Statista, 2019). This is another important factor, since the new HPV campaign of the RIVM is targeting parents who have a girl and a boy in the age between 9-13 years. Therefore, Twitter is a suitable platform to promote the HPV campaign.

5.5.1. Conclusion Design Implications

To sum it up, the greater goal is to increase the HPV vaccination uptake in the Netherlands. To reach this, a new vaccination campaign of the RIVM should be realised. As clarified, the

specific objectives of the campaign are to define what HPV is by giving parents and teenagers clear information about what HPV is and why it is necessary to vaccinate against it. Another objective is to increase the fear of side-effects by giving information about the vaccine efficacy and safety. To translate these two specific objectives into health campaign messages, six different messages are designed which are gained-, and loss-, attribute-, and temporal-framed. Through these six messages, parents might feel persuaded to change their attitude towards the vaccine or get their child vaccinated. What should be noted is that the messages are tailored to the parents, since teenagers are asking their parents whether they should get vaccinated (Schulenburg, 2019). For the effective implementation of the message frames, relevant moderators have to be considered, as the results of the mini-systematic literature review has shown. The analysis of the design implications showed that several factors negatively influenced parental decision to get their child vaccinated against the Human Papillomavirus in the Netherlands. These determinants were; Concerns about the safety of the vaccine (fear of unknown side-effects), perceived effectiveness of the vaccine, low perceived risk of their child getting infected with HPV, lack of knowledge and/or information, religion, educational level and ethnic background. For the RIVM HPV vaccine campaign messages, the following moderators should be considered (based on the results of the mini-systematic literature review) when implementing the message frames; Perceived Risk, vaccine efficacy, ethnic groups, and prior knowledge about the vaccine.

6.0. Discussion

Based on the review of the included 26 articles, this study identifies current research results about the effect of message frames in vaccination communication, the moderators that are influencing the effect of message frames and how these message frames can be used to derive design implications for the RIVM HPV Twitter campaign.

First, the research on temporal and attribute framing in communication about vaccination is limited. Additional research on the effect of temporal- and attribute-framing on the intention to get vaccinated and/or the attitude towards vaccination is needed. Only one study on the effect of temporal- framing and one study on the effect of attribute-framing on vaccination intention and / or vaccination attitude are found and included in this study.

Second, the findings of this study suggest that a growing number of moderators have an influence on the effect of message frames. Initially, three different moderators regarding health messages were identified, being; (1) promoted health behaviour (prevention vs. detection behaviour), (2) Individuals Involvement with the addressed health issue, and (3) Approach/ Avoidance Motivation (Gerend & Shepherd, 2007; Millar & Millar, 2000; Rothman & Salovey, 1997; Rothman et al., 2006). However, throughout the years more moderators were found, being: 1. Perceived vaccine efficacy (Nan et al., 2012); 2. Behavioural Frequency (Gerend et al., 2008); 3. Different media channels (Lee & Cho, 2017); 4. Ethnic groups (Lechuga et al., 2011); 5. Consideration of future consequences (Nan et al., 2019); 6. Text vs. Image support (Lee et al., 2019); 7. Temporal Distance (Wen & Shen, 2016); 8. Prior knowledge about the vaccine (Wen & Shen, 2016); and 9. Colour combination (Chien, 2011). The results of this study also suggest that there is a difference in the number of moderators that influence the effect of message frames in general health messages compared to vaccination messages. An explanation for this difference might be that vaccination is perceived as a divisive topic within society, compared to other health behaviours (Igoe, 2019). Almost every country struggles with a high number of people refusing to get themselves, or their child (ren), vaccinated (Betsch, Böhm & Chapman, 2015). Consequently, repeated outbreaks of vaccine-preventable diseases occur that costs lives and consumes resources (Betsch et al., 2015). Moreover, the vaccine uptake often fails to reach the threshold for herd immunity (Betsch et al., 2015).

For the medical community and health authorities, vaccination is recognised as an important tool to reach public health success (Yaqub, Castle-Clarke, Svedalis & Chataway, 2014).

However, people question the benefits of vaccinating, are concerned about the safety of the vaccine and are wondering why they need the vaccination (Yaqub et al., 2014).This leads to the fact that individuals do not have a positive view on vaccination and might refuse to get vaccinated (Yaqub et al., 2014). Moreover, it seems that through the rise of social media, misinformation (conclusions based on incomplete or wrong facts) and disinformation (spread of false information to promote specific agendas) about vaccination are easy to spread, which might influence opinions (Igoe, 2019). Also, religious opinions might lead to diverse opinion about vaccination and lead to people not getting vaccinated (Pelčić et al., 2016). In general, the most usual reasons for people to refuse vaccinations are; medical, religious, social and philosophical reasons (Pelčić et al., 2016). Vaccination is a divisive topic compared to other health behaviours, which might explain the growing amount of moderators found throughout the years. The results of this study suggest that new models in regards to message frames, and the moderators that influence message frame effects', are needed.

Third, the diffusion of innovation theory (Rogers, 1962) can be partially applied to identify the intended audience for the RIVM HPV campaign. As explained in Chapter 1, the diffusion of innovation theory (Rogers, 1962) is about how over time an idea spreads (illustrated by several groups) resulting in the adoption of a new idea or behaviour. In 2006, the first vaccine against the Human Papillomavirus was approved in Europe, and in 2009 the Netherlands started its catch-up campaign for girls who were born between 1993 and 1996 (Pattey et al., 2017; Schurink & Melker, 2017). Despite the active recruitment, the HPV vaccination rate stayed low in the Netherlands (Schurink & Melker, 2017). To understand this, the diffusion of innovation theory could help with its adopting groups. Graef (2019) found that also in the case of the HPV uptake in the Netherlands, different adapting groups can be identified. In total, Graef (2019) identified four different groups. The first group are the people who have a positive attitude towards the HPV vaccine and simply get vaccinated. Followed, by the so called "on-the-fencers" group where individuals are not sure about the HPV vaccine, which is caused by the influence of scare stories. The third group is not against vaccination per se, but do not feel comfortable with the HPV vaccine due to it being relatively new. The last group is the hardest group. This group are the so called "anti-vaxxers" which have a strong negative attitude towards vaccines in general. Comparing those groups, with the groups of Rogers (1962), it seems that the 'innovators' group of Rogers (1962) is comparable with the first group of Graef (2019), because they are the first ones receiving the innovation/vaccine without hesitation. Regarding the second and third group of Graef (2019), these groups could be compared to the late majority and critical mass group, since both group of Graef (2019)

and Rogers (1962) are open to the innovation/vaccine, but only if they have trust in the innovation/vaccine. The confidence can be achieved through receiving sufficient evidence for the safety and effectiveness of the vaccine or by seeing that people they trust are using the innovation. Lastly, the anti-vaxxers group seems to be not comparable to the groups of Rogers (1962). All in all, to some extent it seems that the groups by Graef(2019) are comparable with the groups by Rogers (1962), except the anti-vaxxers. However, specific research on the cycle of vaccination uptake should prove whether vaccination uptake actually evolves like the 'S' curve model in the diffusion of innovation theory.

6.1. Strength, Limitations and recommendations for future research

In this study, several strengths and limitations are identified. Regarding strengths; this study provides deeper insight into the theory of message frames and its moderators in case of vaccination campaign messages. The study also shows that a growing number of moderators play a role in influencing the effectiveness of message frames in regards to vaccination. The growing number of moderators over the years is an important future research aspect, especially for temporal and attribute- framing. This study also provides a detailed analysis of the design implications aimed to improve the information of the RIVM HPV Twitter campaign. This helps to get a clear picture to whom the RIVM should tailor the campaign, and how the RIVM should frame the messages.

This study contains several limitations, as well. The retrieved studies from the mini-systematic literature review are mainly from the US and only include one European study. This could attenuate the results of the analysis, because there might be a difference between Dutch citizens and Americans regarding their perceptions and opinions of vaccinations. The influence of the moderators on the effectiveness of message frames on vaccination intention and/ or vaccination attitude might also be perceived differently by Dutch people. Furthermore, the messages which are designed for the RIVM might not be perfectly written, since I am not an expert in the field of vaccination and about health communication. Additionally, the determinants for the vaccination uptake in the Netherlands are mostly based on girls and not on boys, because boys cannot get vaccinated until 2021. This could imply that different determinants play a role in the HPV vaccination uptake for boys, which in turn would result in different moderators that have an influence on the effective implementation of framed messages, the RIVM needs to consider this.

Finally, for future research, the following recommendations can be given. First, research is needed on the effectiveness of message frames on vaccination intention and vaccination

attitude in the Netherlands and Europe in general. Second, research is needed on temporal-framing and attribute- framing and their effect on vaccination intention and vaccination attitude. Third, research is needed on which moderators influence the effectiveness of temporal- and attribute-framing on vaccination intention and attitude. Lastly, further research on vaccination uptake cycle should be conducted, to prove whether the diffusion of innovation theory can explain the cycle of (new) vaccines.

6.2. Recommendations for the RIVM

As the study has shown, the RIVM can use framed messages in order to increase parents' intention to get their children vaccinated against the HPV virus and/ or to positively change the attitude towards the HPV vaccine. When designing a new campaign for the HPV vaccine, the RIVM should focus on two specific objectives; (1) clarify HPV by giving clear information about what HPV is and why vaccination is necessary, and (2) decrease the fear of side-effects by providing detailed information, written in plain language about HPV vaccines efficacy and safety. Concerning the intended audience, the RIVM should focus on the 'on-the-fencers' group since this group is still open for additional information and willing to change their mind regarding the HPV vaccine. The determinants why individuals reject vaccination should be considered by the RIVM, which might influence the message frame they should use in their campaign.

6.2.1. Advice

The first advice I would give the RIVM is not just try to tackle the fear of side-effects through attribute-framed messages. The use of short videos on Twitter where parents (either mothers or fathers) and teenagers (boys and/or girls) talk about their positive experience with the HPV vaccine might decrease the fear regarding the vaccine, since the persons in the video appear as trustworthy. The RIVM should also test the provided messages with a pilot group (which should be identical to the group of individuals they are targeting) to see which framed messages have a greater effect on the vaccine attitude and/or intention to get vaccinated. The RIVM should really get to know the people that are refusing the HPV vaccine, and their reasons for refusing the vaccine in order to convince these people with the right means.

7.0. Overall Conclusion

The objective of this study is the improvement of the information of the RIVM HPV Twitter campaign, by answering the following research questions: "*(1a.) Which message frames positively affect vaccination attitude and vaccination intention, and (1b.) which moderators influence the effect of message frames on vaccination attitude and vaccination intention and (2) how can these frames be used in the Twitter HPV vaccination campaign of the RIVM?"*

To answer the first research question, a mini-systematic literature review has been conducted. 26 articles researching the influence of message frames and the conditions, under which the message frames have a positive effect on vaccination intention and vaccination attitude, are included in the mini-systematic literature review. The answer to the second research question is derived from the findings of the mini-systematic literature review.

This study shows that gain-, loss-, temporal-, and attribute framed messages can be applied to persuade individuals to get vaccinated and that they can be used to positively affect the attitude towards vaccination. This study also shows that different moderators are influencing the effect of message frames on vaccination intention and attitude. The following moderators positively influence the effectiveness of loss-framed messages on vaccination intention and vaccination attitude: Perceived risk, risky sexual behaviour, avoidance and approach motivated individuals, vaccine efficacy, ethnic groups, text vs. image support, colour combination, media channel, prior knowledge about the vaccine, consideration of future consequences, temporal distance and behavioural frequency. For gain-framed messages the following moderators are identified: perceived risk, approach motivation, consideration of future consequences, temporal distance, perceived vaccine efficacy, text vs. image support and prior knowledge about the vaccine. Only one moderator positively influences the effectiveness of temporal-framed messages on vaccination intention and vaccination attitude, being consideration of future consequences.

Regarding the HPV campaign of the RIVM, this study shows that all four message frames can be applied to improve the information of the campaign. For the effective implementation of the message frames, the RIVM needs to consider the relevant moderators that are found in this study. The design implications reveal that the RIVM needs to consider the following moderators; perceived risk, vaccine efficacy, ethnic groups and prior knowledge about the vaccine.

In brief, the results of this study provide a useful review of the effects of message frames on vaccination intention and vaccination attitude, moderators that influence the effect of message frames on vaccination intention and vaccination attitude, and how these message frames can be used to derive design Implications for the RIVM HPV Twitter campaign. Future research should contribute to a further understanding of the use of message framing in vaccination communication in Europe and especially of temporal- and attribute framing in vaccination communication.

8.0. References

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9.0. Appendix A.

The article: Parental support for HPV Vaccination Mandates Among African Americans: The Impact of Message Framing and Consideration of Future Consequences (Nan, Daily, Richards & Holt, 2019)

Critical Appraisal Checklist for an Article on Questionnaires/Survey	
Appraisal questions	**Yes/ Cannot Tell / No**
1. Did the study address a clearly focused question/ issue?	**Yes**
2. Is the research method (study design) appropriate for answering the research question?	**Yes**
3. Is the method of selection of the subjects (employees, teams, divisions, organisations) clearly described?	**Yes**
4. Could the way the sample was obtained introduce (selection) bias?	**No**
5. Was the sample of subject's representative with regard to the population to which the findings will be referred?	**Yes**
6. Was the sample size based on pre-study considerations of statistical power?	**Cannot Tell**
7. Was a satisfactory response rate achieved?	**Yes**
8. Are the measurements (questionnaires) likely to be valid and reliable?	**Yes**
9. Was the statistical significance assessed?	**Yes**
10. Are confidence intervals given?	**No**
11. Could there be confounding factors that haven't been accounted for?	**Cannot Tell**
12. Can the results be applied to your organisation?	**Yes**
Study included?	**Yes**

The article: The effects of message framing and healthcare provider recommendation on Adult's hepatitis B vaccination: A randomized controlled trial (Kasting, Head, Cox, Cox (A.D.), & Zimet, 2019)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment?	**Yes**

5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**Message framing and HCP recommendation, Moderation analyses for message framing and perceived message-framing analyses were measured.** **Neither gain or loss-framed messages were effective**
8. How precise was the estimate of the treatment effect?	**95% CI**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (N = 1747)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: Effects of Message Framing on Influenza Vaccination: Understanding the Role of Risk Disclosure, Perceived Vaccine Efficacy and Felt Ambivalence (Kim, Pjesivac & Jin, 2019)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Yes**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**Effects of risk disclosure message and Mediation analyses for underlying mechanisms.** **Key finding; gain-framed only messages were more effective than gain-framed messages with risk-disclosure**
8. How precise was the estimate of the treatment effect?	**95% CI**
Section C: Will the results help locally?	

9. Can the results be applied to the local population, or in your context?	**No (N= 86)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: Now or Future? Analyzing the effects of message frame and format in motivating Chinese females to get HPV vaccines for their children (Liu, Yang & Chu, 2019)

Critical Appraisal Checklist for an Article on Questionnaires/Survey	
Appraisal questions	**Yes/ Cannot Tell / No**
1. Did the study address a clearly focused question/ issue?	**Yes**
2. Is the research method (study design) appropriate for answering the research question?	**Yes**
3. Is the method of selection of the subjects (employees, teams, divisions, organisations) clearly described?	**Yes**
4. Could the way the sample was obtained introduce (selection) bias?	**No**
5. Was the sample of subject's representative with regard to the population to which the findings will be referred?	**Yes**
6. Was the sample size based on pre-study considerations of statistical power?	**Cannot Tell**
7. Was a satisfactory response rate achieved?	**Yes**
8. Are the measurements (questionnaires) likely to be valid and reliable?	**Yes**
9. Was the statistical significance assessed?	**Yes**
10. Are confidence intervals given?	**No**
11. Could there be confounding factors that haven't been accounted for?	**Cannot Tell**
12. Can the results be applied to your organisation?	**Yes**
Study included?	**Yes**

The article: Effects of Multimedia Framed Messages on Human Papillomavirus Preventing Among Adolescents (Tu, Lin, Fan et al., 2019)

Critical Appraisal Checklist for an Article on Quasi-Experimental Designs	
Appraisal questions	**Yes/ No / Unclear/ Not applicable**
1. Is it clear in the study what is the 'cause' and what is the 'effect' (i.e. there is no confusion about which variable comes first)?	**Yes**
2. Were the participants included in any comparison similar?	**Yes**

3. Were the participants included in any comparison receiving similar treatment/care, other than the exposure or intervention of interest?	**Yes**
4. Was there a control group?	**Yes**
5. Were the multiple measurements of the outcome both pre and post the intervention/exposure?	**Unclear**
6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	**Not applicable**
7. Were the outcomes of participants included in any comparisons measured in the same way?	**Yes**
8. Were outcomes measured in a reliable way?	**Yes**
9. Was the statistical significance assessed?	**Yes**
Study included?	**Yes**

The article: Motivating Influenza Vaccination among Young Adults: The effects of Public Service Advertising Message Framing and Text versus Image Support (Lee, Jin & Nowak, 2018)

Critical Appraisal Checklist for an Article on Questionnaires/Survey	
Appraisal questions	**Yes/ Cannot Tell / No**
1. Did the study address a clearly focused question/ issue?	**Yes**
2. Is the research method (study design) appropriate for answering the research question?	**Yes**
3. Is the method of selection of the subjects (employees, teams, divisions, organisations) clearly described?	**Yes**
4. Could the way the sample was obtained introduce (selection) bias?	**No**
5. Was the sample of subject's representative with regard to the population to which the findings will be referred?	**Yes**
6. Was the sample size based on pre-study considerations of statistical power?	**Cannot Tell**
7. Was a satisfactory response rate achieved?	**Yes**
8. Are the measurements (questionnaires) likely to be valid and reliable?	**Yes**
9. Was the statistical significance assessed?	**Yes**
10. Are confidence intervals given?	**No**
11. Could there be confounding factors that haven't been accounted for?	**Cannot Tell**
12. Can the results be applied to your organisation?	**Yes**
Study included?	**Yes**

The article: Framing and visual type: Effect on future Zika vaccine uptake intent (Guidry, Carlyle, LaRose, Perrin et al., 2018)

Critical Appraisal Checklist for an Article on Questionnaires/Survey	
Appraisal questions	**Yes/ Cannot Tell / No**
1. Did the study address a clearly focused question/ issue?	**Yes**
2. Is the research method (study design) appropriate for answering the research question?	**Yes**
3. Is the method of selection of the subjects (employees, teams, divisions, organisations) clearly described?	**Yes**
4. Could the way the sample was obtained introduce (selection) bias?	**No**
5. Was the sample of subject's representative with regard to the population to which the findings will be referred?	**Yes**
6. Was the sample size based on pre-study considerations of statistical power?	**Cannot Tell**
7. Was a satisfactory response rate achieved?	**Yes**
8. Are the measurements (questionnaires) likely to be valid and reliable?	**Yes**
9. Was the statistical significance assessed?	**Yes**
10. Are confidence intervals given?	**No**
11. Could there be confounding factors that haven't been accounted for?	**Cannot Tell**
12. Can the results be applied to your organisation?	**Yes**
Study included?	**Yes**

The article: Promoting HPV Vaccination online: Message Design and Media Choice (Lee & Cho, 2017)

Critical Appraisal Checklist for an Article on Questionnaires/Survey	
Appraisal questions	**Yes/ Cannot Tell / No**
1. Did the study address a clearly focused question/ issue?	**Yes**
2. Is the research method (study design) appropriate for answering the research question?	**Yes**
3. Is the method of selection of the subjects (employees, teams, divisions, organisations) clearly described?	**Yes**
4. Could the way the sample was obtained introduce (selection) bias?	**No**
5. Was the sample of subject's representative with regard to the population to which the findings will be referred?	**Yes**
6. Was the sample size based on pre-study	**Cannot Tell**

considerations of statistical power?	
7. Was a satisfactory response rate achieved?	**Yes**
8. Are the measurements (questionnaires) likely to be valid and reliable?	**Yes**
9. Was the statistical significance assessed?	**Yes**
10. Are confidence intervals given?	**No**
11. Could there be confounding factors that haven't been accounted for?	**Cannot Tell**
12. Can the results be applied to your organisation?	**Yes**
Study included?	**Yes**

The article: Effects of Consideration of Future Consequences and Temporal Framing on Acceptance of the HPV Vaccine among Young Adults (Kim & Nan, 2016)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Yes**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**Present oriented message frames were more effective on the intention to vaccinate on High-CFC individuals. Temporal framing had no effect by Low-CFC individuals.**
8. How precise was the estimate of the treatment effect?(Confidence Interval)	**Cannot tell**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (N= 416)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: Communicating to young Chinese about human papillomavirus vaccination: examining the impact of message framing and temporal distance (Wen & Shen, 2016)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Cannot tell**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**Loss-framed messages were effective in generating perceived severity of HPV infection among Chinese people. Loss-framed was especially effective by highlighting long-term cost of not receiving. Gain-framed were effective regarding short-term benefits.**
8. How precise was the estimate of the treatment effect?	**Cannot tell**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (156)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: Message framing, Perceived susceptibility and Intentions to Vaccinate against HPV among African American Parents (Nan, Madden, Richards, Holt, Qi Wang & Tracy, 2016)

Critical Appraisal Checklist for an Article on Questionnaires/Survey	
Appraisal questions	**Yes/ Cannot Tell / No**
1. Did the study address a clearly focused question/ issue?	**Yes**
2. Is the research method (study design) appropriate for answering the research question?	**Yes**
3. Is the method of selection of the subjects (employees, teams, divisions, organisations) clearly described?	**Yes**
4. Could the way the sample was obtained introduce (selection) bias?	**No**
5. Was the sample of subject's representative with regard to the	**Yes**

population to which the findings will be referred?	
6. Was the sample size based on pre-study considerations of statistical power?	**Cannot Tell**
7. Was a satisfactory response rate achieved?	**Yes**
8. Are the measurements (questionnaires) likely to be valid and reliable?	**Yes**
9. Was the statistical significance assessed?	**Yes**
10. Are confidence intervals given?	**No**
11. Could there be confounding factors that haven't been accounted for?	**Cannot Tell**
12. Can the results be applied to your organisation?	**Yes**
Study included?	**Yes**

The article: Socioecological and message framing factors influencing maternal influenza immunization among minority women (Frew, Saint-Victor, Owens & Omer, 2014)

Critical Appraisal Checklist for an Article on Questionnaires/Survey	
Appraisal questions	**Yes/ Cannot Tell / No**
1. Did the study address a clearly focused question/ issue?	**Yes**
2. Is the research method (study design) appropriate for answering the research question?	**Yes**
3. Is the method of selection of the subjects (employees, teams, divisions, organisations) clearly described?	**Yes**
4. Could the way the sample was obtained introduce (selection) bias?	**No**
5. Was the sample of subject's representative with regard to the population to which the findings will be referred?	**Yes**
6. Was the sample size based on pre-study considerations of statistical power?	**Cannot Tell**
7. Was a satisfactory response rate achieved?	**Yes**
8. Are the measurements (questionnaires) likely to be valid and reliable?	**Yes**
9. Was the statistical significance assessed?	**Yes**
10. Are confidence intervals given?	**Yes (95% CI)**
11. Could there be confounding factors that haven't been accounted for?	**Cannot Tell**
12. Can the results be applied to your organisation?	**Yes**
Study included?	**Yes**

The article: Message framing strategies to Increase Influenza Immunisation Uptake among Pregnant African American Women (Marsh, Malik, Shapiro, Omer & Frew, 2014)

Critical Appraisal Checklist for an Article on Qualitative Research	
Section A: Are the results valid?	Yes/ Cannot tell / No
1. Was there a clear statement of the aims of the research?	**Yes**
2. Is a qualitative methodology appropriate?	**Yes**
Is it worth continuing?	
3. Was the research design appropriate to address the aims of the research?	**No**
4. Was the recruitment strategy appropriate to the aims of the research?	**Yes**
5. Was the data collected in a way that addressed the research issue?	**Yes**
6. Has the relationship between researcher and participants been adequately considered?	**Cannot tell**
Section B: What are the results?	
7. Have ethical issues been taken into consideration?	**Yes**
8. Was the data analysis sufficiently rigorous?	**Yes**
9. Is there a clear statement of findings?	**Yes**
Section C: Will the results help locally?	
10. How valuable is the research?	**Yes**
Study included?	**Yes**

The article: Influenza vaccination acceptance among diverse pregnant women and its impact on infant immunisation (Frew, Zhang, Saint-Victor, Schade, et al., 2013)

Critical Appraisal Checklist for an Article on Questionnaires/Survey	
Appraisal questions	**Yes/ Cannot Tell / No**
1. Did the study address a clearly focused question/ issue?	**Yes**
2. Is the research method (study design) appropriate for answering the research question?	**Yes**
3. Is the method of selection of the subjects (employees, teams, divisions, organisations) clearly described?	**Yes**
4. Could the way the sample was obtained introduce (selection) bias?	**No**
5. Was the sample of subject's representative with regard to the population to which the findings will be referred?	**Yes**
6. Was the sample size based on pre-study considerations of statistical power?	**Cannot Tell**
7. Was a satisfactory response rate achieved?	**Yes**
8. Are the measurements (questionnaires) likely to be valid and reliable?	**Yes**

9. Was the statistical significance assessed?	**Yes**
10. Are confidence intervals given?	**Yes (90% CI)**
11. Could there be confounding factors that haven't been accounted for?	**Cannot Tell**
12. Can the results be applied to your organisation?	**Yes**
Study included?	**Yes**

The article: Persuasiveness of Online Flu-Vaccination Promotional Banner (Chien, 2013)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Cannot Tell**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**Non significant effect of message framing and colour configuration**
8. How precise was the estimate of the treatment effect?	**95% CI**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (N= 180)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: Message Framing and Parents Intentions to have their child vaccinated against HPV (Gainforth, Cao & Latimer-Cheung, 2012)

Critical Appraisal Checklist for an Article on Quasi-Experimental Designs	
Appraisal questions	**Yes/ No / Unclear/ Not applicable**
10. Is it clear in the study what is the 'cause' and what is the 'effect' (i.e. there is no confusion about which variable comes first)?	**Yes**
11. Were the participants included in any	**Yes**

comparison similar?	
12. Were the participants included in any comparison receiving similar treatment/care, other than the exposure or intervention of interest?	**Yes**
13. Was there a control group?	**Not applicable**
14. Were the multiple measurements of the outcome both pre and post the intervention/exposure?	**Yes**
15. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	**Yes**
16. Were the outcomes of participants included in any comparisons measured in the same way?	**Yes**
17. Were outcomes measured in a reliable way?	**Yes**
18. Was the statistical significance assessed?	**Yes**
Study included?	**Yes**

The article: The Effects of Message framing and Risk Perceptions for HPV Vaccine Campaigns: Focus on the Role of Regulatory Fit (Park, 2012)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Yes**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**Loss-framed messages were effective in generating positive attitudes towards the acceptance of the HPV vaccine.** **But, gain- and loss-framed messages did not achieve greater behavioural intentions to get vaccinated**
8. How precise was the estimate of the treatment effect?	**Cannot tell**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (N= 108)**

10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: Risky business: Risky information and the moderating effect of message frame and past behaviour on women's perceptions of the Human Papillomavirus Vaccine (Gainforth & Latimer, 2012)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Yes**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**Loss-framed messages were effective by women with high risk. Gain-framed message were effective by women with low-risk.**
8. How precise was the estimate of the treatment effect?	**Cannot Tell**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (N= 286)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: Acceptability of H1N1 Vaccine among Older Adults: The Interplay of Message Framing and Perceived Vaccine Safety and Efficiency (Nan, Xie & Madden, 2012)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**

3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Yes**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**Loss-framed messages were effective by older adults who perceived low vaccine efficacy. By adults who believed in high vaccine efficacy, no framing effect of loss-or gain-framing could be found.**
8. How precise was the estimate of the treatment effect?	**Cannot Tell**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (N=222)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: Communicating to young adults about HPV vaccination: Consideration of Message Framing, Motivation and Gender (Nan, 2012)

Critical Appraisal Checklist for an Article on Questionnaires/Survey	
Appraisal questions	**Yes/ Cannot Tell / No**
1. Did the study address a clearly focused question/ issue?	**Yes**
2. Is the research method (study design) appropriate for answering the research question?	**Yes**
3. Is the method of selection of the subjects (employees, teams, divisions, organisations) clearly described?	**Yes**
4. Could the way the sample was obtained introduce (selection) bias?	**No**
5. Was the sample of subject's representative with regard to the population to which the findings will be referred?	**Yes**
6. Was the sample size based on pre-study considerations of statistical power?	**Cannot Tell**
7. Was a satisfactory response rate achieved?	**Yes**
8. Are the measurements (questionnaires) likely to be valid and reliable?	**Yes**

9. Was the statistical significance assessed?	**Yes**
10. Are confidence intervals given?	**No**
11. Could there be confounding factors that haven't been accounted for?	**Cannot Tell**
12. Can the results be applied to your organisation?	**Yes**
Study included?	**Yes**

The article: Impact of Framing on Intentions to Vaccinate Daughters against HPV: A Cross-Cultural Perspective (Lechuga et al., 2011)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Cannot tell**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**For African American and Hispanic, Loss-framed messages were more effective in increasing the intention to vaccinate.** **For Non-Hispanic white participants, gain- and loss-framed messages were equally effective in increasing the intention to get vaccinated.**
8. How precise was the estimate of the treatment effect?	**Cannot Tell**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (N= 150)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: Use of Message Framing and Colour in Vaccine Information to Increase Willingness to be Vaccinated (Chien, 2011)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Cannot tell**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**No significant difference between the effectiveness of gain- or loss-framed messages**
8. How precise was the estimate of the treatment effect?	**Cannot tell**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (120)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: Effective or Ineffective. Attribute Framing and the Human Papillomavirus (HPV) vaccine (Bigman, Cappella & Hornik, 2010)

Critical Appraisal Checklist for an Article on Questionnaires/Survey	
Appraisal questions	**Yes/ Cannot Tell / No**
1. Did the study address a clearly focused question/ issue?	**Yes**
2. Is the research method (study design) appropriate for answering the research question?	**Yes**
3. Is the method of selection of the subjects (employees, teams, divisions, organisations) clearly described?	**Yes**
4. Could the way the sample was obtained introduce (selection) bias?	**No**
5. Was the sample of subject's representative with regard to the population to which the findings will be	**Yes**

referred?	
6. Was the sample size based on pre-study considerations of statistical power?	**Cannot Tell**
7. Was a satisfactory response rate achieved?	**Yes**
8. Are the measurements (questionnaires) likely to be valid and reliable?	**Yes**
9. Was the statistical significance assessed?	**Yes**
10. Are confidence intervals given?	**Yes (95% CI)**
11. Could there be confounding factors that haven't been accounted for?	**Cannot Tell**
12. Can the results be applied to your organisation?	**Yes**
Study included?	**Yes**

The article: Behavioural Frequency moderated the effects of Message Framing on HPV Vaccine Acceptability (Gerend, Shepherd & Monday, 2008)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Cannot Tell**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**Loss-framed messages were partly effective. Gain-framed message no effect.**
8. How precise was the estimate of the treatment effect?	**95% CI**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (N=237)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: The role of message framing in promoting MMR vaccination: evidence of a loss-framed advantage (Abhayankar, O'Connor & Lawton, 2008)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Yes**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental intervention, were the groups treated equally?	**Yes**
Section B: What are the results?	
7. How large was the treatment effect?	**Loss-framed messages were more effective in encouraging mother's intention to obtain an MMR vaccine for their children. Gain-framed messages had no effect.**
8. How precise was the estimate of the treatment effect?	**Cannot Tell**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (N=140)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**

The article: Using Message Framing to Promote Acceptance of the Human Papillomavirus Vaccine (Gerend & Shepherd, 2007)

Critical Appraisal Checklist for an Article on Randomized Controlled Trial	
Section A: Are the results of the trial valid?	**Yes/ Cannot Tell / No**
1. Did the trial address a clearly focused issue?	**Yes**
2. Was the assignment of patients to treatments randomized?	**Yes**
3. Were all of the patients who entered the trial properly accounted for at its conclusion?	**Yes**
Is it worth continuing?	
4. Were patients, health workers and study personnel 'blind' to treatment? (informed consent)	**Cannot Tell**
5. Were the groups similar at the start of the trial?	**Yes**
6. Aside from the experimental	**Yes**

intervention, were the groups treated equally?	
Section B: What are the results?	
7. How large was the treatment effect?	**Loss-framed messages were more effective among women with risky sexual behaviour. Nor framing effects among women without a history of risky sexual behaviour**
8. How precise was the estimate of the treatment effect?	**Cannot Tell**
Section C: Will the results help locally?	
9. Can the results be applied to the local population, or in your context?	**Yes (N=127)**
10. Were all clinically important outcomes considered?	**Yes**
11. Are the benefits worth the harms and costs?	**Yes**
Study included?	**Yes**