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Communicating Risk

An analysis of risk communication strategies during the A (H1N1) pandemic to prepare for the next pandemic

Master's thesis in Risk Psychology, Environment and Safety

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Preface

A pandemic influenza is unpredictable, both in terms of when the next pandemic may erupt, how fast it will spread, and lastly, how severe it will be. This presents considerable challenges for communicating risk to the public since past experiences with a pandemic cannot easily be attributed to the next; a fact not underlined by the fact that uncertainty in expert risk estimates and public perceptions of the pandemic risk may put further strains upon communication of risk during a pandemic. In this regard I found it interesting and motivating to use my academic background in Risk Psychology, Environment and Safety (RIPENSA) to research this problem area of communicating risk to the public. Proposing scientific methods which may address these problems to strengthen risk communication for a future pandemic in Norway has been an illuminating and rewarding process for me personally. The experiences and knowledge I bring with me from writing this thesis will undoubtedly prove useful in future work.

My sincere thanks go first and foremost to my supervisor Britt-Marie Drottz-Sjöberg for her invaluable support in completing this thesis. Her good advice and constructive feedback have helped and challenged me to lift the thesis to the level I myself could best achieve.

I would also like to thank my fellow students for their social and motivational support which have made the writing of this thesis a positive experience. Last, but not least, I would like to thank my parents, Lars and Evy Horpestad Tjåland, and my brother Sturla Horpestad Tjåland, for their support during the frustrations and pleasures in the process of completing this thesis.

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Abstract

This thesis addresses the topic of risk communication effectiveness on a national level in Norway regarding a future pandemic. The consequences of a pandemic influenza will depend partly upon the risk communication strategy effectiveness. Within risk psychology research, such a strategy should fully consider how general and situational factors may influence public perceptions of the pandemic risk, and how public perceptions affect risk communication efficiency and, consequently, the behavior of recipients towards the pandemic. If ignored, communication gaps could result in overall greater consequences for the general public and/or unequal protection for vulnerable risk groups during a future pandemic.

The overall aim of the thesis is therefore to help enhance risk communication efficiency, and thereby risk management. To address this area of research the thesis summarizes scientific research on risk perception and risk communication, and reviews experiences from prior situations and cases. The central interest of the thesis has been how public perceptions of a pandemic risk relate to risk communication efficiency and communication strategy. Scientific communication models used to address public perceptions, which may limit or hinder correct health behavior, are presented and their use in potential future pandemic settings are discussed. The thesis argues that risk communication efficiency will be strengthened by use of scientific models of communication. In this context especially models on information processing (i.e. ELM), approaches eliciting mental contents (i.e. mental models), and practical work with communication of risk (i.e. RISCOM).

Predictions of future pandemics are extremely hard to make. To cover various possibilities within a future pandemic this thesis discusses risk communication challenges in situations with different combinations of possibility and consequences (severity of the virus). The idea is that different situations demand different amount of, and different approaches to, the management of risk. Lastly, an effective risk communication strategy does not stop when the pandemic risk officially subsides. It is recommended that communicators learn from the "rights and wrongs" encountered in the latest pandemic and thus ensure public trust in risk communication for the next health risk.

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1.0 Introduction

The theme for this thesis is the psychological and social challenges related to the construction of effective risk communication processes for the next possible pandemic flu in Norway. It is based upon a theoretical study of risk perception and risk communication research, and work and experiences related to the A (H1N1) pandemic.

1.1 Risk communication

Risk communication has developed as a serious area of research during the last decades and is recognized as an important and integral part in the political process of managing risks. Its development is closely related to the area of risk perception research. As used here risk communication is defined as "communication intended to supply laypeople with the information they need to make informed, independent judgments about risks to health, safety and the environment" (Morgan, Fischhoff, Bostrom, & Atman, 2002, p. 4). It is important to differentiate between the acts of risk communication and crisis communication. Crisis communication takes place in situations which are labeled as a "crisis". It is here defined as a sudden, high threat event, requiring immediate action, and with short time for decision making. Communication during such an event would require quick response to the situational development and likely a more authoritarian approach to ensure public life or health due to the nature of the situation. On the other hand, a "risk" situation is rarely sudden and will rarely be attached to short time decision making, but it may by a high threat event under development. Communication during such a period will involve more time to prepare and the communication will be less authoritarian and more open to feedback in ensuring public health. The situations overlap to some degree (e.g. some risk situations may require quick responses to isolated developments) but are usually different in their requirements for quick response and time for clarification of the overall situation.

Public perceptions of risk were early on perceived to be "irrational" and were often readily dismissed in the policy process by risk assessors and managers (Frewer, 2004). Traditional risk communication was thus based upon risk estimates, provided by experts, and mainly focused upon technical representations of risk (Fischhoff, 1989). Approaches focusing upon other contexts than technical estimates were often lacking when it came to influencing public behaviors (Frewer, 2004). As such the early attempts of risk communication were

virtually always one-way approaches of communication based upon simple assumptions of the public's needs (Breakwell, 2007).

Since then, however, risk communication strategies have made a turn in the approach to the public. Especially so in democratic societies where the public has a say in the decision making process of risk management. Communication efforts are now focusing upon public participation and active dissemination of information. A deeper understanding and legitimization of public perception of risk have lead to a two-way process of risk communication (Fischhoff, 1989). Experience from accidents, such as the Seveso chemical accident in 1976, has led to the development of public legal rights to information from authorities and institutions about hazards. Notably the Seveso Directive in 1982, reviewed in 1996 (European Commission, 2012a), and the United Nations Economic Commission for Europe (UNECE, 1998) Convention on access to information, public participation in decision-making and access to justice in environmental matters. Also known as the Aarhus Convention.

However, risk communication is an area where one begrudgingly has to realize that there is no "one-size-fits-all" strategy viable for any domain of risk communication (Nurse, Creese, Goldsmith, & Lamberts, 2011). Though risk communication history consists of approaches that have tried to do so (see Fischhoff, 1989; 1995). Risk communication strategies have to be tailored to address the current specific risk and the different purposes and target groups that exist in the current situation (Nurse et al., 2011). The effectiveness of a risk communication strategy can therefore not truly be evaluated before after the situation has passed. However, effectiveness cannot be ensured if the risk manager is not prepared and have no conceptualized strategy for managing communication and mitigation for the next possible risk. Predicating future public perceptions of risk and risk communication options aimed at handling spread of vital information and possible controversy are important goals of risk research and the central themes of this thesis.

1.2 Challenges to risk communication

The development of an effective risk communication strategy is riddled with challenges. The first being that risk communication during a pandemic inevitably falls under the area of risk management on, in this thesis, a national level. The risk management framework on such a

level has as its goal to make "scientifically sound, cost effective, integrated actions that reduce or prevent risks while taking into account social, cultural, ethical, political, and legal considerations" (Presidential/Congressional Commission on Risk Assessment and Risk Management, 1997, p. 2). Risk communication in such a context can be described as "the interactive exchange of information and opinions throughout the risk analysis process concerning risk" (FAO/WHO, 2001). The risk analysis process (also called risk governance) consists of the three elements: Risk assessment, risk management and risk communication (Presidential/Congressional Commission on Risk Assessment and Risk Management, 1997).

Risk communication efforts on this level will have to involve arenas in which those who may be affected by the hazard (stakeholders) may participate with the risk managers and experts in the decision making process. Public, or specific stakeholders' perception of the risk and decision concerns will likely not be the same as that of the risk manager and the experts and such differences have to be addressed in an arena where all opinions are considered legitimate (Fischhoff, 1989). Further, risk messages will eventually have to be communicated to the general public. Such information needs to take into account what the risk itself is (risk assessment), how the people may react to the information and what knowledge they may already possess of the risk, both true and wrong (risk perception), and be based upon a systematic analysis of what the public needs to know (Fischhoff, 1989). In addition, a concern in risk communication is how information should be presented. Done right the risk communication may make the public more aware of the risk and actually change their opinion and behavior towards it in a way that promotes health, done wrong and the public might be left frustrated and angry towards the risk manager.

This thesis is based on the author's own interest in organizations which have public safety as their working platform. Since risk communication, and especially getting it right, seems to be a growing trend within these organizations the author wished to explore this platform closer with a focus on the psychological aspects of risk communication. The greater part of the literature in this thesis is illuminating the psychological aspects related to risk perception and risk communication processes, with a lesser focus upon other aspects of the greater framework of risk management (e.g. political and financial concerns). While psychological research often ignores the larger framework aspects, they are recognized as governing factors steering risk management, and consequently risk communication.

Effective risk communication is a composite concept wherein the rating of effectiveness will vary in relation to what is aimed to be achieved by communicating the risk. The rating of effectiveness in this context will therefore be based upon theoretical assumptions of change in public attitude, and subsequent behavior, towards the risk as a result of increased awareness of the hazard and its risks. An effective risk communication strategy is thus defined as a communication strategy that successfully informs the public so that it increases public awareness of the risk and, which in turn, facilitates attitude and behavioral change towards the risk that is beneficial for the public's health.

1.3 The purpose of this thesis

The purpose of this thesis is to a) expand the knowledge in the area of risk communication from a psychological perspective, and also to b) review the A (H1N1) pandemic development to highlight potential challenges related to ensuring effective risk communication strategies. Of special relevance here is communication of health related risks and specifically the risk of a future pandemic. On this basis c) the discussion and conclusion will focus on the question: What is an effective risk communication strategy for informing the public about a future pandemic health risk?

1.4 The thesis`s disposition

The following chapters are divided into theory, case description, discussion and conclusion.

The *theory chapter* is based upon Fischhoff's (1989) detailing of the risk communication process, and it will be described in the opening of the chapter. The chapter will start with a theoretical explanation of risk perception research and present three factors of risk perception especially relevant for the pandemic risk and health risks in general. It will then look at the Elaboration Likelihood Model (ELM) to describe how people process information. The mental model approach to risk communication will then be presented. Some legal aspects to risk communication, and the RISCOM model of transparency will then be presented. The chapter will end with lessons learned from risk communication history as to good ways to convey a message.

The *Case chapter* consists of a description of the A (H1N1) pandemic as it developed in Norway. The main focus in this chapter is the development of the pandemic over time in Norway, related to how information became available to the health authorities, and how this information was communicated to the public. It will be further substantiated with quantitative data from Eurobarometer (2009) and Synovate (2009) on the public's perception of the risk and their attitude and behavior towards it.

The case description is used as a basis for the following discussion on how to ensure effective risk communication for the next possible pandemic in Norway. This will be done by links to the theoretical chapter and the quantitative data, the parts which form the basis for the *discussion* on how to ensure effective risk communication relative to the next possible pandemic in Norway. Lastly a *conclusion* based upon the contents of this thesis will be presented at the end of the report.

2.0 Theory

The theory chapter will provide a theoretical background for constructing a risk communication strategy related to the aim presented above. It is based upon the general outline of the risk communication process defined by Fischhoff (1989).

According to Fischhoff (1989) there are two necessary starting points in risk communication work which can be summarized by the following questions: How will the public react to the risk? What do the people already know? The first question entails an analysis of public perceptions of the risk and possible reactions that may come from such perceptions. The second question entails an analysis of public and expert knowledge about the risk (Fischhoff, 1989). To address the first question the first chapter will outline risk perception and how the public might react to risks based on their perceptions. To answer the second question the second chapter will outline how people process information through the ELM theory and then look at how public knowledge about risks might be mapped through the use of mental models.

The third question, according to Fischhoff (1989), is what do the people need to know? This is not an easy question to answer. There may be a big difference between what people need to know about a risk (factual knowledge) and what they themselves feel they want to know. Added to this are public legal rights to information and participation. Factual knowledge can be addressed by utilizing questionnaire studies or, for example, the mental model approach detailed later in the chapter. What the public wants to know can only be investigated through a close dialogue with the public. We will therefore address this issue, firstly, with an explanation of the public rights to information and participation given by the UNECE (1998) and, secondly, presenting the use of the RISCOM model of transparency which provides an arena of discourse for finding out and answering the questions of what the public wants to know.

A subsequent and last question is: How do we say it? The focus here is on message content. This will be discussed by lessons learned from risk communication history.

2.1 How do people react to risk? The role of risk perception

Risk perception, as developed in psychological literature, is referring to "various types of attitudes about risks and hazards and judgments about them" (Breakwell, 2007, p. 14). Risk perception is seen as a subjective evaluation of risk, that is, a subjective evaluation of a possible future negative event related to a hazard. It should not be confused with expert risk assessment calculations which often result in mathematical estimations usually presented numerically, probably more often than not presented in terms of likelihood and severity[1]. Likelihood here relates to the chance of being exposed to a hazard (e.g. perceived likelihood of being infected by a virus). Severity relates to the consequences of being exposed to the hazard (e.g. perceived consequences from subsequent infection).

The core assumption related to risk perception in this thesis is that risk perception is an important determinant of protective health behavior[2]. This means that if an individual perceives a risk as being dangerous for his/her well being then he/she will have an increased likelihood of changing his/her behavior to minimize or eliminate the risk. Such an assumption is debated in risk perception research and warrants justification, the thesis will present some research that deny as well as support the assumption. However, the thesis cannot go into a full review of the subject matter due to constraints in time and writing space.

A review on risk perception research by van der Pligt (1996) found that, generally, research results on the impact of perceived risk on health behavior is mixed. He found that risk perception research only shows it to be a modest predictor of health behavior when compared to other behavioral determinants such as past behavior or subjective norms. Although generally, the perception of personal vulnerability to health risks seems to be a necessary component for individuals to consider behavioral change, van der Pligt (1996) did not find this to be sufficient to induce behavioral change. He concludes by stating that there is not enough evidence to confirm or deny that perceived risk is related to the adoption of health behavior. It is important to note that the study by van der Pligt (1996) focused upon the likelihood component of risk perception not the severity aspect.

[1] Other words in risk research for likelihood are probability, and for severity other words are effect and consequence. The thesis uses the words interchangeably. However, the meaning is the same.

[2] Other words for health behavior may be protective or preventive behavior as used by van der Pligt (1996). By health behavior the thesis means behavior intended to promote health. This can be done by changing ones behavior to protect or prevent oneself from the risk thus ensuring ones health.

The approach of this thesis agrees with van der Pligt's (1996) conclusion that there are other determinants of health behavior than perceived risk. However, it is argued here that risk perception is an important determinant of health behavior and an analysis that supports such a notion is presented. A meta-analysis of eligible studies (e.g. removing studies with ambiguous or impersonal questions) looking at the relationship between risk perception and health behavior for one health protective action, vaccination, was performed by Brewer, Chapman, Gibbons, Gerrard, McCaul, and Weinstein (2007). The meta-analysis consisted of 34 studies, 28 being cross-sectional and 6 being prospective studies. All the data in the original studies were correlational since no previous experimental studies on the subject matter had examined how perceived risk affects vaccination.

The study assessed three measures of risk perception related to vaccination: perceived illness likelihood, susceptibility and severity. Susceptibility is an overlapping concept with likelihood and both are often used interchangeably. By likelihood Brewer and colleagues (2007) meant the probability of getting harmed by a hazard under certain behavior conditions (e.g. the chance of getting the flu if I do not get a vaccine is...), while susceptibility emphasized individual resistance or constitutional vulnerability (e.g. I am more likely to get the flu than other people). Lastly, severity was defined as the extent of harm a hazard would cause (e.g. how serious a disease is the flu?). The results showed strong evidence that perceived likelihood; susceptibility and severity are reliably related to vaccination behavior, although the relationships were small to moderate. However, Brewer and colleagues (2007) state that the size of the relationship can more likely be characterized as moderate because of methodological weaknesses that suppress the size of the relationship. Many of the effects stemmed from cross-sectional studies, but larger effects were found in longitudinal studies.

The study by Brewer and colleagues (2007) enhances confidence in the assumption of risk perception being a determinant of behavior, though there is no possibility to make claims of causality. There are other determinants of behavior. For example, Brewer and colleagues 2007) found that studies of medical personnel yielded a smaller effect size than studies of sick and/or high-risk adults. Hence risk perception is less of a motivator for health personnel in relation to vaccination behavior. This may be due to advanced knowledge and other motivational factors such as the concerns that are specific to the job role, such as not wanting to spread infection to the patients, or that they are required to get vaccinated. In summary, more experimental research on risk perception is needed to provide a more definite

confirmation of a causal relationship between risk perception and health behavior (Brewer et al., 2007).

2.2 Differences in risk perception between experts and the public

Before going into general theory of risk perception it is important to note the observed differences in risk perception between two main groups in the risk management setting, namely the experts and the public. The concept of expert refers to an individual who has advanced topical knowledge in a given field above that of the average person in a population (Sjöberg, 2003). It should be noted that the groups are not homogenous and in reality there will be differences within the groups.

It has been observed and recognized that the experts and the public rarely have an equal perception of the risk (Sjöberg, 1999a; Fischhoff, 1989). A study by Sjöberg and Drottz-Sjöberg (1994, as cited in Sjöberg, 1999a) where they asked their respondents (experts and the public) to judge the risk from domestic nuclear power found a large difference in perceived risk between the two groups. Very few experts judged the risk to be larger than "very small", while 65% of the public did so. When the respondents were asked to judge if a solution to the problem of how to store the nuclear waste was satisfactory solved the same pattern was shown. Very few of the public felt the problem was satisfactory solved while the majority of the experts felt it was. Differences in risk perception between the experts and the public have also been found in other areas such as environmental risks (see US Environmental Protection Agency, 1987) and risks related to transportation (see Rundmo & Moen, 2006).

The differences between the experts and the public cannot be attributed to different levels of knowledge only. In fact the public has been shown to be quite knowledgeable, and knowledge itself has been shown to explain little of the variance in risk perception (Sjöberg, 1999a). Since the public have a relatively good understanding of risks the idea of the public as reacting in a highly emotional and irrational manner due to ignorance is unfounded. The difference in risk perception between the groups can quite likely be ascribed to several factors such as perceived control, familiarity, gender, trust (experts trust industry, agencies and other experts more than the public), education etc. (Sjöberg, 1999a). One factor of note is the difference in definitions of risk between the groups. Experts tend to rate risk by probability while the public tend to rate risk by consequence (Sjöberg, 1999b; Drottz-Sjöberg, 1992).

However, it is not within the scope of this paper to fully address the difference in risk perception between the experts and the public. The point here is that a difference in risk perception between the groups exists and it presents a challenge for the risk manager since he/she has to consider all involved in the decision making process. Though it falls to the risk manager and the experts to make decisions on how to reduce a risk the public is also to be included into the decision making process by law (e.g. UNECE, 1998). A common approach is also as a necessity if one should warrant effective risk communication (this will be addressed more closely in the risk communication chapter). Failure to take note of the difference between the groups in a risk communication setting, for example only listening to the expert's judgement of the risk, will likely fail to address the public's perceptions of the risk making the communication efforts less effective.

2.3 Measuring risk perception – the psychometric paradigm

The psychometric paradigm is a methodological approach to exploring risk perception. It uses different varieties of psychological scaling methods to produce quantitative measures of perceived risk and benefit (Breakwell, 2007). It is not a theory that explains risk perception but it has given rise to models that have tried to do so. Research within the psychometric paradigm, such as the psychometric model by Fischhoff, Slovic, Lichtenstein, Read, and Combs (1978), showed that it was possible to quantify average ratings of perceived risk in the public. But more importantly it also proved that it is possible to ask people for complex risk judgments about difficult societal problems and receive orderly, interpretative responses making it possible to predict public risk perception.

2.3.1 The psychometric model

Some of the earliest and most influential model of risk perception (the psychometric model) was developed by Fischhoff et al. (1978). The model is a response to the discussion of "acceptable risk" and factors in risk perception initiated by Chauncey Starr (1969) and it represents an alternative approach to that of Chauncey Starr (1969). Risk perception in this model is seen as a function of judgments of properties of the hazard. In the 1978 study they asked subjects to rate 30 hazards on nine seven-point scales indicating qualitative characteristics of the risks: whether they were voluntary, had immediate effect, were known

by the person exposed to the risk, known to science, controllable, new, chronic or catastrophic, common or dreaded, and how likely they were to be fatal. Through factor analysis of the nine dimensions, two main factors of risk perception: "dread" and "knowledge". Later research by Slovic, Fischhoff, and Lichtenstein (1980, cited in Slovic et al., 1982) confirmed the two factors and included a third factor "number of affected". The "dread" factor of the risk encompassed characteristics such as certain to be fatal, potentially catastrophic, and dreaded. The "knowledge" factor of the risk – encompassed characteristics such as uncontrollable, new, involuntary, poorly known and having delayed consequences. The higher the rating of dread and knowledge, the higher the risk perception was perceived to be.

The explained variance of risk perception based on the model has long been thought to be around 80%. However, a study by Sjöberg (2000a) found that it can only explain around 20% of the variance of raw data. By incorporating a new factor including the aspect interference with nature the explanatory power of the model increased to 30-40%, thus nearly doubling the explained variance. The new factor takes into account perception of unnatural, immoral characteristics associated with a hazard. Another study by Sjöberg (2000b) labels the factor "tampering with nature". Sjöberg's (2000a) conclusion is that the old model only account for a modest share of the variance of perceived risk. Taking into account aspects of tampering with nature and moral issues sheds more light onto risk perception of hazards and is worthy of serious consideration in future risk perception work.

The psychometric model cannot explain all aspects of perceived risk. It is nonetheless a useful tool in mapping the average perceived risk related to the characteristics of the hazard in question. Getting an average rating of the hazard is a useful basis for risk communication since one can get a "feel" for how the average citizen perceives the overall risk. However, other factors are needed to get a more detailed view of perceived risk across different situations during the pandemic. In the A (H1N1) pandemic context the thesis deems following factors to be especially important predictors of perceived risk: Experience, trust, including antagonism, and media coverage.

2.3.2 Experience

Personal experience with risks will invariably affect the perceived risk. It is therefore important for the risk manager to know the effects on how it shapes risk perception when communicating risk. We will describe here how individual risk perceptions generally develop as they become more knowledgeable about the risk from personal experience. This thesis recognizes that knowledge is multidimensional and does not assume that knowledge is something easily reduced to something an individual have or do not have. This would mean that either the public do not know what the experts talk about, and social conflicts stems primarily from public ignorance, or the public know what the experts talk about and will agree as a result (Johnson, 1993). Even experts perceive risks differently and frequently disagree between themselves even though they are more knowledgeable about risks than the public (Sjöberg, 1999a). Thus, there are several types of experience and knowledge, and individuals have more or less of it.

A review of different hazards by Weinstein (1989) found that personal experience with risks generally leads to hazards being seen as more frequent and individuals more often view themselves as potential future victims. This was also found by Siegrist and Gutscher (2006) on the subject of perceived risk of flooding in Switzerland. They found in their results that experience was the strongest predictor to perceived risk. In other words those who had experienced flooding perceived greater flood-associated risks than those who had not experienced it. They concluded that this result suggests that risk perception is most strongly influenced by lay peoples own experience with flooding and they attributed this conclusion to the availability heuristic. According to the availability heuristic (Tversky & Kahneman, 1973), people use the ease of which a hazard can be brought to mind as a cue to evaluate the probability of the hazard. Consequently, the ease with which the memory can be retrieved will affect the effect of the heuristic. As a result the more frequent an individual is exposed to a risk, and/or the more (negatively) sensational the experience was, the more risky it should be perceived.

The heuristic is applicable to the findings by Siegrist and Gutscher (2006) and Weinstein (1989) since experience with a risk increased risk perception. However, the heuristic might be applicable to other factors as well, such as increased news coverage, images of climate change etc. influencing availability. What can be concluded is that personal experience of a negative event generally increases risk perception.

However, the effect of experience seems to dissipate over time. Weinstein (1989) found that the effect of experience on precautionary action was more prominent in occasions requiring a single action, such as buying insurance. Precautions requiring frequent actions, as in using seatbelts, were more short-lived. This type of decrease in perceived risk is often attributed to habituation towards the risk. Habituation towards the risk has been further illuminated in a study by Lima (2004). Lima (2004) performed a five year longitudinal study which consisted of 2797 interviews with 906 residents living at different distances from a waste incinerator. Four waves of surveys took place before and four after the incinerator started working. Her results showed that (i) before the incinerator became operational those living close to the hazard had a higher perceived risk than those living farther away and (ii) after the incinerator became operational those living close to the incinerator had a greater reduction in perceived risk than those living farther away.

It can thus be hypothesized that the effect of personal experience on risk perception firstly depends upon if the individual has been subjected to an adverse event (Weinstein, 1989). Secondly, prolonged exposure to the hazard, without any adverse experience with it, will likely instill a habituation effect in individuals and more so in those who are more frequently exposed to the risk (Lima, 2004). Lastly, with no prior exposure (regarding frequency and/or extent of impact) to a risk will result in an initial higher risk perception than for those previously exposed who have not experienced adverse effect; the longer the uneventful exposure is, the lower the perceived risk is likely to be.

2.3.3 Trust

Trust is seen as probably one of the most influential factors for successful communication. There are different components to trust and different models try to explain the impact of trust upon perceived risk. This paper includes three trust factors that have been identified as some of the most influential in predicting perceived risk: social trust (trust in a source), epistemic trust (trust in scientific knowledge) and antagonism.

Social trust: Social trust is defined as "the willingness to rely on those who have the responsibility for making decisions and taking actions related to the management of technology, the environment, medicine, or other realms of public health and safety" (Siegrist & Cvetkovich, 2000, p. 354). In short social trust (or lack thereof) affects the public's

willingness to rely on the information source to take actions to protect them from the hazards, but also to rely, and possibly act, on the information from the information source. Trust in the information source about a hazardous technology or activity is important when the individual lacks personal knowledge (or experience) with the hazard (Siegrist & Cvetkovich, 2000). If the individuals has no prior knowledge on which to estimate risks they do not have any independent means by which to establish facts or truths about the risk. Judgment and reactions towards the risk will therefore have to rely on mediated information, showing the importance of mediators and trust in the information source (Drottz-Sjöberg, 2003). Information source in this thesis is the experts and institutions responsible for mitigating the risk. Experts, because of their expertise relative a particular hazard, are viewed as better able to assess the risk and benefits of associated with a hazard. However, the public often does not have the knowledge to assess the reliability of the information given by the experts. Hence it is hypothesized that decisions and judgments of the risk are guided by social trust (Siegrist & Cvetkovich, 2000).

This hypothesis is supported in research by Siegrist and Cvetkovich (2000). They found that if the public had no prior knowledge of the risk then strong correlations between social trust and judged risks and benefits emerged. If individuals were knowledgeable of the hazard no significant correlations between social trust and perceived risk and benefit were found. This suggests that when people lack knowledge they rely on social trust to make judgments about risk and benefit. Meaning they rely on the judgments of risk and benefit of the information source since they cannot make the judgments themselves. However, this does not mean that the public take all information for granted. Negative previous experience with the information source will likely make people more disinclined to listen than if they have no prior experience with the source (Drottz-Sjöberg, 2003).

This is an important point to make in the functioning of social trust. Today's society consists of a high diversity of expert knowledge which makes it difficult for the lay person to evaluate the truth of the information they receive. Consequently they have to more than ever rely on the reliability and honesty to those who give them information about the dangers that surround them. According to Frewer (2003) risk information from a trusted information source is internalized by the recipient and contributes to the way that an individual perceives and responds to the particular risk. On the other hand, if the recipient distrusts the information source then subsequent communications may be disregarded due to the information being perceived by the recipient as unreliable or self serving. It may even result in influencing attitudes in the opposite direction of that intended by the information source itself (Frewer,

2003). Ensuring social trust is therefore important for the information source since it determines if the public take heed to the messages. Should there be social distrust the public may look elsewhere for other more trusted sources of information (e.g. other experts) which may instill unfavorable perceptions of the particular risk (e.g. perceiving a highly dangerous risk as indifferent or overrate a negligible risk).

Perceived antagonism: Perceived antagonism is the belief that the agent responsible for risk management (called risk manager from here on) is indifferent or even hostile, to the well-being of the public (Sjöberg, 2008). Results from research by Sjöberg (2008) on perceived antagonism and epistemic trust (detailed below) found that (i) perceived antagonism was an important (negative) determinant of trust, (ii) perceived antagonism was positively related to perceived risk, and (iii) perceived antagonism was a more important determinant of perceived risk than social trust. Social trust also accounted for a part of the variance in perceived risk, albeit social trust contributed less to the explained variance of perceived risk than perceived antagonism.

Epistemic trust: Epistemic trust, meaning trust in the science on which the risk is based, plays an important role in risk perception (Sjöberg, 2008). Sjöberg (2001) found that 46,5% of the public, as opposed to only 5,4% of the experts, were open to the possibility that there might be some effects from a nuclear repository that are unknown. The same trend was also observed in measurements on public and expert perceived risk from domestic and eastern nuclear power. These results show that the public is more skeptical about the completeness of expert knowledge than the experts themselves (Sjöberg, 2001). Lack of trust thus becomes prevalent when people believe that there are clear limits to how much science and experts can know. Any remaining unknown effects associated with the hazards were usually believed to be negative by both the public and the experts. In Sjöberg's (2001) analysis the most important predictor of perceived risk from the three technologies under study turned out to be the beliefs about the likelihood that there might be effects that are still unknown. In a later study Sjöberg (2008) also found that epistemic trust played a larger role than social trust in accounting for risk perception and the acceptance of hazardous technologies and facilities. In a model Sjöberg (2008) shows that social trust had a small effect but was mediated by epistemic trust. Epistemic trust was only partially explained by social trust. The results from the same study also showed again that antagonism played the most important part in accounting for a sizable share of social trust rather than for epistemic trust which were considerably lower.

Summary of trust: The short accounting of the influence of the factor trust on risk perception shows that there are different categories of trust and that the categories will have different effects contingent upon the situational context of the risk. It can be hypothesized that risk perception from risks which are more technological in nature will mainly be dominated by epistemic trust whereas other non-technological risks will be mainly determined by social trust. The role of the risk manager in these cases should not be underestimated since results show that perceived indifferent or hostile manager will likely affect social trust negatively making the perceived risk increase. Lastly, social and epistemic distrust will likely have powerful negative consequences on any subsequent attempts at risk communication such as making the public unwilling to listen to risk managers' messages. The impact of social trust, perceived antagonism and epistemic trust on risk communication will be further discussed in the discussion chapter of the thesis.

2.3.4 Media

With respect to many everyday hazards people acquire information about the risks mostly through personal experience. Information about other hazards is acquired indirectly through many channels such as statements from experts, risk managers etc. through the mass media. By mass media this thesis means information channels such as TV, radio, internet and newspapers which are used by different parties for information or debate (e.g. about a pandemic risk) for conveying messages to the general public. In this thesis the main focus is on the relationship between media and risk perception within health related situations. It is worth mentioning, however, that a review of research on risk perception and media by Wåhlberg and Sjöberg (2000) found that the strength of the influence of media on risk perception is still poorly understood and that the effect is probably not a strong factor in risk perception. One of the main effects they found was one of availability, and more information (good or bad) increases perceived risk. These results were based on observations of sheer amount of media coverage however, and the size of the effect could not be fully stated. However, the trend was clear: public perception of risk vary in accordance with media coverage (Wåhlberg & Sjöberg, 2000). It is therefore important, when it comes to central risks, to maintain the flow of information to the public so that they do not unfavorably lower their risk estimates.

The relationship between mass media output and risk perception within a health context should not be understated. Today more than ever, health is one of the topics most frequently covered by the mass media (Carducci, Alfani, Sassi, Cinini, & Calamusa, 2011). We live in a time with increased access to information, especially through the internet, but also from more traditional means such as TV, radio and newspapers. In accordance with Ackerson and Viswanath (2010), and May (2005), the media have grown to be an important source of health information for the general public. The effect of this trend, however, is not necessarily entirely positive (or negative).

Research on media coverage of health related risks has found that the media's focus upon sensational/newsworthy stories tend to increase and distort public perception of the risk in question (May, 2005). The media do in some cases focus upon health risks disproportionally to their public health effect (Ackerson & Viswanath, 2010). Ackerson and Viswanath (2010) found that the media in Massachusetts, USA, focused equally on eastern equine encephalitis (EEE), a virus transmitted from fleas to humans, to that of cancer, even though EEE has a lower incidence rate than cancer and a lesser health impact. The effect on public risk perception due to media coverage was more likely an elevated perception of the EEE risk and a perception of risk from EEE and cancer disproportionate to the population health impact (Ackerson & Viswanath, 2010). Even among those over 45 which are at greater risk from cancer than those 44 and younger.

The media's portrayal of the EEE virus was characterized to attract attention. It focused upon the novelty of the disease cases, highlighted the unusual nature of the disease risk and emphasized the danger of death from the disease (Ackerson & Viswanath, 2010). Similar findings are reported by May (2005). The media's focus upon a link between autism and the mandatory MMR vaccine (against measles, mumps and rubella) for children in USA led to an increase in perceived risk from the vaccine by the children's parents and an increase in exempting children from the vaccine by the parents (e.g. 59% increase in Colorado from 1987 to 1998). The link was rejected in the medical literature and the Institute of Medicine (IOM). According to May (2005), the consequences are mainly attributed to the media because they made the story sensational/newsworthy and misleading by focusing upon the most serious, though statistically extremely low, risks from the vaccine. The news was also personalized since everyone in the target group was affected (the vaccine was mandatory for all children) making the story relevant for all parents. May (2005) also stated that the problem

was exacerbated because most contemporary parents had not experienced an epidemic which may confirm the success of the vaccination program.

The abovementioned results show that the media is an important source of health information for the general public and that it may easily distort and unfavorably increase public risk perception. However, the negative view of the media portrayed by Ackerson and Viswanath, (2010) and May (2005) is somewhat misleading. Research by Carducci, and colleagues (2011) found that media that focus on food related hazards led to an increase in people changing their food habits, at least temporarily, as a consequence. The respondents showed greater awareness of different risks associated with food due to the media coverage. Again, this shows that the mass media is an important source of health information for the general public and that public risk perception, to a degree, is reflecting what the media focuses on.

An increase in more "correct" risk perception can be facilitated if the health authorities tailor their messages for their intended audience to maximize the chance of communicating the message intended (Ackerson & Viswanath, 2010; May, 2005). Research by Agha (2010) found that when health authorities in Kenya, in a health campaign against HIV/AIDS, tailored[3] their messages of increased condom use to prevent HIV/AIDS to their intended audience (Kenyans between ages 15-39) they met with greater success than the more generic messages. The tailored message promoted the condom *Trust* as positive lifestyle and marketed it as "cool" and contemporary. The generic message was developed to induce uncertainty/fear about the consequences of not using a condom. Agha's (2010) results showed that the tailored message increased personal risk perception. People with high exposure to the tailored message were twice as likely as those with no exposure to report that they were at high risk of acquiring HIV/AIDS. Surprisingly those highly exposed to the generic message were less likely to feel at risk from HIV than those who were not exposed. Agha (2010) attributed this result to its design, that is, promoting uncertainty and fear as less effective in promoting behavioral changes.

Summarizing media: The abovementioned research shows the importance of the mass media, both as a source for information to the general public and as a useful tool for risk

[3] Agha (2010) uses the word branding. The condom was given the brand name *Trust* and the subsequent communication in the health campaign was formed around that brand. In essence the communication was tailored to its intended audience and the brand name the symbol. For all intents and purposes the branding approach is the same as tailoring: to construct messages to its target audience as to maximize the chance of communicating the message intended.

communication in health promoting campaigns. Information portrayed in the mass media should be well thought trough and preferably tailored to its target audience so the intended messages are communicated. The aspect of tailoring will be further explored in the section on mental modeling.

2.3.5 Risk perception conclusion

Risk perception is complex and many factors influence it. The factors listed here are those we deem to be central for risk management in a health related situation and are not exhaustive. Different situations will likely include other factors to explain perceived risk. The strength of the factors mentioned here is that they can be measured and it is psychometrically sound to do so. The measured strength of the factors will in turn have consequences in ensuring effective risk communication. For example, should knowledge be lacking then the public needs to be informed about the risks. However, a risk rated as high by the psychometric paradigm, when the public has no prior experience and little trust in the risk manager, would require considerable risk communication efforts to mitigate. Vice versa, an opposite low risk rating would need another risk communication approach to mitigate (e.g. to increase public awareness of the risk).

2.4 What do people need to know? The ELM model and the role of mental modeling

This section of the theory chapter will focus upon the Elaboration Likelihood Model (ELM) and the mental modeling approach to risk communication. The ELM model will be described first and then the mental model approach.

2.4.1 The ELM model

The elaboration likelihood model of persuasion[4] (ELM) is a dual processing model developed by Petty and Cacioppo in 1980's (see also Petty, Cacioppo, Stratham & Priester, 2005; Petty, Barden & Wheeler, 2009). Its main function is to explain how people process information that they are presented with. How the information is processed will influence the

[4] For a figure of the model see Appendix A

recipient's attitude towards the position advocated by the source. Attitude again shapes behavior (Petty et al., 2009). In this context it is of interest to incorporate the ELM model because it suggests an approach to information processing that could be of great importance for how to present information about a pandemic risk situation.

The central and peripheral routes to persuasion

The ELM model is based upon the assumption that people gain from learning correct attitudes and beliefs since these will prove helpful for the individual in getting through life (Petty et al., 2005). For example, if people thought highly of shoddy products they would be in trouble. On this assumption the ELM model describes two routes which organize and process information into an attitude; meaning either keeping the original attitude or change the attitude into an altered one. The two routes are called central and peripheral.

The *central route* involves careful consideration of the relevant information in the message. The recipient of the information is in a motivated and able state ready to relate the relevant information to previous stored knowledge and to generate new implications of the information. This type of thinking is called elaboration and is at the core of the central route of persuasion. The more the individual elaborates the more he/she uses the central route. Both positive and/or negative attributes of the received information on the source's advocated position are evaluated. The ultimate goal for this cognitive effort is to determine if the position taken by the source has any merit. In short, should the recipient generate a negative interpretation towards the persuasion effort he/she will most likely not change his/her initial attitude. However, should it be positive he/she will most likely change the initial attitude towards the views of the message (Petty et al., 2005; Petty et al., 2009).

In contrast, if the recipient is in a non-motivated and/or non-able state he or she may use the *peripheral route* of processing. Rather than using a lot of cognitive effort in determining the validity of the argument(s) in a message the person will rather make use of simple cues (e.g. attractiveness of the source, experts are usually correct, etc.) in determining if they agree or not (Petty et al., 2005; Petty et al., 2009). In short, the use of this route involves processes requiring little thought about the issue-relevant information in forming an opinion about the message or in changing ones behavior (Petty et al., 2009).

It is important to note that an individual rarely makes use of just the central or the peripheral route (Petty et al., 2009). According to Petty and colleagues (2009) persuasion occurs along an elaboration continuum. The continuum goes from processes requiring a lot of consideration (e.g. listing pros and cons in making a decision) to those requiring a modest amount of effort (e.g. counting arguments) to those requiring little to no effort/thinking (e.g. heuristics etc. that are outside of awareness). So both the central and peripheral routes influence attitudes simultaneously along the continuum. However, increase in the elaboration (thoughts that require more consideration) increases the likelihood that the central route of processing will dominate the content of attitudes over the more peripheral or superfluous ones.

Motivation and ability

There are two necessary conditions advocated by Petty and colleagues (2009) which affect the elaboration likelihood, and hence the use of the central route to process information, namely motivation and ability. Motivation relates to the individual's rather conscious intentions and goals in scrutinizing a message and its content while ability relates to whether the individual has the necessary skills, knowledge and opportunity to evaluate the message and its content. As such there are a number of situational and dispositional variables which affect motivation and ability.

When people are motivated and able to follow the central route (meaning e.g. that they are interested in the message and have sufficient time for careful consideration) they carefully appraise the extent to which the message reflects the true merits of the person, object, or issue under consideration. Should the individual be either not motivated or not able, or both, this will lead to the use of the peripheral route (Petty et al., 2005; Petty et al., 2009). It can be deducted from this presentation that the choice of processing route differs from individual to individual and from situation to situation. Thus a message that is processed by the central route by one individual might be processed by the peripheral route by another.

Consequences from use of the different routes

Attitude changes due to central processing tend to have different consequences and properties than those based on peripheral processing (Petty et al., 2005; Petty et al., 2009). In general terms, the central route tends to elicit stronger attitude changes than the peripheral ones. Strength does not mean an increase in the extremity of the attitude, but how persistent it is. Strong attitudes tend to endure over time and are resistant to change when challenged with contrary information (Petty et al., 2009). In addition, people who have changed their attitude due to central route processing are more likely to act on them (change their behavior) (Krosnick & Petty, 1995, as cited in Petty et. al., 2009). The strength of the attitude stems from the thoughts of the message being linked to internal knowledge to the information presented (Petty et al., 2005). Lastly, if the individuals have a high degree of confidence in the thoughts generated through central route processing (i.e. little reason to doubt the thoughts) then the thoughts are more likely to determine their attitude (Petty, Brinõl & Tormala, 2002). However, the variables that determine confidence are likely many, ranging from individual variables, heuristics and situational factors (Petty et al., 2002). Within the constraints of this thesis the situational factors are most relevant, meaning credibility of the information source in instilling confidence (such as expert statements or trust).

It is important to note, however, that the peripheral route might also lead to attitude change. The difference being that the attitudes are not as durable as those promoted by the central route. The consequence of this is that the attitude might have lesser chance of leading to sustained behavioral change due to its vulnerability to contrary information, making them susceptible to change of attitude. Its weakness stems from unfavorable thoughts and/or low confidence in them (Petty et al., 2009).

2.4.2 Mental modeling theory

As shown in the risk perception chapter by Agha's (2010) research, health promoting campaigns show greater effect when the message is tailored to its intended audience. According to Fischhoff (1989) and Morgan et al. (2002) effective risk communication must focus upon the gap between what people need to know and also on what they yet do not know. Such information needs can only be fully addressed by conducting a systematic analysis of public beliefs and knowledge gaps in relation to the risk they face. Only asking

technical experts what the public should be told would be neglecting the empirical evaluation of the communication by the individuals who will use it. This, in turn, will likely lead to those communicating the risk having a lack of either the knowledge or the needs of the intended audience (Morgan, et. al. 2002).

Mental modeling is a cognitive approach which, in risk research, seeks to identify accurate and inaccurate beliefs about a hazard that are held by the target population (Breakwell, 2007). As such it seeks to identify the gap between what people need to know but as of yet do not. The mental modeling approach to risk communication assumes that the audience of a message, by definition, lacks a complete understanding of its subject matter (Morgan et. al., 2002). However, the audience will over time accumulate at least some relevant beliefs about the subject matter which will be used in interpreting the communication. If judgments about the risk are needed they will assemble their different beliefs into a mental model which is used to reach conclusions (e.g. who manages the risk, how can it be controlled) (Morgan et al., 2002). It is important to note that the use of the word "model" is a metaphorical explanation of the general principles people use in judging how things interact with one another in a complicated situation. Thus "model" is not meant as a formal interpretation of strict mapping of elements in the model or fixed operations for combining those elements.

Morgan et al. (2002) chose to summarize beliefs in influence diagrams since they allow (i) the integration of different forms of expertise and (ii) involve assessment of the importance of different facts. See Appendix B for an illustration of influence diagrams. The mental model approach to risk communication suggested by Morgan and colleagues (2002) contains five steps in systematic order. A short description of the steps follows.

Step 1: Create an expert model

The first step entails producing a summary of the scientific knowledge which details the processes of the nature and magnitude of the risk (Morgan et al., 2002). Such information will mostly come from experts within the scientific field(s) relevant for the specific risk. However, experts are often in possession of knowledge that most people do not need to know, or it is to peripheral for the specific risk, and therefore irrelevant for risk communication (Morgan et al., 2002). Morgan and colleagues (2002) state that decisions on what can be done

about the risk (what to inform about) need to be established first. This may be done in part in collaboration with the experts one consults, who have expert knowledge about risk mitigation. Once the knowledge summary is defined it should guide the expert model development. It is important to note that an expert model does not necessarily mean knowledge which resides in one expert. Mostly the model will be constructed upon the knowledge of several experts. The accumulated expert knowledge will be pooled into the creation of a single description of the risk, meaning an influence diagram (Morgan et al., 2002).

There are several strategies which can be used for developing an expert influence diagram. What strategy to use is largely based upon an evaluation of what is possible and most practical in the given setting (Morgan et al., 2002 section 3.2. give four generic strategies which can be used alone or combined). The basis is the same however. To accumulate expert knowledge into a single description requires open contact with experts through interviews. Complete diagrams start as simple ideas and develop as more knowledge is incorporated into it. The development of a full influence diagram requires repeated iterations with multiple experts (Morgan et.al., 2002). In other words, one starts with interviewing one or more experts (alone or together). The initial knowledge will form the basis of the model. More knowledge will be attributed to the model through repeated reviews of the model by technical experts with different perspectives so that balance and authoritativeness are assured. If done repeatedly one will eventually reach a point where there is nothing more to add to the model. What also can be deducted from this presentation is that the expert model is a qualitative one.

Step 2: Conduct mental models interviews

The next step is to extract public beliefs about the hazard. Morgan and colleagues (2002) advice the use of open-ended interviews so that such beliefs can be expressed in the respondents' own terms. This approach is advised on the ground that the public mental model is diverse and not as systematic as the one of the experts. It can be that they conceptualize the model components similarly or differently. The interview protocol will be based upon the influence diagram so that relevant topics can be covered. In other words, one starts the interview very generally and focuses the questions on more detail as the interview develops. The focus will be on topics and concepts that the subject has touched on, and if the subject has not touched on topics in the influence diagram these will not be addressed. This process is

dependent upon skilled interviewers which can extract beliefs and concepts from the subjects without inducing beliefs in them, especially when asking follow up questions. The question then remains on what to do with matters untouched but found in the diagram? Morgan and colleagues (2002) give some strategies for following up untouched subject matters; hopefully without inducing beliefs in the subject and, for the skilled interviewer, these may be worth looking into.

The number of respondents needed depends on the type of population one is interested in. On a national level Morgan et al. (2002) recommend structured surveys. If one wishes to address misconception held by 10% of the population then they recommend 20-30 interviews. The reason for this is because when one reaches 20 – 30 interviews the number of concepts introduced to the mental model tend to level out with few to none new concepts being introduced. Overall however, what is important is to continue with interviews until one reaches a point wherein few to no new concepts are introduced. The numbers given by Morgan and colleagues (2002) should be considered as instructional.

After the interviews are collected the answers are coded using the expert model as a template. Those that cannot be coded within the expert model are assigned new categories. Major patterns, and weighing of the different topics, can be done simply by using the frequency with which the subjects talked about the topic. More complex analyses look at patterns of these frequencies (Morgan et al., 2002). The main point during the analysis is to outline the public mental model, this means that those beliefs that the public have, but the experts do not, are relevant and included in the model. Other times the lay public may generate knowledge which is relevant for the expert model and therefore is included there (Morgan et al., 2002). When the coding scheme has been developed Morgan and colleagues (2002) recommend it should be tested so the results are shown to be reproducible. They report that two to three people following the same coding instructions, and independently coding the same transcript, were found to agree two-thirds of the time, which is better than could be expected from chance (Morgan et al., 2002).

Step 3: Conduct structured initial interviews

This step entails the creation of a confirmatory questionnaire wherein the questions capture the public beliefs found in the open interviews and the expert model and the

subsequent comparison between them. The questionnaire is administered to large groups, representing the intended audience, in order to estimate the most prevalent beliefs in the population (Morgan et al., 2002). Estimation of beliefs allows the risk communicator to identify widely spread correct beliefs on which the message can be built. Further, this work will identify misconceptions that need to be addressed. If there are specific issues suggested in the public mental model that are not clarified, then they may also be addressed here (e.g. confused use of terms like climate and weather) (Morgan et al., 2002). Invariably the information one manages to extract from the questionnaire depends upon the quality of its construction. Giving a full detailing of this process falls outside the scope of this thesis. Should the reader want more specific information about this process Morgan and colleagues (2002) give a description in chapter 5, as well as two case examples in chapter 7 and 8.

Step 4: Draft risk communication

Results from the interviews and questionnaire will identify many misconceptions and gaps in lay people knowledge about a specific risk. Priorities must be set to cover the gaps deemed most important. Therefore communications focus on the facts that have the greatest impact upon the greatest portion of the audience (Morgan et al. 2002). As such the process of what message content to choose will depend on the given situation. For example, Morgan and colleagues (2002) found in one their studies the misconception that radon can permanently contaminate a house. People who held that belief could forgo to test their house for radon since it was viewed as unnecessary (since they could do nothing about it) and they therefore felt better of not knowing. A clarification of the misconception would then be the first step since uncorrected it could undermine the value of more correct knowledge. That is, one has to explain that the radon would not be a problem once the influx is stopped. Even though there were other examples of public misunderstandings, such as radon coming from decaying garbage, these were ignored since they were either not prioritized or could be solved indirectly through the clarification of other misconceptions.

The process of drafting the risk communication starts with the selection of key concepts that one wishes to address. A logical organization of principles is needed so people can make sense of the message content and integrate it into their existing mental model (Morgan, et al., 2002). This requires knowledge of how the organization of text may enhance or hinder the reader's ability to understand and remember the message content. People are

different however, some may read the whole text, others may read only pieces of it and some may go wanting for more details. Multiple methods are needed to address different reading styles. Morgan and colleagues (2002) state that a hierarchical organization of information is useful for simple messages like a brochure. More complex topics would require hypertext for flexible hierarchical organization (only available on computers). Devices such as diagrams, drawings, pictures and so on may help the reader and make the brochure more appealing. Use of a "myth-fact" section, presenting each incorrect belief, followed by the correct one, complimented with an explanation designed to help readers to revise and redesign their mental models is also promoted. The presentation of information should follow scientifically proven methods that help in matching the new information to the reader's internal representation on the subject matter.

The last step involves making a first draft of the message content based upon the list of key concepts and organized principles acquired. This should preferably be done by a technical expert who understands the technical issues and has a gift for writing to the lay public so the factual content is correct and the writing understandable. According to Morgan and colleagues (2002, p. 100) "a communication must be clear, interesting, and useful to lay readers, as well as balanced, correct, and understandable to technical experts". The most common problem relates to issues involving scientific controversy or uncertainty. These subject areas should be leveled and balanced in such a way that the readers can understand where the positions stand so they can draw their own conclusions. In other words, make all sides of the controversies and uncertainties understandable and correctly presented so the readers have a basis to reach their own conclusion. "Correct" in this context mean, that all sides of a controversy should confirm the statement presented as correct.

Step 5: Evaluating communication

The last step entails testing and refinement of the communication draft. According to Morgan and colleagues (2002) getting the design of the risk message correct the first time is a rarity and refinement of the message content is more often than not a necessity to make the material more accessible. This invariably means getting an empirical evaluation of the message content by the target audience and/or by other specialists less involved in the communication design. The feedback from the empirical evaluation will highlight what is

needed or should be removed/altered to increase the effect of the message content, that is, making the information more correct, readable and easy to understand.

2.4.3 Use of the model in this thesis

The process of constructing, implementing and evaluating mental models is time consuming and complex. A communications approach based upon mental modeling seeks to convey a comprehensive picture of the process of creating a picture of and controlling a risk (Fischhoff, Bostrom & Quadrel, 1993). According to Fischhoff and colleagues (1993, p. 197) "bridging the gap between lay mental models and expert models would require adding missing concepts, correcting mistakes, strengthening correct beliefs and deemphasizing peripheral ones". The mental model approach presented by Morgan and colleagues (2002) seeks to do so in a systematic manner. What is presented of this approach in the thesis is a general outline of the mental model approach so its use can be discussed as a relevant tool in outlining expert and public knowledge. Based on that, constructs of an idea of what lay public needs to know can be used and, as a consequence of addressing the discrepancies through communication, recipients can hopefully act on it. The mental model approach is best suited for the preparation of explanatory brochures or other similar channels of communication (Fischhoff et al., 1993). The examples by Morgan and colleagues (2002) are all related to the use of such forms of media. Although the thesis focuses upon risk communication from authorities on a societal level, the approach of mental modeling can be used in the work preparing an information campaign.

2.5 Legal concerns and the RISCOM model of transparency

There is a sharp distinction between what the public need to know and what they have the legal right to know. The former entails a judgment of public information need by the one wanting to convey a message. The latter entails a compulsory action written in law which has to be followed by the communicator. The legal rights of the public does not only encompass a right to information about a risk but also for participation in the decision process regarding, for example, environmental hazards. An arena is thus needed that facilitates participation. Such an arena could also be able to capture what the public wants to know. Thus, legal rights

will be presented first and the RISCOM model of transparency second as a suggestion for a risk communication arena.

2.5.1 Legal aspects of risk communication

Lessons learned from previous accidents have shown that there is a need for a legal framework in the field of risk communication. Rather than information sharing being a recommendation of conduct, it is in many cases now a legal requirement. Accidents, such as the Seveso chemical accident in Italy in 1976 firmly showed the need for rights of access to and provision of information for the public at risk. This has led to the granting of public rights regarding access to and provision of information. Specific requirements for improving the information and risk mitigation measures related to potential major accidents in certain industrial activities are covered by the Seveso Directive from 1982, reviewed in 1996 (European Commission, 2012a).

A later and more comprehensive detailing of public rights to information, with regard to environmental issues, is given by UNECE (1998), also known as the Aarhus convention. UNECE (1998) states that any citizen has the right to: (i) receive environmental information that is held by the public authorities, (ii) to participate in environmental decision-making and (iii) to review procedures and to challenge public decisions that have been made without respecting the two aforementioned rights. According to European Commission (2012b) the environmental information in the Aarhus convention includes: "information on the state of the environment, but also on policies or measures taken, or on the state of human health and safety where this can be affected by the state of the environment" (European Commission, 2012b).

The question: should we inform the public? and, should they be allowed to participate in the decision making process? is not up to debate, the public have a legal right to information and participation. Further the authorities are legally obliged to pro-actively disseminate any environmental information in their possession, and to arrange an arena that enables the stakeholders to comment on issues regarding the environment which are to be taken into account in the decision-making process. Information has to be provided on the final decision and the reasons for it (UNECE, 1998)

2.5.2 The RISCOM model of transparency

As highlighted above, today's risk manager is sometimes required to create an arena of discourse in which the public is included in the decision process. The arena should include the relevant stakeholders, the risk manager(s) and the experts in the field(s) related to the specific hazard under debate. All opinions in such an arena are considered legitimate (Fischhoff, 1989). Such an arena is open to complex societal issues which have a tendency to divide rather than unite various parties. It is impossible for any single person, experts included, to understand all implications of a risk situation. Debates may last for years with little progression, understanding or resolution unless an effort is made to thoroughly discuss the matter (Andersson, Drottz-Sjöberg, Espejo, Fleming, & Wene 2006). Andersson and his colleagues (2006) state that as the issues are discussed in public, various points of view tend to crystallize. Crystallized frames of thinking include interests, emotions, values, cognitive styles and ingrained ways of thinking which often cause groups to frame issues solely by defining what the issues really are about for them. The established frame of thinking affects what information is considered relevant and what is not. This way of reasoning often leads to unprofitable discussion, premature closure in framing policy issues, and lack of attention to minority views. Such narrow framing, which may be political or technical, should therefore be avoided.

Procedures are needed that allow a wide range of participants to take part, representing diverse perspectives on the issue at hand (Andersson et al., 2006). Essential to this process should be the stimulation of awareness of the existing framing, as well as the reframing of issues into a broader framework. For the RISCOM model of transparency this is an essential part of the work (Andersson et al., 2006). The model is defined as ”a theoretical framework that incorporates the simultaneous communication of scientific facts or expertise information, social norms and personal characteristics” (Drottz-Sjöberg, 2012, p. 764). Andersson and colleagues developed the model in the 1990's and it has been tested in European Union projects in the 2000's (Drottz-Sjöberg, 2012).

The model is based upon the theory of communicative action developed by Jürgen Habermas in the 1980's (Andersson, 2006). The theory stipulates that if a statement is to be communicative it has to be true, right and truthful. A statement of truth is based upon claims of validity that may be challenged (e.g. scientific methods and technology). Rightness means that the statement is legitimate in its social context (e.g. societal norms, practical interests). Truthfulness means that an actor needs to be honest or "authentic" (e.g. consistency between

words and action) (Andersson et al., 2006; Drottz-Sjöberg, 2012). This approach to dialogue, as a means of clarifying understandings between the actors follows a set of guidelines on the way discussions are conducted (Andersson et al., 2006).

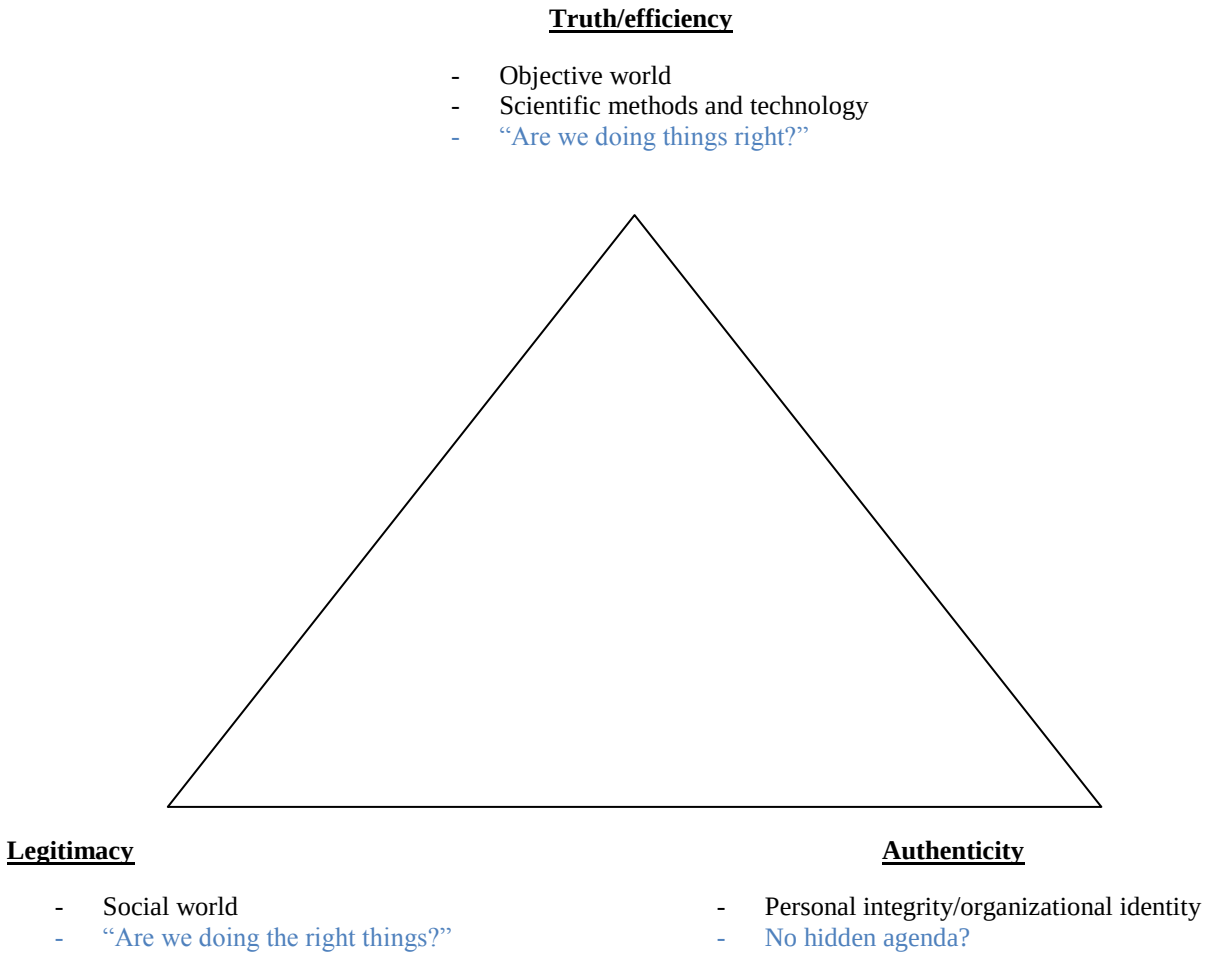


Figure 1 The RISCOM model of transparency. Adapted from Drottz-Sjöberg (2012).

Figure 1 illustrates the three claims of the RISCOM model (adapted from Drottz-Sjöberg, 2012). The arena wherein the discussions are held allows questions regarding the stakeholders' claims to truth, legitimacy and authenticity. The challenges are meant to lead to reflection and understanding of claims (these are exemplified in the brackets). Claims to truth may be challenged in the RISCOM arena (is this true?) and technical and scientific issues can be clarified by scientific methods (are we doing the things right?). Claims of legitimacy relates to the roles and statues of the involved, as well as to normative issues on what is

considered fair and acceptable in society (are we doing the right thing?). Lastly, authenticity is a double claim to truthfulness: that a speaker is true to the dialogue partners and also towards himself. (A speaker presents true facts and reflect around his own, and the organizations, values and honestly reflect these). It implies that personal integrity is shown through consistency between words and action. If a person considers another person, or, for example, an authority or implementor, as authentic (truthful/honest) it is more likely that trust is developed regarding the communicators views and decisions (Andersson et al., 2006).

The goal of the model is to achieve transparency of the decision making process. This goes beyond simply questioning a proponent's use or understanding of science and technology, and all aspects of the triangle need to be illuminated (Andersson et al., 2006). The purpose of transparency is to clarify effectiveness (are we doing the right thing?). Transparency is achieved as an outcome of an ongoing learning process which is contingent upon the establishment of various modes of interaction between an organization and relevant stakeholders. Such contacts will enhance what Andersson and colleagues (2006) call s*tretching*. The concept entails that any proponent is challenged with critical questions from different perspectives by the other stakeholders and that the "stretching" will increase the awareness of all involved. Increased awareness of the others' views and concerns may lead to a re-examination and possible reformulation of objectives and performance. Stretching will thus make the views and concerns of the dialogue partners more accessible and consistent with each other (Andersson et al., 2006). In more technical terms the participants need to "stretch" their own positions regarding, for example, to meet requirements for technical explanations, proof of authenticity, and legitimacy of actions (Drottz-Sjöberg, 2012).

When *applying the model* Andersson and Wene (2006) state that a reference group is needed. The reference group is build upon stakeholder participation and the group is established by formal agreement between the participants. Its role is to agree on the structure of the communication process such as the level of meaningful debate. The different levels of meaningful debate will vary from local (e.g. communities), national (e.g. health policy) and wider levels of social concern (e.g. role of multinational parties). The three components of the RISCOM model will have different meanings at separate societal levels (Andersson et al., 2006). The reference group will also agree on other overall process matters such as planning of seminars, hearings etc. (Drottz-Sjöberg, 2012).

When the reference group has been established and the overall structure agreed upon the second phase of communication activities (e.g. a hearing or seminar) may commence (Drottz-Sjöberg, 2012). These activities follow a tailored format and should be as public as possible, preferably with media coverage. The last phase is documentation and dissemination of results. Recommendations to the decision-makers are not made; the sole aim of using the model is to create an arena where all stakeholders leave with increased awareness and learning. The normal political system takes over the actual decision-making (Drottz-Sjöberg, 2012).

The RISCOM model advocates the use of a process guardian with independent resources, societal trust, and authenticity to secure process integrity (Andersson et al., 2006; Drottz-Sjöberg, 2012). The goal is to prevent potential manipulation by concealed strategic action from any of the dialogue partners. Who the guardian should be is not explicitly stated but Andersson and Wene (2006) found that it is often the chair person of the reference group which assumes this role. So the guardian could be a person, a group or an organization agreed upon by the reference group.

2.6 How do we say it? Lessons learned from risk communication history

Risk communication has undergone considerable changes from its humble beginnings. Baruch Fischhoff (1995) gives a short speculative (i.e. unsubstantiated empirically) summary of risk communication history in his review of twenty years of risk communication research and practice. According to Fischhoff (1995), the period from 1975 to 1995 has undergone eight stages, each stage building upon the previous stage. The development stages are presented below cited from Fischhoff (1995, p. 138).

1. All we have to do is get the numbers right
2. All we have to do is tell them the numbers
3. All we have to do is explain what we mean by the numbers
4. All we have to do is show them that they've accepted similar risks in the past
5. All we have to do is show them that it's a good deal for them
6. All we have to do is treat them nice
7. All we have to do is make them partners
8. All of the above

In Fischhoff's (1995) outline of risk communication history he outlines the trend from experts thinking no communication is necessary, to one-way communication based upon simple assumptions of the public, to the modern view involving two-way communication and public participation. There are lessons to be learned from history on how to present a message and those are outlined below.

Presenting numbers: Firstly there is a need for a clear and concise way of presenting the numbers from expert risk assessments. However, just telling the numbers to the public will likely just serve to reflect the distance between the analysts and its audience (Fischhoff, 1995). According to Fischhoff (1995) the communicator (early on the experts) will easily be perceived as out of touch with the public and thereby undermine the own credibility. Further, if the numbers give no meaning the recipients will likely be confused and add some of their uncertainty to that expressed by the analysts adjusting their risk estimates up or down to accommodate likely biases. It may also be seen as a deliberate act of trying to cloud the subject matter, even if this is not intended (Fischhoff, 1995). If the numbers cannot explain the risk in themselves, they have to be better explained as to what they mean. However, this entails putting a subjective evaluation into the meaning of the numbers. There may be disagreement between those experts who judge the probability of a risk as small versus those who judge it as high (e.g. greenhouse warning) (Fischhoff, 1995). Controversy might create uncertainty as to which explanation is correct and the public will be hard pressed on which expert is right. To smooth the process clear communication on the numbers that matter is advised (Fischhoff, 1995).

Risk is more than numbers: Numbers can only go so far. It is of course important to explain what one-in-a-million chance actually means, however clear communication entails a focused attention on the relevant subject matter. The communicator should not give too much information, but neither too little. In other words, tell the people what they need to know. This requires an informed understanding of what the public wants to know (e.g. some may want numbers; other may want to know how the industrial factory works etc.) (Fischhoff, 1995). Details of what the public wants to know could have been obtained using the mental modeling or RISCOM model approaches described above. Trying to suggest "acceptable risk" by showing the public that they have faced similar risk before which are now accepted is not a recommended approach. The parental approach of saying "the risk from the current hazard X is not greater than hazard Y which you have accepted" will easily be perceived as condescending by the public (Fischhoff, 1995). The presentation of the message is therefore

required to frame it in an attractive manner. For example, describing a health program in terms of lives that will be saved, rather than lives that will be lost, has been shown to increase the attractiveness of a message (Fischhoff, 1995). However, public views change over time and suspicion of manipulation may arise, even if this was not intended by the communicator.

Presentation of the message should, with respect to correct presentation of the information, therefore *respect and include the recipient it is meant for*. Even if the message is perfect it may not be perceived as such by the public (Fischhoff, 1995). Questions about the communicator's trustworthiness will likely be the only excuse needed to readily dismiss the message. To remedy this the recipients need to be treated with the respect they deserve. If they feel disrespected they may fear those who disenfranchise them (Fischhoff, 1995). However, respect will only get the communicator so far if it is not followed up with quality information and a real intent of action. This means including the public in the decision process. It also means that communicating risk is only half the message. The latter half entails making actions which take into account public perceptions.

Summary: There is no easy answer on how to give information. However, the negative effects of saying nothing, or assuming that the public is ignorant receivers of information, are sufficiently documented. Messages need to be clear and concise in their presentation. Numbers, their meaning and attached uncertainties, will have to be explained. However, numbers will likely not be enough in themselves so an understanding of the public's need for information is necessary so that the right type of information can be delivered. Making a message attractive is a difficult task which requires much reflection, especially so the message is not perceived as manipulative. Lastly the message needs to be respectful and inclusive relative the recipients. This means including those concerned in the decision process but also that the message has to be followed up with action.

3.0 Case: The A (H1N1) Pandemic

3.1 What is a pandemic?

According to the Norwegian national preparedness plan for pandemic influenza, commonly known as the pandemic plan, developed by the Norwegian Ministry of Health and Care Services (HOD)[5] in 2006, a pandemic is an epidemic (a disease that spreads more quickly than normally expected) that occurs in a large area and usually affects a large proportion of the population (HOD, 2006). For an influenza a pandemic can be described as "a worldwide epidemic, the global spread of a "new" virus (new subtype) where no, or only a few, can be expected to be immune against the new virus" (HOD, 2006, p. 125). During a pandemic a considerable part of the earth's population can be expected to be infected during the first season due to the lack of herd immunity. Herd immunity is a concept wherein protection is achieved through the attainment of a high enough immunity in the population to the disease so those not immune have an extremely unlikely chance of being exposed to the virus (May, 2005). In other words, if a high enough amount of the population is immune, then, those who are not, are protected due to herd immunity. The exact percentage needed to ensure herd immunity against a pandemic is not stated.

Viral types: There exist three types of influenza viruses: Type A, B and C. Type A is the only virus associated with pandemic outbreaks and is usually found in birds and larger animals such as swine (Directorate for Civil Protection and Emergency Planning [DSB], 2010)[6]. The virus types are again divided into subtypes. For example, the swine flu pandemic in 2009 is called A (H1N1), H1N1 marking the subtype. The Asian flu in 1957 is called A (H2N2). Pandemic outbreaks happen as a consequence of mutation in the virus leading to animal to human contamination and a large probability for human to human contamination if the virus continues to mutate. It is not uncommon for new A viruses to replace the existing seasonal virus and assume its role as a seasonal flu afterwards (HOD, 2006). It is important to note that the Spanish flu in 1918 was also an A (H1N1), the same as the swine flu in 2009. However, there are also mutations within the subtypes, called antigenic drift, which may determine the effect of the virus (e.g. how easily it spreads or causes fatalities) and immunity is not a certain outcome if one has been exposed to a similar subtype before (HOD, 2006).

[5] HOD stands for Helse- og omsorgsdepartementet, the Norwegian name for Ministry of Health and Care Services. The Norwegian abbreviation will be used in the thesis.
[6] DSB stands for Direktoratet for samfunnssikkerhet og beredskap, the Norwegian name for the Directorate for Civil Protection and Emergency Planning.

Pandemic occurrence: Since 1510 there have been 18 pandemics with varying intervals, usually between 10-40 years (HOD, 2006). The pandemics which affected Norway during the 20-century are presented in Table 1 adapted from HOD (2006)[7].

Table 1 Pandemics which have affected Norway during the 20-century

Pandemic Name	Type	Population	Sick	Deaths
The Spanish flu (1918)	A(H1N1)	2 589 463	45% 1.2 mill.	14 676 Let. 5.7%
Asian flu (1957)	A(H2N2)	3 507 985	15% 1.05-2.81 mill.	1 126 Let. 0.32%
Hong Kong flu (1968)	A(H3N2)	3 832 192	- 0.57-1.53 mill	1 768 Let. 0.46%
Russian flu (1977)	A(H1N1)	4 051 207	9%, 364 609	0 Let. 0%

Note. Based upon numbers from HOD (2006). Let. stands for lethality, meaning the mortality rate from the pandemic, presented here in percentage.

What is presented in Table 2 are the most "serious" numbers resulting from a pandemic, meaning what is of main concern for a risk manager to focus on, namely reducing or stopping the number of sicknesses and deaths. There are other aspects, however, such as particular risk groups, possible immunity in the population and so on. These aspects also vary due to type of pandemic (HOD, 2006). The main point to make here is that the effect of a pandemic varies. Predicting the effects of a future pandemic, including sickness and fatalities, cannot be done with absolute certainty, a fact also highlighted by HOD (2006).

According to HOD (2006) the most likely scenario of a future pandemic is a *moderate pandemic* (based upon the development of the pandemics during the last century). It is in this situation expected that 30% of the population will get infected in the course of six months and around half of the infected population will get sick (15% of the population). Excess mortality is expected at 0.1-0.4% of the sick. This means that out of 700 000 sick about 700 – 3000 additional persons are expected to develop complications and die as compared to a normal winter season. The main risk management efforts during such a scenario is the focus upon

[7] The A (H5N1) virus (the Avian flu) is not characterized as a pandemic. The reason being that it has as of yet not mutated into a human to human transmittable virus thereby not resulting into what is characterized as a pandemic outbreak (Norwegian Institute of Public Health, 2007). However, the A (H5N1) virus may mutate to a human to human virus thus becoming a pandemic (see Imperial College London, 2009, for more information).

preventive measures to reduce spread, sickness and deaths since the most important community services will not be affected so hard that they are in danger of breaking down (HOD, 2006)

The *worst case scenario*, which is less probable, expects 50% of the population to get infected during six months and 25% to get sick. Excess mortality is estimated at 0.4-1.1% of the sick meaning that of the 1.2 million sick, 5 000 – 13 000 may die in addition to fatalities of a normal winter season. The main concern for risk management in such a scenario is to maintain the most necessary community services, and through this, try to reduce sickness and deaths (HOD, 2006).

3.2 International development

The A (H1N1) pandemic, also known as the swine flu and new pandemic, was first registered in the USA at the 24th of April 2009 (World Health Organization [WHO], 2009a; Aavitsland, 2009a). Before this there had been reports from Mexico about an A (H1N1)-like flu which was lab-confirmed in Canada. Twelve of the lab-confirmed cases were confirmed as being genetically identical to the A (H1N1) virus detected in California, USA (WHO, 2009a). The World Health Organization (WHO) quickly announced the information to its member nations as a new virus with a potential for developing into a pandemic. The pandemic virus was continually surveyed by the WHO from the 24th of April and onwards leading to a release of a total of 81 situation reports.

It is important to note that the WHO divides a pandemic into different phases ranging from phase 1 to phase 6. An account of these different phases is found in Appendix C adapted from WHO (2009b). Summarized the pandemic phases 1 - 3 predominantly entail animal infections with few human infections. Phase 4 is a clear signal for the need for response and mitigation effort. At this stage the virus has been verified to transmit from human to human and able to cause community-level outbreaks. A pandemic is not a foregone conclusion however. Phase 5 signals transmission from one nation to another, and a pandemic is now imminent. According to WHO (2009b) the time is short to finalize organization and communication; and implementation of the planned mitigation measures. Phase 6 is the pandemic phase and it signals that a pandemic is under way. It is "characterized by communal

level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in phase 5" (WHO, 2009b, p. 25).

The exact times of declarations of pandemic phases one to three are not stated, though it is known that WHO was at pandemic phase three per 26th of April 2009 when the first cases were reported (Aavitsland, 2009a). The declaration of a transition from phase three to four was announced the 27th of April, 2009 (WHO, 2009c), quickly followed by the declaration of phase five on the 29th of April, 2009 (WHO, 2009d). The final phase was announced at the 11th of June, 2009, announcing a full blown pandemic showing that further spread of the disease was inevitable (DSB, 2010).

In addition to the pandemic phases there are two types of periods given by the WHO (2009b). The *post-peak period* in which the pandemic disease levels have gone below previously peak observed levels. This period signifies that the pandemic seem to be decreasing, however, this does not exclude that further waves will occur. Further waves have been seen in previous pandemics. It can go months in between and it is the role of communicators to ensure that the public is prepared for the possibility of another wave (WHO, 2009b). In the *post-pandemic period* the influenza disease activity has returned to normal levels signifying the end of the pandemic virus and a return to phase 1. The pandemic virus will behave as a normal seasonal virus (WHO, 2009b).

The post peak period will vary from country to country. Two waves were experienced in Norway, the biggest, signaling the post peak period, was at the beginning to late October 2009 (DSB, 2010). The post pandemic period was reported by the WHO the 10th of August 2010 signaling the end of the pandemic (WHO, 2010).

3.3 The A (H1N1) pandemic in Norway

This part of the thesis will be divided into three main sections. The first section will shortly outline the Norwegian organization of the health authorities during a pandemic. The second section will give an account of the development of available information concerning the pandemic in Norway as time went on. The final section will focus on risk communication efforts within the periods described in section two. The reason for this division is (i) to give a clear presentation of what happened in Norway and how the authorities classified the risk

(risk assessment) and (ii) what was actually done in terms of risk communication in this period.

3.3.1 The organization of the Norwegian health authorities regarding a pandemic

The Norwegian organizational structure regarding the pandemic classified the A (H1N1) pandemic as primarily being a challenge for the health sector (DSB, 2010). The central actors responsible for mitigating and communicating the risks on the national level were the Norwegian Ministry of Health and Care Services (HOD), the Norwegian Health Directorate, and the Norwegian Institute of Public Health (FHI) (DSB, 2010).

Risk management: As per the 27th of April 2009 the Norwegian Ministry of Health and Care Services (HOD), in accordance with the pandemic plan (HOD, 2006), took on the role as the leading department of the pandemic. This involved the overall responsibility for the Norwegian health services, including the prevention, community health services and specialist health services (DSB, 2010). In accordance with the National Health Care Plan, developed by HOD in 2007 (see DSB, 2010), HOD delegated the responsibility for the overall coordination of the health sector efforts to the Norwegian Health Directorate the same day. The Health Directorate can, if necessary, implement measures when an emergency threatens or has occurred. Under normal circumstances the Health Directorate is subject to the HOD. However, during the pandemic the HOD assumed a more background role while the Health Directorate performed a more prominent role in risk management and risk communication (DSB, 2010). Most of the Health Directorate's handling of the pandemic was made in close collaboration with the Norwegian Institute of Public Health (FHI) which is another subject of HOD and which, in accordance with the Disease Control Act developed in 1994 (see DSB, 2010), has the responsibility for ensuring a necessary vaccine supply and vaccine preparedness as well as to survey the international epidemiological situation and to conduct research on the infection control area (e.g. the pandemic). According to DSB (2010) FHI was the main academic advisor due to its surveillance of the pandemic situation on a national and international basis. In summary, the Health Directorate assumed the role of main risk manager during the pandemic, FHI assumed the role of risk assessor and academic advisor.

Risk communication: The overall responsibility for the communication effort for the health authorities during the pandemic was the communication departments within the Health

Directorate and the FHI (DSB, 2010). Their responsibility involved both the strategic and the operative aspects of communication. According to DSB (2010) the two organisations worked in close collaboration throughout the process and formed a joint communication group. HOD had no central part in the overall communication process but was informed of the communication process. HOD's main role with regard to information sharing was to disseminate information to the other departments (DSB, 2010).

3.3.2 Risk assessments during the A (H1N1) pandemic

The main responsibility for gathering information about the pandemic was given to the FHI. The institute made use of information mainly from organizations like WHO's Emergency Committee, European Centre for Disease Control (ECDC) and Centers for Disease Control and Prevention, USA (CDC) in the beginning. Later, as more scientific information was made available, such materials were also included (DSB, 2010). This information was collected, analyzed and summarized in reports by the FHI and given to the Health Directorate. The detailed analysis of the situation and its development by the FHI will be used to outline the risk assessments of the pandemic. The FHI compiled a total of 51 reports, and these have been retrieved from their homepage[8]. This thesis cannot include all the information from all the reports. The thesis has therefore limited the inclusion of reports to those needed to give an overview of the main risk assessment events in Norway as they unfolded. The pandemic development will therefore be divided into three main periods, as stated by DSB (2010).

Period one is from 24th of April, when the outbreak was reported, to 10th of June 2009 when WHO declared phase 6.

Period two is from 11th of June to 15th of October 2009, and the latter date signifies when the first shipment of vaccines arrived.

Period three is from 16th of October to 31st of December 2009 which is the phase where vaccinations changed from prioritizing of risk groups to becoming commonly

[8] The main page for the reports can be accessed at http://www.fhi.no/eway/default.aspx?pid=233&trg=MainArea_5661&MainArea_5661=5631:0:15,5099:1:0:0:::0:0&MainLeft_5799=5544:76458::1:5800:1:::0:0

available. It is also the period when the main wave of the pandemic hit the country (DSB, 2010).

3.3.3 Risk assessment categories

The main factors that the FHI focused on can be divided into three subcategories: medical, background and social factors. A short description of each subcategory follows along with a table which illustrates the development of the factors within each subcategory over time as the pandemic developed. A more in-debt description of risk assessment development within each time period will be presented afterwards. Note that the latest risk estimate development is shown in each period taken from the last FHI report in that given period. No difference means no new information was produced that changed the existing risk estimate.

Medical category

The *medical* category constitutes the more clinical aspects related to the virus itself. The factors included in this category and their development are shown in table 2.

Table 2 Risk assessment development regarding the factors in the medical category

Medical Dimension	**Start of Period 1**	**Period 1** **24 April – 10 June**	**Period 2** **11 June – 15 October**	**Period 3** **15 October – 31 December**
Lethality (how dangerous is the virus for the individual)	Unknown Assumed low	Observations abroad show below 0,1%	Observations abroad and nationwide show between 0,1-0,01%	No difference
Contagiousness (how easily it was contracted)	Unknown	Considered high by WHO Secondary attack rate[a] put at 22-33%	Considered high by WHO Secondary attack rate put at 18-30%	No difference
Pathogenic Ability (how many, when infected, would develop symptoms)	Unknown	Unknown	Assumed that two thirds of the infected will get sick	No difference

Cont. table 2 Risk assessment development regarding the factors in the medical category

Medical Dimension	**Start of Period 1**	**Period 1** **24 April – 10 June**	**Period 2** **11 June – 15 October**	**Period 3** **15 October – 31 December**
Disease Spectrum (what are the normal and abnormal consequences of being infected, who are the ones getting hit the hardest)	Unknown	Unknown Observed as mild abroad with some cases being serious	Observations within the nations show mild spectrum, 2% are serious	No difference
Contagious Period (how long a person was contagious)	Unknown	Unknown Put at 1 week	Observations show same period as with normal flu, one week	No difference
Incubation Period (how long from infection until symptoms start showing)	Unknown	Median 2 days Generation time 1,9 days	Median 2 days Generation time 2-3 days	No difference
Viral Genes (how the virus developed genetically)	Unknown	Unknown No change in genes but unstable	Unknown No change in genes but unstable	Unknown No change in genes but unstable
Antiviral Sensitivity (is the virus sensitive to antiviral substances)	Testing shows sensitivity to oseltamivir and zanamivir	No difference	No difference	No difference

Note. Based upon information from Aavidsland (2009a), Aavidsland (2009b), Iversen (2009), and Iversen, Hauge, and Løboll (2009).

[a] Secondary attack rate means how many that got sick after being exposed by a person with the disease. So if an infected person has contact with 10 people and two gets sick then the rate is put at 2 out of 10 meaning 20% (Aavitsland, 2009c).

Background category

The *background* category entails factors that focus upon people's predispositions towards the virus, meaning certain traits which people have that make them more or less vulnerable to the virus. The factors included in this category and their development are shown in table 3.

Table 3 Risk assessment development regarding the factors in the background category

Background Dimension	**Start of Period 1**	**Period 1** **24 April – 10 June**	**Period 2** **11 June – 15 October**	**Period 3** **15 October – 31 December**
Immunity (are some individuals immune)	Unknown	Studies from USA show one third over 60 are immune. No immunity in young people	No difference	No difference
Age *(are some age groups harder hit than others)*	Unknown	Young adults and children might be more exposed, unknown why	Young adults and children are more exposed, mainly between 12-17 years, unknown why	No difference
Gender (any difference between the genders)	Unknown	No observed difference	No difference	No difference
Risk Groups (which groups are more vulnerable to the disease)	Unknown	Unknown who the groups are	Risk groups identified: mainly people with chronic diseases	No difference

Note. Based upon information from Aavidsland (2009a), Aavidsland (2009b), Iversen (2009), and Iversen, Hauge, and Løboll (2009).

Social Category

The s*ocial* category holds factors looking at the interaction between people and the effects which the risk of the pandemic posed. The factors included in this category and their development are shown in table 5.

Table 4 Risk assessment development regarding the factors in the social category

Social Dimension	**Start of Period 1**	**Period 1** **24 April – 10 June**	**Period 2** **11 June – 15 October**	**Period 3** **15 October – 31 December**
Reproduction Numbers[a] (how many would one contagious person infect)	Unknown	Assumption put at 1,4 – 1,6 in Mexico but 2,3 in Japan	Assumptions put the number at 1,4-1,5, however some show 3,5	No difference

Cont. table 4 Risk assessment development regarding the factors in the social category

Social Dimension	Start of Period 1	Period 1 24 April – 10 June	Period 2 11 June – 15 October	Period 3 15 October – 31 December
Number infected (how many would get infected)	Unknown	It is unknown how many will get infected	Based on previous experience with pandemics and measures from other countries puts assumption at 30%	No difference
Chain of infection (how is the virus transmitted)	Unknown	Assumed same as with normal flu, no deviation from this observed[b]	No difference	No difference

Note. Based upon information from Aavitsland (2009a), Aavitsland (2009b), Iversen (2009), and Iversen, Hauge, and Løboll (2009).

[a] A normal seasonal flu has a reproduction number at 1.1-1.4 (Aavitsland, 2009b).
[b] Meaning infection mainly through droplet infection and to a lesser extent through contact with other people or inanimate objects (Aavitsland, 2009b).

3.3.4 Risk assessment development

In general the tables above show that the process of risk assessment is a continuous process of information gathering to produce, and adjust, risk estimates. They also show how little is actually known at the outset of a pandemic risk, and the uncertainty which marks the initial risk estimates (illustrated by the period 1 estimates). As time progresses more information is provided which leads to more adjusted risk estimates, while also providing information where little was as of yet known (illustrated in period 2). Lastly, at some point in time, new scientific information that is made available does not change what is already known, but further reinforces the already existing risk estimates (illustrated in period 3 where nothing new is added). In summary, it takes time to produce good risk estimates. It is important to note that the medical factor "viral genes" was subject to continuous surveillance, even though the tables report no development, since it addressed the possibility of mutation in the A (H1N1) virus. In other words, FHI monitored if the virus developed into a more lethal version or became resistant to existing antiviral substances or the vaccine. As it happened the virus did not mutate into a more serious or resistant virus, although it was never known if it would.

What is not shown by the tables is (a) FHI's dependency upon external sources of information before the pandemic reached Norway (e.g. WHO, measurements from Mexico, USA, etc.), (b) how information was provided piece meal requiring continuous data collection, analysis and adjustment of risk estimates by the FHI during the pandemic, and (c) how priorities of risk assessment changed between the periods to accommodate the development of the pandemic risk. A short summary exemplifying the development will be presented below for each period to highlight the process of risk assessment over time.

Period 1: 24 April – 10 June 2009

Uncertainty was a big factor at the outset, and throughout, the first time period from 24th of April to the 10th of June. Regarding the factors presented in tables 2 – 4 there was much the Norwegian authority did not know with regard to the medical, background or social categories and the focus was therefore on trying to limit the introduction and spread of the virus through commonly known means (e.g. increased hygiene awareness, this will be further explained in the risk communication section) while getting more information as soon as it was made available (Aavitsland, 2009a). At the immediate outset of this time period all details of the mentioned factors were unknown. The FHI was dependent upon information and observations of the pandemic development abroad to provide a basis for risk assessment. An exception to this lack of knowledge was information regarding the spread of the virus provided by WHO. Per the 24th of April 2009 WHO had declared pandemic level 3 (Aavitsland, 2009a). That meant that the virus was able to transmit from animal to human, but there were uncertainties linked to if the virus was adapted well enough to transmit effectively from human to human and how easily it could do this. In other words, it was not certain that a pandemic was underway, but that was a possibility.

The situation changed quickly, however, due to the observed quick spread of the virus leading to the WHO declaring pandemic level 4 the 27th of April 2009 and stating that a human to human transmission had been verified which was able to cause community level outbreaks (WHO, 2009c). Likewise did the declaration of pandemic level 5 the 29th of April (WHO, 2009d) show that the virus had spread into at least two countries in the WHO region showing that a pandemic was imminent (WHO, 2009b). In other words what was known, just by observing the spread, was that the virus was spreading across national borders and that it was difficult to contain geographically. At this stage FHI also assumes that there was little

immunity in the populace due to the new virus being different from other A (H1N1) viruses (Aavitsland, 2009c). Since there was little immunity, and therefore no herd immunity, the virus spread easily and quickly.

As the pandemic situation developed abroad more information was produced which was analyzed and used to produce risk estimates regarding the factors mentioned above. The estimates were subject to continuous scepticism and "fine tuning". A good illustration of the trend on how information was produced piece meal and better estimates made available is reflected in information about lethality. Lethality was assumed to be below 1% the 30th of April (Aavitsland, 2009c) and was further lowered to 0.1% the 8th of May (Aavitsland, 2009d) and was kept there out this period (until 10th of June) (Aavitsland, 2009b). In terms of possible fatalities the change from 1% to 0.1% is great, though it should be noted that the FHI overestimated and they were critical to the correctness of these estimates. These numbers were based on observed deaths outside of Mexico, since deaths in Mexico were above the numbers found in other countries. The higher fatality rate in Mexico was attributed to late implementation of intensive care (Aavitsland, 2009b). The lethality estimate was therefore biased towards the actual number of fatalities in the respective countries up to that point in time and therefore uncertain.

The uncertainty was also attached to the other factors. Information was made available by, among others, WHO and countries such as USA, Japan and Mexico to provide initial risk estimates to all factors except in pathogenic ability, viral genes, contagious period, number infected, and risk groups[9]. However, as all these estimates were based upon the observed general trend abroad they were inherently uncertain, something the FHI reports often admit along with the fact that the FHI would know more once the virus reached Norway (Aavitsland, 2009e). The end estimates of period one, depicted in tables 2 – 4, were, in short, best possible assumptions based upon information available at that time. In effect this lack of knowledge meant that FHI could not produce a sufficient risk assessment basis for communication of the pandemic risk to the public. For example, knowing that the virus spreads fast (as indicated by WHO and other observations abroad) but not which groups were at greater risk from the pandemic meant that communications of risk could mostly be aimed towards the public in general, not towards any specific risk groups since these were as of yet

[9] Note that risk groups mean *identified* risk groups which are more susceptible to the actual A (H1N1) virus. Some risk groups are known to be generally more susceptible to a common flu or pandemic virus and are detailed in the pandemic plan (HOD, 2006).

unknown (though the pandemic plan by HOD, 2006, lists what is "commonly" known to be risk groups in similar kinds of risks). However, this uncertainty changed during period 2 when the pandemic reached Norway.

Period 2: 11 of June to 15 October 2009

The 11th of June started with the first two confirmed infected cases within Norway, out of 13 in total so far, wherein the other 11 were infected earlier when abroad (Aavitsland, 2009f). The WHO had alerted it members the 9th of June that it would declare pandemic phase 6, that is that a pandemic is underway and cannot be contained. In other words, it is spreading fast because it has adapted to infecting humans on a global scale (WHO, 2009b). Pandemic phase 6 also meant that Norway are in obligated agreement to order 9.4 million doses of vaccine (two for each person in Norway[10]) against the pandemic virus from GlaxoSmithKleim (GSK) which was developing the vaccine (Aavitsland, 2009f). As time progressed in this period the virus quickly spread and where confirmed in hundreds of countries making the pandemic a factum. In Norway, the number of lab-confirmed infected cases increased quickly from roughly 300 at the 24th of August to 1700 at the 15th of October (Iversen, Hauge, & Løboll, 2009). This put the estimate of people who had got sick from the virus at around 50 000 to 200 000 by October 15. The main wave of infected was still expected by the health authorities, but they did not know when this would happen.

The main uncertainties, which the FHI focused on in this period, were how many that would be infected (number infected), the number who would get sick (pathogenic ability), the number of who would need to get hospitalized and/or need intensive care (disease spectrum) and finally how many that were expected to die (lethality) (Aavitsland, 2009f). The focus was more aimed at factors related to preventing death and serious illness than at limiting the spread which was seen as unavoidable. Furthermore, since the pandemic virus was within Norway, direct observation of the pandemic virus was now also possible. This situation is reflected in the risk assessment work during this period. Direct observations within the nation, along with more longitudinal surveys from abroad, provided more clear estimates regarding

[10] The decision to order two doses for each person in Norway was based on the assumption that two doses, given with a three week interval, was needed to achieve adequate protection of the vaccine. Actual clarification of how many doses which were actually needed with certainty were given in mid December (vaccination started mid October) wherein it was found out that one dose was enough, except for in those which were immunosuppressed (DSB, 2010)

the different factors, and provided information on those factors where information was, as of yet, not available at the end of period one.

With regard to lethality the observed trend within the nation led to increased scepticism in the numbers received abroad, especially those from Mexico (Aavitsland, 2009f). Based on observations within the nation, the estimate at the 28th of July put the lethality at 0.1% to 0.01% with few children dying (Aavitsland, 2009g), although this was later also stated as being an overestimate. Another example is the identification of risk groups. Observations within the nation showed that people with chronic underlying diseases (i.e. asthma and other respiratory illnesses, extreme obesity, diabetes, immune deficiency, chronic illnesses and cancer) were at greater risk from the pandemic virus. Surveys from America further confirmed this observation showing that 70% of those hospitalized had an underlying disease (Aavitsland, 2009g). This information led to those identified as being in the risk groups were prioritized for vaccination when the vaccine was made available the 15th of October (DSB, 2010).

Period 3: 16 October – 31 December 2009

In the final time period the information provided did not change the already existing estimates from the end of period two. Rather, the information enforced the estimates already available. The main events in this period were the arrival of the main pandemic wave which lasted from mid October to mid November 2009, and the distribution of the vaccine and the vaccination campaign which started at the beginning of this period. First priority of vaccination was the identified risk groups and health personnel, then the general populace (DSB, 2010).

Of the factors listed there were still some uncertainties such as in the age gap. The authorities did not know clearly *why* young adults, mainly in their twenties, were more exposed, but they were (Iversen & Hauge, 2009). The information about the risk, however uncertain, did not change in any of the factors (see Iversen & Hauge, 2009; Blystad, Hauge, & Rønning, 2009; Iversen, 2009). The focus in this period therefore shifted more unto trying to prevent deaths and hospitalization as well as to encourage vaccination of identified risk groups and health personnel. Lastly, since the pandemic infection rate went down sharply,

risk assessments in this period went primarily from collecting new information to making an account of the overall pandemic development in Norway.

3.3.5 Consequences of the pandemic in Norway: number infected, sick and dead

The consequences from the pandemic, in health terms, were comparatively mild. The results are shown in Table 5. The numbers are copied from DSB (2010) and Statistics Norway (2010).

Table 5 Consequences of the 2009 A (H1N1) pandemic in Norway

Pandemic Name	Population	Infected	Sick	Deaths
Swine flu, New influenza or A (H1N1) pandemic	Ca. 4.8 million	N/A	Est. 900 000	29 Let. 0.003%

Note. Based upon numbers from DSB (2010). Population number taken from Statistics Norway (2010).

HOD (2006) expected a mild scenario to entail 30% of the population being infected by the virus, half of these to get sick, and an excess mortality at 0-1 to 0.4% meaning 700-3000 deaths. The A (H1N1) pandemic however, led to 29 registered deaths per the 7th of January 2010 (DSB, 2010). It is estimated that around 900 000 got sick. Out of the estimated 900 000 sick and number of fatalities this puts the lethality of the disease at 0.003%. Meaning that the mortality, the proportion of the population who dies, in connection with the pandemic was 0.6 persons per 100 000 people. This was somewhat higher than most countries in western Europe, including Sweden and Denmark (DSB, 2010). All in all the pandemic was surprisingly mild when compared to most previous pandemics and the scenarios earlier depicted by HOD (2006).

3.3.6 Summing up risk assessment

The A (H1N1) case has shown the many types of uncertainties that are related to fact finding in a real pandemic situation. It shows that it takes time to collect enough data for a solid basis for risk estimation; related to, for example, geographic spread and speed, type of virus and its severity, relevant herd immunity, incubation time, and specific risk groups. There

was considerable uncertainty related to how the virus would develop over time; affecting considerations related to expectations of severe cases, planning of health care and, not the least, type of adequate vaccine and vaccination procedures.

The case has also shown considerable world wide data collection and collaboration. The situation in Norway was characterized by, for example, expecting the virus from abroad, thus, having some time to prepare, highly alerted health authorities, continuous review of new information, and early ordering of vaccine.

In the following the challenges to risk communication specifically related to the A (H1N1) pandemic will be outlined. The review is focused on a few selected central aspects, and mentions some results from data collections during the time. The previous detailed account of the pandemic situation, the theoretical introduction, and the next section on risk communication strategy during the latest pandemic, all form the basis to discuss and conclude about risk communication strategies in expectation of a future pandemic.

3.3.7 Risk communication strategy during the pandemic

The HOD (2006) outlined five guiding principles for risk communication for an eventual pandemic (HOD, 2006). These principles are based upon the WHO information strategy. According to DSB (2010) the Norwegian health authorities structured their *communication strategy* according to the principles outlined in the pandemic plan (HOD, 2006) and its description of more concrete measures (detailed further down). The overall principle of communication in Norway during a pandemic is according to HOD (2006, p. 24-25) to ensure:

- *Trust*: To facilitate trust and to regain it if lost. It is built through a competent appearance, taking responsibility, being open and compassionate understanding. Lack of trust is stated by the pandemic plan to increase public fear and reluctance to follow authority advice.
- *Coordination*: To give the same information regardless of who informs. Ensured through close collaboration with the relevant organizations which ensures quality of the message. Lack of coordination may lead to conflicting advice, confusion and lost trust.

- *Active information*: Go out early with information to establish oneself as a good source of information about the pandemic. Lack of proactive information may lead to others setting the agenda and rumours and misinformation may soar. Consequently the authority of the manager may be lessened.
- *Openness*: Sincere, easy to understand and concrete information. Meaning to limit information to what is necessary and to be honest about what one doesn't know. Openness may give the public insight into how information is gathered, risks assessed and decisions made. Lack of openness may lead to lost trust and suspicion, making it difficult to be heard by the public.
- *Compassionate understanding*: To meet and take up public misconceptions and unrest is important in formulating effective messages. Communication should tell people what to do so they may protect themselves thereby increasing public self efficacy and dampen unrest. Lack of public understanding may lead to information needs being ignored and the public may search elsewhere for information.

As can be seen in the principal outlining of communicating risk during a pandemic HOD (2006) promote a two way process of risk communication enhancing transparency in the decision making process and the inclusion of public concerns and information need in the overall design of the message content.

The HOD (2006) description of more *concrete measures* is structured according to overall goals and measures which should be based upon the WHO pandemic phases, if the virus has arrived in the country or not, and with consideration of the targets of the communication (DSB, 2010; HOD, 2006). For example, HOD (2006) states that the WHO pandemic *phase 6* entails an *overall goal* of minimizing the effect of the pandemic. Risk communications *targeting* the public, if the virus is in the country, should among others measures show understanding for public reactions and evaluate an increase in communication measures depended upon the degree of seriousness of the pandemic. As can be seen, the more concrete risk communication and risk management measures defined by HOD (2006) are generic and meant to be adapted to the specific situation. Use of different communication channels (e.g. webpages, pandemic phone, etc.) are also described to be used according to goal, target group, description of the measure and message content, principles guiding it and who has the responsibility. Again these suggested measures are generic and the specific situation will define their use.

3.3.8 Information distribution during the pandemic

During the A (H1N1) pandemic, the information distributed to the public was primarily the same as in the situational reports from FHI, but more brief and narrowly formulated (DSB, 2010), the reason being that the information could then be used by, for example, the Minister when communicating to the media. More specific numbers related to, for example, contagiousness was not communicated as such; however, the numbers could be accessed among others at the FHI report homepage. The information was further disseminated down to "county men, health organizations, patient-, user-, and professional-organizations, pharmacies and the largest municipalities" (DSB, 2010, p. 124). According to HOD (2006), the local health authorities are responsible for communication in their local community and good communication entails that information from other authorities is distributed downwards (and up if needed) so the information content is the same, but the presentation tailored to the specific situation in that community. The content of the information given to the public developed as more information was available to the health authorities and it was readily distributed within the relevant authorities and out to the public. According to the FHI status reports (2009) more specific information related to the risk assessment was also distributed as it became available, though mostly through the web pages where specific information could be accessed. For example, the report of the 8th of May states that they will distribute daily risk assessments on *www.FHI.no* from that date on. The report at the 18th of October added information on the vaccine on the same page (Aavitsland, 2009d; Iversen et al., 2009). The FHI reports were also distributed on the homepage address when they were available.

3.3.9 Risk communication during the three pandemic phases

As to be shown by the brief outlining of the communication strategy and information distribution, communication during a pandemic is complex, involving many different measures according to the current situation and goals. According to DSB (2010) the Norwegian health authorities' risk communication efforts can be divided into three main phases contingent upon what the overall goal was in that period. There were one hygienic advice phase, and two vaccine phases. It is important to note that throughout the phases the authorities provided regular situational updates about the national and international development of the pandemic and the vaccine (e.g. how many infected, if the biggest wave was believed over, number of infected and deaths etc.).

The *hygienic advice phase* covers the beginning of the pandemic up to before the vaccine was made available to the risk groups at the 12th of October; this involves the FHI reports from 24th of April to 15th October. The main goal of communication in this period was to limit the spread of the virus (DSB, 2010) and, after the introduction of the virus in Norway (around the 11 of June), to limit serious illness and death (Aavitsland, 2009f). The general message throughout this period was that a pandemic is impending and the policy is to limit its spread but not at any cost. As detailed in the sampled FHI reports from this period, there was a continuous focus upon giving the public regular status updates about the pandemic nationally and internationally as it developed as to prepare the public for an impending pandemic. There was also continuous emphasis upon the pandemic as seemingly mild, but for some individuals, especially those with underlying disease, the virus could cause complications. Lack of information regarding different aspects of the risk assessment is reported as being admitted by the health authorities (among others the FHI reports were distributed on the net where they could be accessed). Around mid September until the 15th October information about a vaccine becoming available in mid-late October was distributed emphasising that risk groups, and heath personnel, would be prioritized and that recommendation to the public would follow (Aavitsland, 2009h; Iversen et al., 2009).

There were some specific situations in this period which may have had an adverse effect on the risk communication effort. According to DSB (2010) the first press conference was specifically noteworthy. The 27th of April a press conference was held by the health authorities, represented by the current HOD minister and representatives from the Health directorate and FHI. It presented HOD's (2006) worst case scenario estimation of 13 000 extra deaths and 1.2 million sick in half a year from the pandemic (DSB, 2010). It was, however, highlighted as the least likely scenario. The Health Directorate stated later that much was unknown at that point in time and that they were confident that the public would rationalise and have trust in the authorities (DSB, 2010). It is not the role of this thesis to judge if the presentation was right or wrong. What is important is that the FHI was not informed about the heavy emphasis on the worst case scenario, showing a lack of coordinating of the communication efforts at this early stage. According to DSB (2010) press conferences after this event were better coordinated and the message contents the same across channels. According to DSB (2010) the effects of this message led to a media focus on the worst case scenario and an overall public perception that the authorities initially exaggerated

the risk from the virus. Measurements of public risk perception will be given in the next section, where the effects of the hygienic campaign can be seen more clearly.

The *first vaccination campaign phase* involves the vaccine called pandemrix. It begins with a focus on risk groups at the start of October 2009 and continues to the end of the same month. The main goal here was to reach as many individuals as possible in the risk groups, and health personnel, to get vaccinated (DSB, 2010). The goal was to limit the possibility of severe complications or deaths in the risk groups, not to limit the spread of the pandemic. More specifically the order was: (1) pregnant in second or third trimester, (2) individuals with risk of serious complications in the age 3-64 years and (3) individuals with serious risk of serious complications in the age 65 and above (Hungnes et al., 2011). Communication in this period emphasised distributing information to those who were in the risk groups, informing them that they were prioritized and recommended to take the vaccine. Pregnant women, as a risk group, received special advice and information about the vaccine itself (prerequisites for taking it) as well as general advice related to their condition (Iversen & Hauge, 2009). Information about the vaccine itself and possible side effects was also distributed. Besides the regular information and updates to the general public about national and international development, they were also informed that they would get the vaccine and that there were two doses for each person (it was found out later that one dose was needed but normally two vaccines are recommended for full effect, DSB, 2010). Lastly, since vaccination in Norway is done on the communal level, templates and texts were developed by the national health authorities for the municipalities so that information could be adapted and coordinated at that level.

The *second vaccination campaign phase* starts with recommendation of mass vaccination the 23rd of October. The campaign itself starts at the beginning of October after the risk groups had been vaccinated (DSB, 2010). Vaccination was, at this stage, available to the whole population. The main goal here was to get as many as possible in the public to know about the vaccine, where to get it, that there was enough for everybody and that it was the health authority's recommendation to take it (DSB, 2010). Among the authorities' recommendations for taking the vaccine was that everybody should take the vaccine to protect themselves from the pandemic, to protect others from it, and to lessen the infection pressure in society as a whole (Blystad et al., 2009). However, if there were people identified as belonging to the risk groups those were still prioritized. According to the FHI questions and answer page during the pandemic vaccination campaign, the vaccine would help against

complications for one-self and prevent transmission of the virus to others close by (Norwegian Institute of Public Health, 2010). A report on the usefulness of the vaccine in 2011 from FHI, state that one of the goals of vaccination, besides protecting the individual from complications or death, was that people who were vaccinated would "protect others who either cannot be vaccinated or who have poor effect of the vaccine[11] in that they do not expose them to infection" (Hungnes et al., 2011, p. 2). The health authorities sought to attain herd immunity: getting enough people immune to the virus so those who were not immune (because they could or would not take the vaccine) still would be protected since those immune cannot transmit the virus (c.f. May, 2005). It is important to note that the primary goal of the second phase was not to affect the course of the pandemic, meaning to limit or stop the spread. If this had been the goal then it would have been a greater focus upon vaccinating the potential big spreaders, such as school children (Hungnes et al., 2011).

Of special interest in this period is the first occurrences of possible side effects and deaths from the vaccine. FHI had in this period published information about the vaccine and its safety as proven by European drug authorities (EMEA) (Blystad et al., 2009). Another webpage was also made accessible and run by the Norwegian Medicines Agency the 19th of March 2010, wherein it was possible to see registered side effects and deaths related to the vaccine, and a short report if there was a causal link between the vaccine and illness/death. The page is still running and it is being updated[12]. As per February 2010 ten reports of deaths had been reported with no causal link to the vaccine (Norwegian Medical Agency, 2010). Iversen & Blystad (2009) also report that there was a growing assumption that a number of countries had not recommended the vaccine to pregnant women with adjuvant. This assumption was refuted by FHI, after reviewing the official recommendations from other countries and organizations (e.g. WHO), and a summary of other countries recommendations to pregnant women was provided. In total FHI estimated that 2.2 million individuals, or 45%, of the Norwegian population, were vaccinated against the pandemic virus (Hungnes et al., 2011). Estimates of how many in the risk groups that were vaccinated are not given though the report states that early vaccination of risk groups likely prevented many deaths. According to the DSB report (2010) young adults were less likely to get vaccinated than the rest of the population and men less so than women. According to the FHI report by Iversen (2009)

[11] In Norwegian "…dårlig effekt av vaksinen…"
[12] See the Norwegian Medicines Agency (2012) in the reference list to access the web page. Note that the web page is in Norwegian and is continually updated; the reference date may therefore be inconsistent with the latest update.

young people (children and adolescents) should get the vaccine since they are more prone to infection and are those that most effectively spread the virus.

3.3.10 Communication channels

During the pandemic a wide variety of *communication channels* were used to inform the public through the three phases such as posters, web pages, household information, TV, movies and public "pandemic phones" (DSB, 2010). Active use of such channels is detailed by HOD (2006). The thesis will give a short summary of the performance of the most central channels for informing the public during the pandemic. The selection was mainly determined by the frequency of which they were used by the authorities and the public, as presented by DSB (2010).

Media: HOD (2006) defines media as radio, TV, newspapers, journals and online media. FHI was normally contacted by the media five to ten times a day and up to twenty times on a busy day. During the main wave this type of contact could reach 60 to 80 inquiries a day. FHI was the most heavily contacted health authority during the period (DSB, 2010). Most questions were of a professional character and related to the current situation. Press briefings, a total of 13, were arranged by FHI and the Health directorate to address issues to relieve the pressure from the media.

However, the amount of contact by the media is shown to be largely contingent upon the development of the pandemic situation. Since the FHI reports (2009) use words such as few, many, less than last report, or numbers such, as 5 – 10, to describe media contact, a comprehensive figure cannot be produced. What is shown in the selected FHI reports (2009) however, is that media contact increases and fluctuates in accordance with the general pandemic development or specific events (e.g. vaccine related and deaths). For example, there were 20 media contacts related to a suspected case of infection in Trondheim in early May (Aavitsland, 2009i). After the introduction of the first cases of infected in the country (around 11 June) the media focused on these cases but the amount of contacts were few (Aavitsland, 2009b). In contrast, as the pandemic developed with more people being infected and some seriously ill, the media contact increased to an average of around 30 – 40 media contacts each week day and to 10 – 15 in the weekends in July requesting mostly information about the authorities' preparedness and prevention measures against the pandemic (Aavitsland, 2009f).

In September less than five contacts each day were reported, which was considerable lower than in July. The media asked mostly for basic information related to the vaccine in this period (Aavitsland, 2009h). Then again, a high amount of media contact became prominent in late October and November (up to 20 contacts each day, though not as high as reported in July). The main information requested related to the vaccine such as when vaccination starts, distribution, what it consists of, possible side effects etc. (Iversen et al., 2009; Iversen & Hauge, 2009; Blystad et al., 2009; Iversen, 2009)

The *Pandemic phone:* The contact channels were established the 3rd of August and run by the Health Directorate (Aavitsland, 2009f). The main messages conveyed here reproduced the information from *pandemi.no* or gave simple advice. People with more medically specific questions were referred to medical doctors or other professionals. According to DSB (2010) the use of the phone channel exploded in October. Though no specific number is given one of the phone personnel reports that the use "went from 20 to 900 enquiries on one day!" (DSB, 2010, p. 127) highlighting the increase of its use in this period.

The *Web pages FHI.no and pandemi.no:* On the internet the webpage *FHI.no* was established the 24th of April 2009 and was continually updated with information on the current situation, advice to travellers and those who lived in the infected areas, advice to the health services and a questions and answers page (DSB, 2010). More general information relating to health information aimed at the public was supplied at the webpage *pandemi.no*, established the 4th of may, and which received over 90 000 visitors during the first three days. This webpage contained links to other web pages (e.g., *FHI.no*, *Regjeringen.no*) where more concrete information could be accessed if desired (DSB, 2010). The webpages were run by both FHI and the Health Directorate even though the Health Directorate had the main responsibility.

Posters: Of particular noteworthiness is the early introduction of posters, at the 29th of April, 2009, displaying basic hygienic advice aimed at limiting the spread of the pandemic (Aavitsland, 2009c). These were distributed firstly to airports with international flights. In around the end of July/beginning of August another 80 000 posters were distributed to kindergartens, schools, high schools and universities in the country (Aavitsland, 2009g). The poster was simply made and highlighted the importance of washing the hands, sneezing/coughing in the crook of the arm and stay at home if sick (see Appendix D). This

information was also repeated through other channels such as TV, movies, public "pandemic phones", web pages etc. (DSB, 2010).

3.4 Public risk perception, behaviour change and risk communication results

Eight public surveys were performed within Norway during the 2009 pandemic by the market research firms Synovate, Opinion, Sentio and Respons. These surveys were collected by Synovate (2009) and analyzed by Synovate (2010) on assignment from the Health Directorate. The surveys performed by Synovate and Opinion (four in total) were financed by the Health Directorate. The other four surveys by Sentio and Respons was financed by external actors (the newspapers Aftenposten and Bergens Tidende) according to DSB (2010). The measurements were mainly based upon rating of statements on category scales and responses to open ended questions, collected through phone interviews of 500 – 1000 individuals in nationally drawn quota samples. Since the surveys were performed by different actors and finance by different sources, in different points in time, with different samples, and with different questions and methods the various measurements are not readily comparable. However, the data presented here are the data currently available regarding the A (H1N1) pandemic in Norway and are those used in this thesis. The compilations give some clues on how the public perceived the pandemic, authorities and information during the pandemic as well as some indication of possible behavioural change. In addition, a European survey was performed by Eurobarometer (2009) between 26 – 30 November 2009 consisting of 28000 respondents across 27 EU member states. The study is mentioned as being evaluated by the Norwegian health authorities during the pandemic (DSB, 2010). Lastly an overview of media coverage of the pandemic was performed by Retriever on assignment from the Health Directorate (DSB, 2010).

Presented below are the results, and further discussion of the results' relevance will be covered in the discussion chapter. The thesis will firstly present the findings of the general public's risk perception. It will then give results on public behavioural change in relation to the hygienic and vaccination phases related to risk communication. Lastly, detailed results relevant for each of the risk perception factors will be presented. No measures were specifically related to personal experience and perceived antagonism. Implications of these factors and their relevance will be discussed in the discussion chapter. The criteria for inclusion of survey results are detailed in each section.

Public risk perception during the pandemic: The results deemed valid for assessing general public risk perception are ratings of public concern of infection by Synovate and Opinion (Synovate, 2009) and Eurobarometer (2009). Public concern is seen to be valid since it reflects overall subjective evaluations of risk from the pandemic. The collected polls from Synovate (2009) measured public concern by asking respondents to give their rating on the provided scales of the statements: "I am *not* concerned of getting infected or sick due to the pandemic flu" (presented in figure 2). According to figure 2 the largest difference in public concern occurred between August to October. Synovate's (2010) analysis attributes this trend to the occurrence of the main pandemic wave hitting the country in October. The measurements by Eurobarometer (2009) in November on public concern asked different questions than Synovate (2009). Specifically they asked how concerned the respondents were: (i) about the possibility of the A (H1N1) virus becoming a serious risk in their country, (ii) of how likely they believed it was that they would personally catch the pandemic influenza, and (iii) how dangerous the pandemic was in comparison with the seasonal influenza. They found that the Norwegian respondents were largely unconcerned about the pandemic developing into a serious risk (72% not concerned at all/not concerned versus 27% quite concerned/very much concerned). Norwegians were almost equally divided between those who deemed it likely to get infected versus those who did not. In addition a small majority of Norwegians deemed the pandemic as more dangerous (54%). Whereas those who did not (43%). To summarize, public concern during the 2009 pandemic situation stayed relatively stable with the exception of October. The Norwegian public was neither very concerned about the pandemic itself or that it could develop into a serious risk.

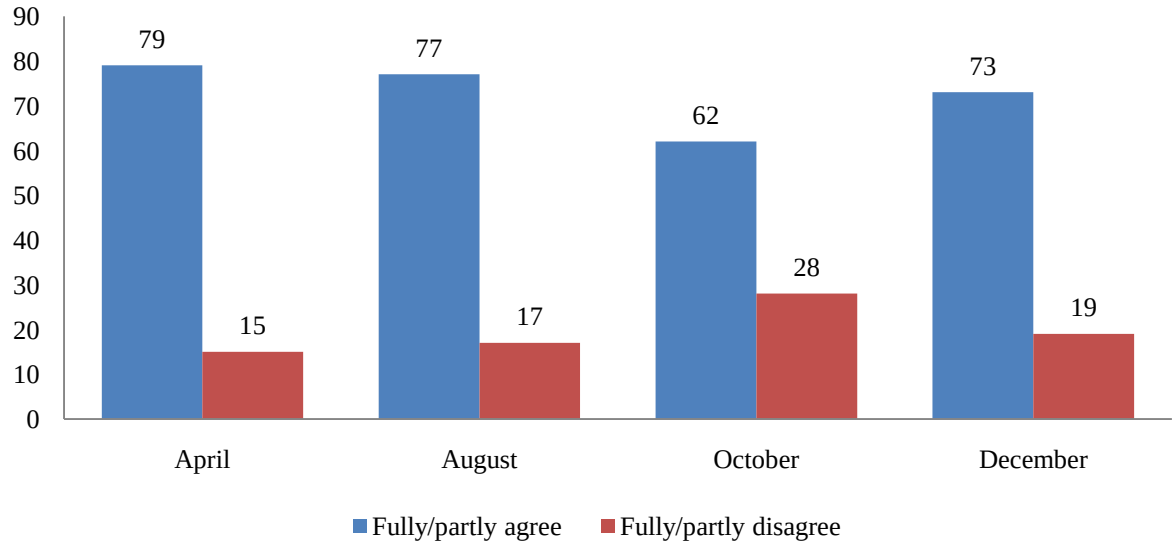


Figure 2 Percentages of public concern for four months of 2009. Data presented by Synovate (2009) from the Synovate source in April and August, and Opinion source in October and December. Figure adapted from Synovate (2009). Respondents were asked to rate their agreement to the statement: I am not concerned of getting infected or sick from the swine flu.

Behavioural change: Included here are results on reported public behavioural change. The presentation of possible behavioural change is limited mainly to knowledge about hygienic measures and the vaccine since these were the main issues of communication during the pandemic and were reported by Synovate (2009). Measurements by Eurobarometer (2009) give some more behavioural change results and they are presented last. Since there are two different studies (in terms of time of survey and questions asked) by Synovate (2009), each conducted by different contractors, the results are not placed into a single figure (see Figure 3 and Figure 4).

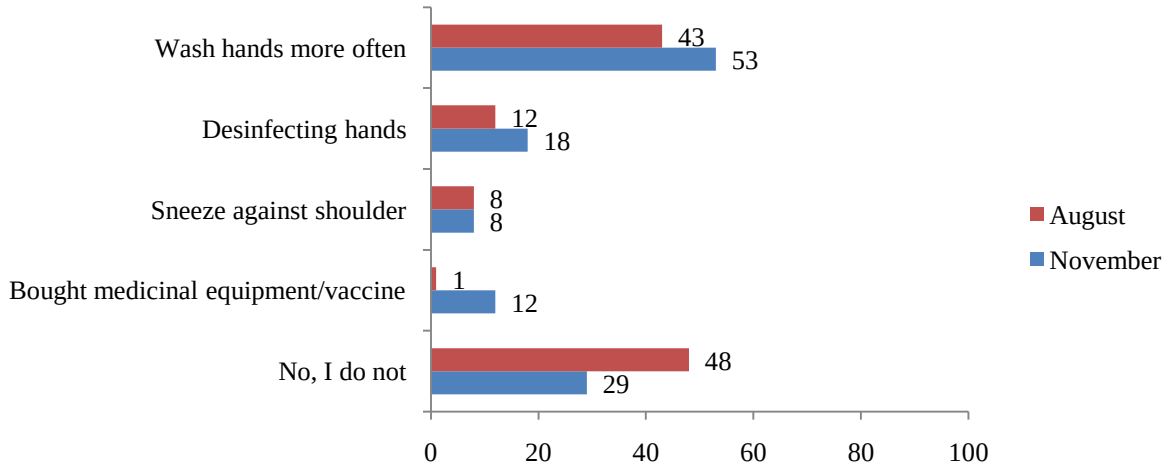


Figure 3 Frequency responses to open ended questions regarding measures the individual did take against infection in the months of August and November. Data presented by Synovate (2009) from the Sentio source. Figure adapted from Synovate (2009). Respondents were asked the question: Are you doing anything actively to prevent infection? If so what?

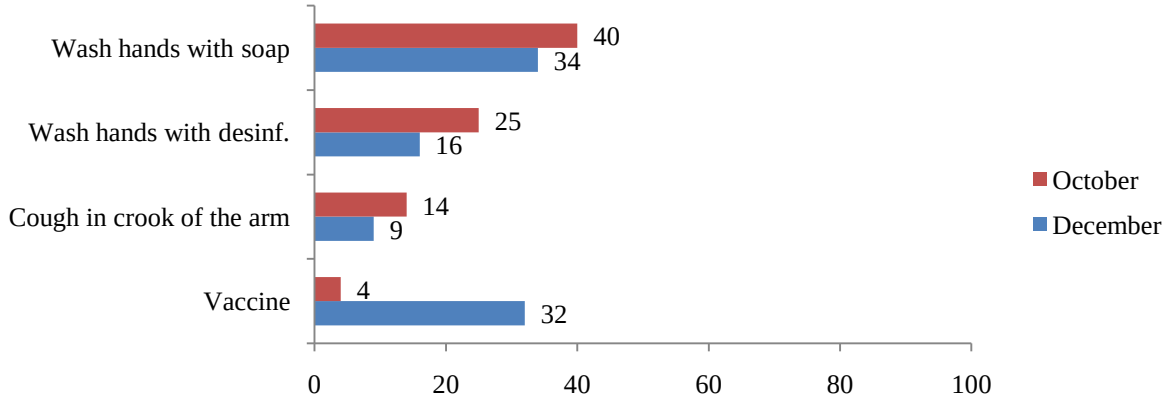


Figure 4 Frequency responses to open ended questions regarding measures the individual implemented to protect oneself or loved ones against infection in the months of October and December. Data presented by Synovate (2009) from the Opinion source. Figure adapted from Synovate (2009). Respondents were asked the question: have you implemented any measures to protect you or your loved ones from being infected, and if so, which ones?

Both surveys ask open questions and the most frequent answers are given in percentages. Figure 3 focuses on behaviour change the respondents have performed themselves in relation to the pandemic while figure 4 focuses upon single acts of preventive measures towards infection by the virus in relation to the respondents as well as others close to them. Specifically, the respondents represented in Figure 4 were asked to mention three concrete measures against infection (Synovate, 2009). The respondents in Figure 3 were asked to mention any concrete measures and the respondents were allowed to give several answers not just one.

Figure 3 shows that there was a decline from 48% to 29% in the months of August and November of those answering "no" to the question if they had done anything to prevent infection. Among the measures taken to prevent infection washing and disinfectant of hands are those mostly used, showing a small increase from August to November. The sharpest increase is related to the respondents' acquirement of medicinal equipment/vaccine going from 1% to 12% in this period. To sneeze against the shoulder[13] is the same for both periods. It should be mentioned that the advice from the health authorities says sneezing in the crook of the arm, not against the shoulder. The end result is the same: avoiding sneezing into the palm of the hand to avoid transmitting disease by touch.

Figure 4 shows a small decline in the use of general hygienic measures between the periods of October and December. In contrast use of the vaccine as a measure to prevent infection goes from 4% to 32% in the period. Synovate (2010) attributes some of the decline in hygienic measures to be possibly related to the increase of vaccinations as a measure to prevent infection towards oneself and others.

Measurements by Eurobarometer (2009) in November found that 38% of the Norwegians stated that they had changed their behaviour to protect themselves against the pandemic. When asked to mention how they changed their behaviour (of those who so indicated), mostly mentioned washing their hands regularly (78%), whereas fewer mentioned good respiratory hygiene (e.g. sneezing in tissue) (16%), avoiding places with large number of people (11%), avoiding people who are infected (10%), or got vaccinated (5%).

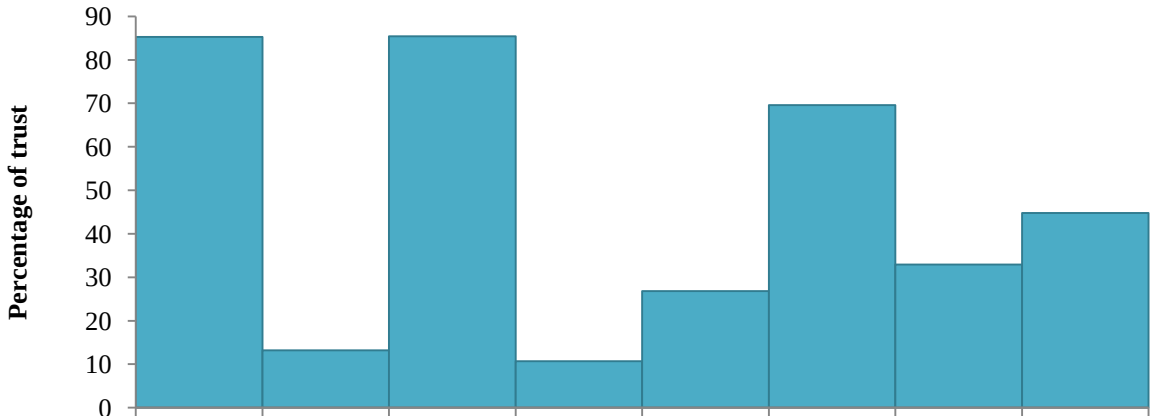
Regarding change of behaviour there was considerable deviation in Eurobarometer (2009) results as compared to the Synovate (2009) measurements in November. Synovate (2009) reports 29% while Eurobarometer (2009) reports 61%. The difference in reported behavioural change between the two may be attributed to Synovate (2009) asking if the respondents did something *actively* to prevent infection while Eurobarometer (2009) simply asked about behaviour change which in the latter case may imply a stronger sense of general behaviour change, as compared to the Synovate study (2009). In either case both measurements ask the same thing, namely change in behavioural measures used to protect oneself from infection.

Social trust: In this context the inclusion of results had to fulfil the criteria of measuring trust in the health authorities during the pandemic. Eurobarometer (2009) asked

[13] This expression is here considered equal to "cough in the crook of the arm".

their respondents to rate how they trusted different information sources, including, among others, the health authorities, to provide them with information about the pandemic. Synovate (2009) had two relevant measurements. The first asked the respondents to rate the statement: "I am confident the Norwegian health authorities are well prepared now that the swine flu has come to Norway". The second task asked the respondents to rate to what degree they were satisfied with the information from the health authorities through the statement: "Norwegian health authorities have given good and balanced information about the swine flu". Both reflect social trust since they concerned public willingness to rely on others for judgment about the risk.

Figure 5 shows the results from the Eurobarometer (2009) survey in November, NHA stands for the Norwegian national health authority. Figure 6 illustrates the first statement by Synovate (2009) presented above, and Figure 7 illustrates the second one.



	Trust NHA	Distrust NHA	Trust Proffesionals	Distrust Proffesionals	Trust Media	Distrust Media	Trust Internet	Distrust Internet
Total trust	85.3	13.2	85.4	10.7	26.8	69.6	32.9	44.8

Figure 5 Percentages of trust in information source in November 2009, Norwegian population of the Eurobarometer. Adapted from Eurobarometer (2009)

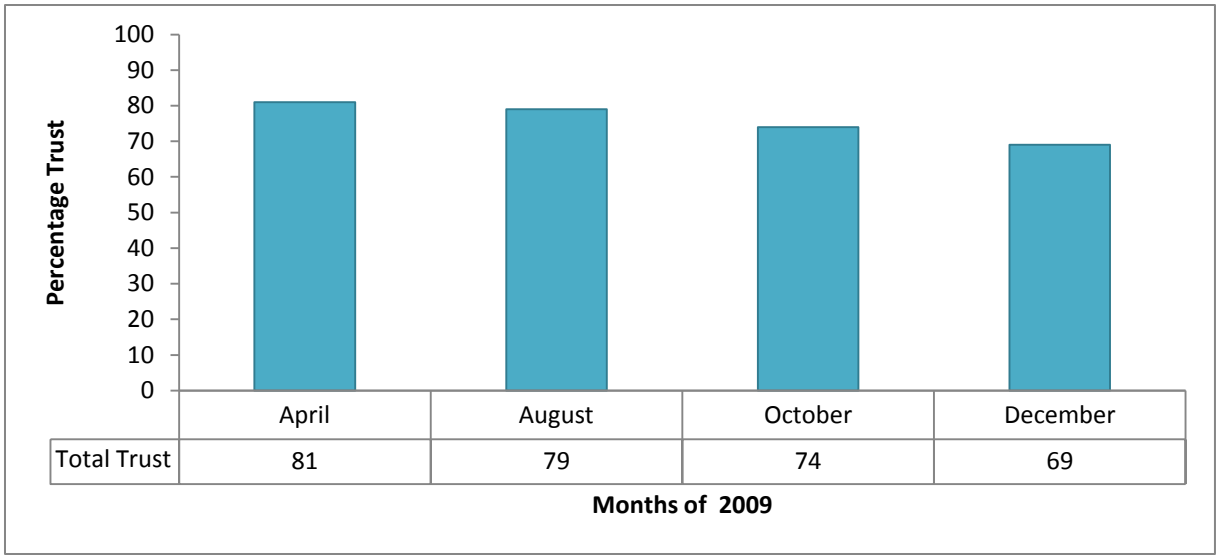


Figure 6 Percentages of trust in health authorities. Data presented by Synovate (2009) from the Synovate source in April and August, and Opinion source in October and December. Figure adapted from Synovate (2009). Illustrated are the respondents who agreed to the statement: I am confident the Norwegian health authorities are well prepared now that the swine flu has come to Norway

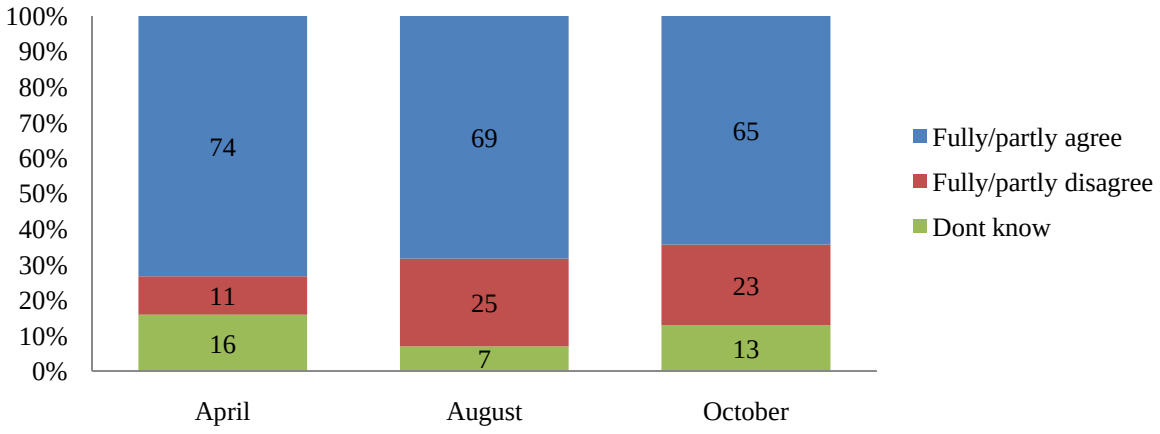


Figure 7 Public satisfaction with information from the health authorities. Data presented by Synovate (2009) from the Synovate source in April and August, and Opinion source in October and December. Figure adapted from Synovate (2009). Respondents were asked to rate their agreement to the statement: Norwegian health authorities have given good and balanced information about the swine flu.

The Eurobarometer data figures show that the Norwegian health authority was considerably trusted as an information source along with professionals (e.g. doctors and pharmacists) compared to other sources such as media (e.g. TV, radio, newspapers etc.) and the internet which were largely distrusted. It should be noted, however, that in most countries trust in national health authorities came second after trust in health professionals which were

considerable more trusted on average. The Norwegian findings of equal trust in both are limited to Norway only (Eurobarometer, 2009). Figure 6 based on Synovate (2009) includes only those who partly agreed/agreed fully to the statement. However, one can see that trust scores were considerably high throughout the pandemic with a slow decrease in trust as the main wave hit the country and the vaccine became available. It is important to note that the Eurobarometer (2009) study rated trust in information sources while Synovate (2009) rated public perception of the authority's capability to handle the pandemic. Nonetheless, the Norwegian authority enjoyed considerable trust in both respects. Lastly, Figure 7 shows that the Norwegian populace was largely satisfied with the information from the authorities. However, there was a doubling of respondent discontent regarding the information received from the authority between April and August, which is an increase from 11% to 25%. The majority was content however, and 74% in April to 69% in August were content, although this trend also shows that there was a steady, albeit small, decline in satisfaction.

Epistemic trust: Results relevant to epistemic trust in this thesis had to reflect public trust in scientific knowledge. Synovate (2009) had one relevant measurement where the polling firm asked the respondents to rate the statement: "the Norwegian authorities have exaggerated the danger from the swine flu". This statement is taken to reflect epistemic trust since it reflects a subjective estimation of authority estimations of the risk compared to their own. In this respect the statement to a lesser degree reflects social trust. Other relevant measurements by Synovate (2009) and Eurobarometer (2009) captured perceptions of the vaccine which is a kind of technological risk estimation and can therefore be assumed to be more related to epistemic trust (c.f. Sjöberg, 2008).

Synovate (2009) found that the majority of respondents felt that the authorities exaggerated the danger the pandemic posed (illustrated in figure 8).

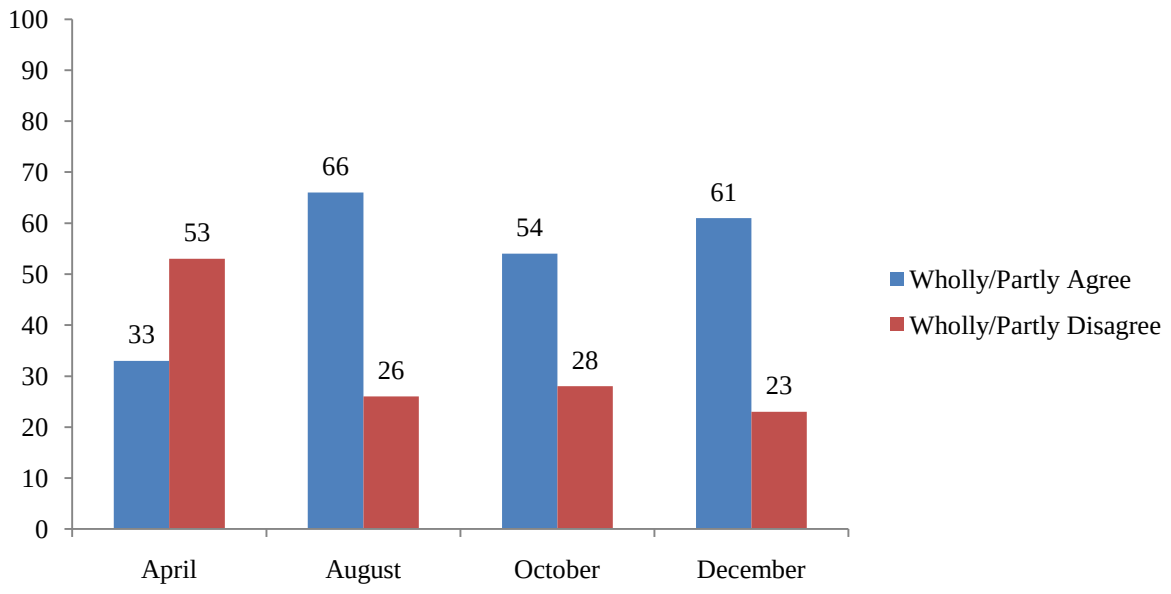


Figure 8 Public perceptions regarding that the health authorities have exaggerated the danger from the A (H1N1) influenza. Data presented by Synovate (2009) from the Synovate source in April and August, and Opinion source in October and December. Figure adapted from Synovate (2009). Respondents were asked to rate the statement: Norwegian authorities have exaggerated the danger from the swine flu.

Synovate (2010) partly attributed some of the negative trend seen in trust and satisfaction with information to the effect seen in this variable. The proportion of respondent's agreeing to the assumption that the authorities exaggerated the pandemic went from 33% in April to 66% in August. In October this trend backed somewhat (54%) but increased again in December (61%). The development in October could likely be attributed to the main wave hitting the country creating an increase in public concern which would indicate that the pandemic was considered real (Synovate, 2010).

The analysis by Synovate (2009) considered public willingness to take the vaccine in week 42, 43, 49 and 50 in 2009 (from middle of October to the middle of December). Measurements in week 42 and 50 were financed by the newspaper firm Aftenposten. Lastly, week 43 and 49 was financed by the Health Directorate.. The results are shown in Figure 9.

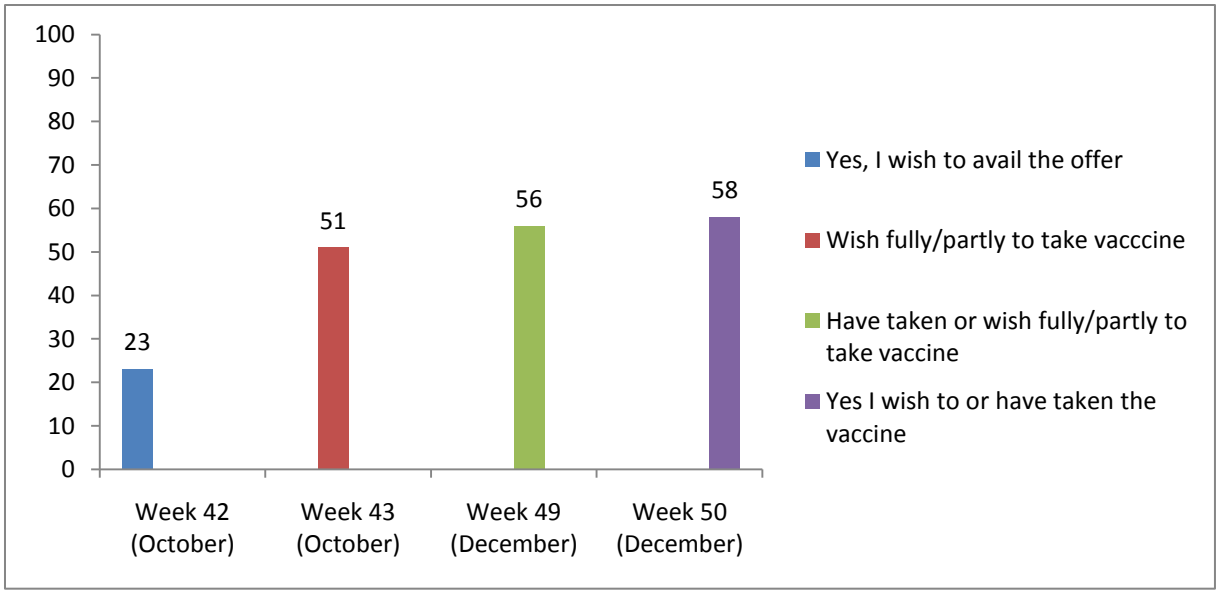


Figure 9 Changes in public attitude towards the vaccine. Data presented by Synovate (2009) from the Respons source in week 42 and 50, and Opinion source in week 43 and 49. Figure adapted from Synovate 2009. Respondents were asked different questions. Week 42 and 50: Do you think you are going to take advantage of the offer of flu vaccine? Week 43 and 49: Do you wish to take the vaccine against the swine flu?

This compilation of available information shows that there was a great increase from 23% wishing to take the vaccine in week 42 to 51% in week 43. A small increase was seen in week 49 to 56%, the same in week 50 with only a minor increase to 56%. The increase in willingness to take the vaccine between week 42 and 43 may be attributed to the vaccination campaign, increase in infection rate or increased media coverage (Synovate, 2010). However, Synovate (2010) also state that the results may be due to differences in the questions asked by the different actors. Results from these surveys are therefore directional at best. Results from Eurobarometer (2009) in November largely support the results from Synovate (2009). Most Norwegians in November thought it "very likely" or "likely" that they would get vaccinated if the vaccine became available to them (56%) versus those who though such action was "very unlikely" or "unlikely" (32.1%).

Media coverage: Some data on media coverage during the pandemic is presented Figure 10. The figure is adapted from the DSB report (2010). The data were collected by Retriever on assignment from the Norwegian Health Directorate. The DSB report (2010) uses the pandemic plans (HOD, 2006) definition of media as radio, TV, newspapers, journals and online media.

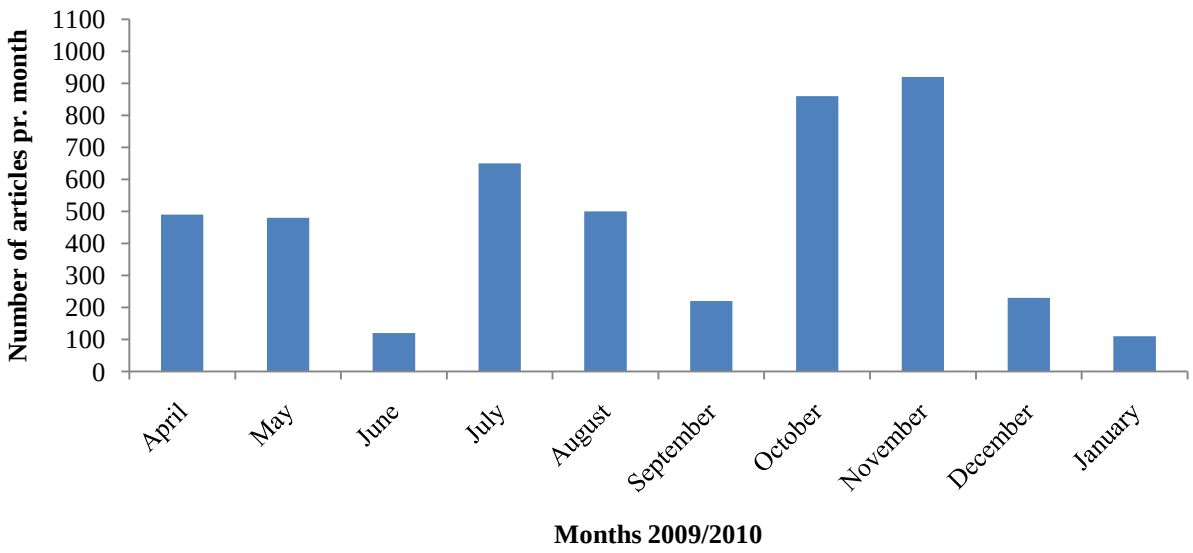


Figure 10 Data presented by DSB (2010) from the Retriever source on media coverage during the A (H1N1) pandemic from April 2009 to January 2010. Figure adapted from DSB (2010).

The figure shows that there was considerable media coverage in each month of the pandemic. In fact, the A (H1N1) was Norway's biggest media case in 2009 (DSB, 2010). The lowest coverage was in June, September, and December in 2009 and January 2010. Still, in these periods there were around 100 to 200 articles published. The highest points were in October and November 2009 which coincide with the biggest infection wave hitting the country. The number of articles published these months was between approximately 850 to 900.

Media focus also changed from month to month depending upon what the main events were during the time. The main focus of the media from month to month, from April 2009 to January 2010, is illustrated in Table 6.

Table 6 Media focus in Norway from April 2009 to January 2010

Month 2009/2010	Media focus
April	First Outbreak abroad and presentation of "worst case" scenario by the health authorities'
May	First detected infection in Norway and the continual global spread
June	First case of infection in Norway
July	Continued spread in Norway and preparations and preventive measures against the pandemic in Norway
August	Information about preventive measures
September	First registered fatality in Norway
October	Increased spread of the virus and vaccination
November	Spread and fatalities in Norway along with prescription free Tamiflu and discussions about the side effects of the vaccine
December	Decrease in number infected
January	General discussion about the side effects of the pandemic and the government's handling of the pandemic

Note. Table based upon data presented by DSB (2010) from the Retriever source on media coverage during the A (H1N1) pandemic from April 2009 to January 2010.

As shown in table 6 media foci were on some "danger" aspects of the pandemic, such as the presentation of the "worst case" scenario in April 2009 and fatalities in September 2009. Some other negative aspects of the media coverage were also reported in the months when the media focus were not reported to focus on the "danger" aspect of the pandemic, but rather on dramatic storytelling through exaggeration of the risk. For example, DSB (2010) state that an employee in the Stord municipality, central in handling the pandemic within his/her municipality, reported that when the vaccine started the 22 of October they weren't prepared for such a massive amount of people showing up wanting vaccination and the situation were described as chaotic. The Stord municipality employee attributed the situation to the media having exaggerated the situation and that the health authorities had not done enough to calm it. The example is not attributable to all municipalities in Norway, but it shows some of the challenges which arose due to media coverage.

For the most part however, especially in the months when media coverage was most extensive (see figure 10), the media focused upon conveying messages from the health authorities. DSB (2010) state that overall the media focus was mostly upon prevention and treatment of the influenza with a running update of disease and infection. "Seen in a public

health perspective most people received good access to advice about prevention and treatment trough the media" (DSB, 2010, p. 128). The health authorities tended to dominate the overall media picture during the pandemic and media coverage are said have reinforced the messages from the health authorities (DSB, 2010). In reference to what has been reviewed earlier in this thesis regarding the media, negative media focus, such as upon the presentation of the "worst case" scenario in April 2009, could have had negative effects upon public perception of risk.

4.0 Discussion

The thesis has so far pointed out that risk perception is an important determinant in future behavior. Specifically this work has focused upon the role of three main factors; personal experience, trust and media with respect to people's reactions to risk, knowledge and concerns. Both individual cognitive processing and more general framework factors have been described with the overall aim to provide a better knowledge basis for considerations related to the next pandemic situation. This discussion will mainly be related to the usefulness of this approach with respect to the next pandemic, specifically for Norway. As always, the overall aim is to enhance risk communication efficiency, and thereby risk management.

This chapter will start by establishing factors that can be generalized for the pandemic risk. It will then define a general framework of a future pandemic in Norway. The framework consists of three selected situational phases, a pre-pandemic, main pandemic, and post-pandemic phase. The pandemic framework will provide the basis for a general discussion of risk perception and risk communication on a national basis in Norway. The thesis will then present four selected situational alternatives, based upon predictions of likelihood and severity, which may occur during a pandemic requiring more specific risk communication. Considerations of risk perception and the use of the different tools of communication; the ELM model, mental modeling, and the RISCOM model of transparency, will be presented and elaborated upon both in the general framework and within the selected possible phases which may occur. A conclusion will be based upon the discussion.

4.1 General factors of the pandemic risk

There are several factors which are generally given for the entire pandemic risk which will be detailed before describing the pandemic framework for a future pandemic in Norway.

Firstly, the division of responsibility among the health authorities has already been outlined in HOD (2006), National Health Care Plan in 2007 and the Disease Control Act 1994 (see DSB, 2010). The organization of risk management, risk assessment and risk communication will therefore be largely the same as in the latest pandemic (DSB, 2010).

Secondly, the pandemic risk will receive a lot of attention from the already existing general media which are controlled by external actors (e.g. TV, radio, internet, etc.), as seen

during the latest pandemic by the analysis by the consult firm Retriever (see DSB, 2010). As such, these channels of communication already exist and will be used by the health authorities throughout the pandemic to provide regular situational updates about the pandemic risk (i.e. dissemination of their risk assessment so far) as detailed by the Pandemic plan (HOD, 2006). Other channels will have to be developed and run by the health authorities and will be further discussed within the pandemic framework.

Thirdly, it will take time to produce concrete scientific information and measures. This was seen during the latest pandemic with scientific information coming "piece meal" over time (see Tables 2 – 4). As such it will take time to, for example, produce concrete messages to the public or to produce a vaccine. Communication of risk, when scientific information is lacking, will have to rely on what is "common sense" based on prior knowledge and experience.

Fourth, since pandemics generally occur within a 10-40 year interval (HOD, 2006) it is reasonable to assume that the majority of the public will have prior experience with a pandemic. As such it is important to take note of the public's prior experience with a pandemic since it will affect their reaction to the next one. Further, public risk perception of the pandemic risk will develop over time contingent upon situational factors of risk perception such as media coverage, increase in number of fatalities and so on. Risk communicators will therefore have to take into account the risk perception development when formulating their messages.

Lastly, the amount of attention the pandemic risk will receive from the general media, and likely also from other external sources of information (e.g. other experts and organizations), may at best simply disagree with the health authorities and at the worst launch/show open opposition which may create controversy. The media attention can be a blessing for the health authorities wishing to convey their messages to the public. It may also be a curse if the media presents opinions from external actors in opposition to the health authorities' information and advice, or if they, for example, have a disproportional focus on rare health risks as opposed to the more common public health effect of the pandemic (c.f. Ackerson & Viswanath, 2010) or just focus upon dramatic storytelling (c.f. May, 2005). As such the media and external sources of information may exaggerate or possibly downplay the pandemic risk. Due to the relatively unforeseeable and unreliable nature of the media and external sources of information it is important that risk communication efforts aim at

providing the public with "tools" which give them the ability to critically analyze information so they can decide for themselves what constitute correct information and risk mitigation measures for them. In other words, to provide them with "tools" which promote central route processing of information from different sources (Petty et al., 2005; Petty et al., 2009).

4.2 Framework of a future pandemic in Norway

The pandemic framework detailed here is based upon four assumptions about a future pandemic. Firstly, a potential pandemic risk is identified when WHO declares pandemic phase three signaling a possible human to human transmittable virus, for example, as seen during the latest pandemic (DSB, 2010). Secondly, the thesis assumes that the pandemic virus will be identified outside the borders of Norway. Should a pandemic virus be identified within the borders of Norway this would require another approach than that being discussed in this thesis. Lastly, the thesis assumes that the Norwegian health authorities will have no knowledge of (i) the speed of which the virus spreads and (ii) its potential severity. The reason being that the speed of the spread and severity of prior pandemics have varied and do not provide a secure basis for estimating the development and effects of a future pandemic (see Table 1). The effects of a future pandemic cannot be effectively measured before it is actually observable, and even then it will take time for the risk assessors to provide confident risk estimates as seen during the latest pandemic (see Tables 2 – 4). Thus, valid information about the severity of the virus will most probably require time. A future pandemic may spread slowly, or it may spread fast; it may be severe or it may not. What characterizes the different phases presented here is therefore the geographical spread of the virus as defined by WHO pandemic phases (see Appendix C).

Based upon these assumptions and the WHO pandemic phases the thesis specify three selected possible pandemic phases which outline the framework of a future pandemic: a pre-pandemic phase, a main pandemic phase, and a post-pandemic phase.

The *pre-pandemic phase* is characterized by the detection of a possible pandemic virus outside the borders of Norway and it lasts until the virus is introduced into the country. In terms of the WHO pandemic phases the pre-pandemic phase starts when WHO declares pandemic phase three (WHO, 2009b). This phase may last until WHO declares pandemic phase six. The general goal of the health authorities during this phase is to delay the

introduction of the pandemic virus into Norway and to prepare itself and the public for an impending pandemic.

The *main pandemic phase* is characterized by an identified pandemic virus being introduced into Norway and lasts until the pandemic has run its course, meaning that the main wave of infected is in decline signaling the beginning of the end of the pandemic. The earliest possible WHO level during this phase is level five since it signals transmission from one nation to another, thus, signaling an impending pandemic (WHO, 2009b). The WHO announcement that the pandemic situation has reached the post-pandemic period marks the end of this main phase. The general goal of risk communication during this phase is to limit the spread and effects of the pandemic to enhance and ensure public health and lives.

The *post-pandemic phase* starts when the number of infections, sicknesses and deaths related to the pandemic is mainly over. In terms of the WHO phases, this phase starts when WHO declares that the pandemic has reached the post-pandemic period. There may still be occurrences related to the pandemic virus, but such events are isolated events and not a representation of the overall situation in Norway. Furthermore, a large portion of the population is immune to the virus, or less exposed due to herd immunity, and the pandemic and its associated risks for the overall society are for all intents and purposes over. Risk communication during this phase is one of follow-up, including the consideration and evaluation of the prior pandemic.

4.3 Risk communication during the pre-pandemic phase

To achieve the general goal during the pre-pandemic phase, the authorities' risk communication will follow the general outline detailed above of providing the public with regular situational updates about the pandemic risk, so they are aware and updated of the pandemic, and to promote measures against the spread of the pandemic risk. However, the pre-pandemic phase will be characterized by a general lack of specific scientific information, especially early on, with which to form concrete counter-measures (e.g. vaccine) and specific risk communication. By specific risk communication the thesis means communication aimed at the individual. For example, if scientific information shows that young people are at greater risk then specific risk communication will be the construction of messages aimed at individuals in this group. The lack of specific scientific knowledge means that the health

authorities will have to promote measures to the general public which are based on "common sense" in their ability to delay the introduction of the virus into Norway and to limit the effect of the virus once introduced. "Common sense" measures are measures which are generally known to be important against a virus and pandemic risk. Examples of such measures are the promotion of hygienic measures, travelling advice and so on. These measures cannot entirely solve the pandemic risk, but are effective at limiting the spread of the virus and may delay the introduction of the virus into Norway.

However, the effectiveness of general situational updates and promotion of "common sense", and later specific measures (e.g. vaccination), will be contingent upon several *general requirements* which must be established during the pre-pandemic phase, and considered and maintained throughout the pandemic, to evaluate the provision of effective risk communication. Firstly, the health authorities need to be trusted as a good and reliable source of information which can make judgments of the pandemic risk on the behalf of the public (c.f. Drottz-Sjöberg, 2003; Siegrist & Cvetkovich, 2000). Secondly, the health authorities need to reach as many people as possible. Lastly, public risk perceptions will have to be considered when formulating messages of protective measures to the public. This is important when the health authorities as of yet do not know how serious the pandemic risk is, and especially if later scientific information shows it is serious. All requirements are closely related, but the two first requirements must be established first to even consider risk perception when constructing messages to the public. The main focus here will therefore be on these two first conditions. If the health authorities are not trusted or cannot communicate to the overall public then further attempts at risk communication will have very limited effects or be in vain.

4.3.1 The importance of trust and self-established channels of communication

To be trusted as a good source of information one has to, for example, provide the public with regular information through various channels which provide information at varying degrees of specificity. Some people will want much information, some will want little. Some will want information related to them (e.g. parents, teachers, etc.), some will be content with general information. The "regular" channels controlled by external actors (called general media from now on) are important channels since they may reach a lot of people. However, the general media provide a somewhat limited arena in which to convey messages.

Newspaper, newscasts, radio broadcasts, etc., will require short simple messages summarizing the main parts of the FHI risk assessments so far; along with short examples of protective measures (DSB, 2010). As such the channels do not provide a reliable basis in which to reach all the potential different groups wanting different information. Further, the general media may also be distrusted to various degrees as an information source by some or most of the public, as was the case in the latest pandemic (Eurobarometer, 2009), and the public may therefore be disinclined to listen. Or they may be mistakenly trusted, which may provide other challenges if, for example, the general media focuses upon dramatic storytelling (May, 2005) and thereby exaggerate the pandemic risk. Or conversely, they may downplay the severity of the pandemic risk and thus hinder precautionary measures.

If the health authorities do not reach all the different population groups, or just present summarized information, then those groups may look elsewhere for information (e.g. external self-declared experts suggesting alternative solutions) and consequently come to distrust the health authorities. Such developments would in all likelihood, have a general negative effect upon public trust in the health authorities and at best portray them as an incompetent source of information not worth listening to (Siegrist & Cvetkovich, 2000), or at worst, see them as non-caring and antagonistic, which would increase public risk perception (Sjöberg, 2008). This again may lead to external sources of information getting a foothold in defining the discourse of the pandemic. Such development may prove faulty at best (e.g. giving bad advice or creating controversies) and disastrous at worst should the pandemic be severe. Further, if the general media is allowed to control which information are deemed relevant, or how information should be presented, then public risk perception will likely be heavily influenced by them, as opposed to the health authorities.

To hinder or mitigate the possible negative effects from the media, and to provide correct and sufficient information to the public, it is important for the health authorities to establish communication channels in which they themselves construct the message content. Most easily established during the pre-pandemic phase are web pages, which have been shown to be frequently used by the public (DSB, 2010). Such web pages can contain information aimed at different groups (e.g. summaries, information to pregnant women, etc.) which can be presented in a more sober manner relative to the general medias' presentation as of how to mitigate possible effects. Examples of subsequent communication means are the introduction of pandemic phone lines and brochures distributed at hospitals, local health clinics and pharmacies and so on, which will require more scientific information to be viable

for good solutions. Finally, by providing much differentiated information through easily accessible channels the health authorities establish themselves as a trusted source of information. Trust is the result of action, for example, good and correct information, and that the suggested measures actually work. Information on such channels should also be presented in a clear and respectful manner as to prevent misunderstandings (Fischhoff, 1995). They should also, whenever possible, establish two-way communication, meaning that the public should, for example, be able to ask questions or to request more information (e.g. a question and answer page on the web page). Such multifaceted efforts would further facilitate public trust in the health authorities. Such two-way communications may also make the health authorities' aware of public concerns of which they were not aware of, and these concerns may then be addressed as they arise.

4.3.2 Risk perception's role in promoting protective measures

Considerations of public risk perception are important when communicating protective measures to the public since it is an important determinant of public behavior (Brewer et al., 2007). The role of risk perception is therefore, in this thesis, specifically relevant when providing messages which are meant to promote protective behavior. If public risk perception should be low, with respect to the risk of a novel virus, then the impact of the warning messages are likely to be less effective, due to the view that the pandemic risk is not warranting protective measures. Conversely, should public risk perception be high then the suggested measures by the health authorities may be seen as lacking and insufficient, consequently reducing public trust in the authorities. However, public risk perception will vary contingent upon different variables in each pandemic phase.

In general however, one can assume that risk perception will increase and decrease along with the amount of media coverage (Wåhlberg & Sjöberg, 2000) and how the stories are perpetrated (Ackerson & Viswanath, 2010; May, 2005). Considerations of the effects of the media coverage on risk perception will therefore have to be continually evaluated by the health authorities as the pandemic develops. The thesis assumes that the health authorities will balance the effects of the media, and will be largely trusted, by following the general risk communication strategy of providing situational updates and information through the communication channels they have established to inform different societal groups in the population; that is, provided they do not perpetrate themselves in an antagonistic manner (c.f.

Sjöberg, 2008). It is the promotion of protective behavior, through "common sense" or specific information, aimed at individuals which further strengthen this trust.

Considerations of public risk perception when constructing messages are to be based at the specific group and individual level. The thesis has provided different theoretical tools with which to measure and analyze public risk perception: the psychometric model and the mental model approach. The psychometric model may be used to measure the level of different factors, consisting of many items, which make up the average risk perception of the pandemic risk in specified groups (Slovic et al., 1982; Sjöberg, 2000a). Usually based on questionnaires, it is faster and easier to execute than the mental model approach, which is why it would be most practical to use first to get an insight into public risk perceptions. Based upon such results one can determine which factor(s) should be considered when choosing and formulating messages to the public.

For example, due to prior experience with a surprisingly mild pandemic with little experience of adverse effects one can assume that initial measurements in the pre-pandemic phase will show that the public does not dread the pandemic risk and feel they are knowledgeable about a pandemic risk (c.f. Weinstein, 1989). This may then explain why the public does not adhere to the promoted "common sense" measures during the pre-pandemic phase. Risk communication will therefore have to provide information that challenges this view since it is not fully warranted. This would require at least explaining that the characteristics of the latest pandemic cannot be attributed to this pandemic so one does not know how dangerous the pandemic may be at this stage; one should therefore prepare for the possibility of a serious pandemic until scientific information proves otherwise. Regular use of the psychometric model over time will give an overview of the average risk perception development and give some insight into the messages' effectiveness. Should later measurement show the same results, especially if scientific information seems to suggest a serious pandemic, then this is a cause for concern. Either the message construct was ineffective and will therefore have to be readdressed or the message content was deemed irrelevant by the public. It is with this concern in mind that the mental model approach should be applied to ensure effective risk communication (i.e. effective message content and construction).

The mental model approach, as described by Morgan and colleagues (2002), has the advantage of targeting knowledge gaps, or cognitive "barriers", which may hinder appropriate

behavioral change and it provides an information organizational structure of the message content to make it reader friendly. If the public does not follow the promoted measures even though risk perceptions are measured as high by the psychometric model, or when risk perception may be low even though the general information provided says otherwise, then this suggests that there is something wrong. As said, either the messages are not working and must be readdressed, or there may be a knowledge gap, or cognitive "barrier", which prevents appropriate behavioral change (e.g. the message is seen as irrelevant).

For example, it is likely that prior experience with a surprisingly mild pandemic may have established a cognitive "barrier" that excludes large severe effects which needs to be addressed so that the public may see the sense in the "common sense" measures promoted during the pre-pandemic phase. The public may think that hygienic measures, such as washing of hands and sneezing/coughing in the crook of the arm, will have no effect since the pandemic will arrive and spread anyway. Or they may think some measures are ineffective as suggested by Synovate (2009) measurements on sneezing/coughing in the arm during the latest pandemic. One must then formulate specific information aimed at removing this wrongly perceived fact so that the public does see the sense of such a protective measures. This may involve a scientific explanation, simply organized and illustrated to make it reader friendly and prevent misunderstandings, which shows the effect of the different hygienic measures and explains why all should be used, or some more than others. One should also highlight that the hygienic measures are important to prevent infecting possible risk groups and so on to put the message in a bigger context.

It is important to note that the mental model approach in theory only addresses the targeted population group (Morgan et al., 2002). In other words, if one targets and constructs a mental model of the general public then the messages are tailored to them. It is therefore important to also target other important groups, such as possible risk groups, to identify cognitive "barriers" relevant for only this group. The psychometric model may be used to identify specific groups warranting special attention. The mental model approach can then be used if attempts of risk communication to the groups prove ineffective. Lastly, the message content should be organized and constructed to inform its intended audience and suggest protective measures; no attempts of manipulation are to be performed. It is left to the recipients to judge the relevance of the message content. At best attempts at manipulation will be perceived as unethical and immoral. At worst, and more likely, it will lead to outrage

should it surface that the health authorities' attempt to manipulate their recipients, and it would thereby destroy public trust in the health authorities.

The downside of the mental model approach is that it requires time to produce and it provides much information which cannot easily be transmitted through the general media. One will likely find a few cognitive barriers which will need to be addressed, some more important than others, and they will require more information to prepare for action or intervention than simply saying "this is wrong". The arguments to why something is a wrong perception will have to be substantiated and arguments supporting the promotion of protective measures by the health authorities will have to be produced. This information will be collected from different experts from expert fields deemed relevant. Web pages, brochures and other channels that allow much information to be included are needed to transmit such messages. Again, it will take time to produce and transmit such messages. However, such an endeavor is important to ensure effective promotion of protective behavior to the public.

4.3.3 Providing the public with "tools" for critical analysis of message content

Lastly, in the pre-pandemic phase, we address the issue of providing the public with "tools" that promote central route processing by which the individual can use to critically address information emanating from the different information sources which are likely to be available. The preparatory work starts during the pre-pandemic phase and must be maintained in the other phases. The first stage in ensuring that incorrect external sources of information do not get a foothold in defining the discourse during the pandemic has already been established. However, one cannot rely on general information sharing and promotion of "common sense", or specific, protective measures to provide the public with enough "tools" of evaluation. Promotion of central route processing requires that the public is motivated and able to evaluate the message content (Petty et al., 2005; Petty et al., 2009). The thesis assumes that the public must be motivated to gather information due to the potential pandemic health risk which is impending. However, this will require supplying them with information which gives them the knowledge basis to effectively assess the information they are provided.

The mental model approach is again a viable option to effectively map possible knowledge gaps which may limit or hinder such an evaluation. This would require experts to evaluate what information is needed to make such judgments (e.g. what is a pandemic virus,

how does it spread, how can risk estimates be interpreted etc.). The model will likely have to be used several times to be effective. However, simply providing the public with information aimed at education does not ensure that everyone will read it. Some will skip through it, some will not. Some may take it to heart, some may deny it. To further ensure that one promotes central route processing in the public the thesis advice the use of the RISCOM model of transparency, an arena of discourse, where central route processing is required.

The *RISCOM model of transparency* is a theoretical model of discourse between different stakeholders. Within the pandemic risk the model's intended use is to establish an arena wherein the different stakeholders can meet and challenge each others claim to truth, legitimacy and authenticity (c.f. Andersson et al., 2006). This goes both ways, the stakeholders may challenge the health authorities, and the health authorities may challenge the stakeholders. The discussion should preferably be open for the media to attend (Drottz-Sjöberg, 2012). This involves inviting journalists to attend the meetings. Afterwards they are free to decide if they want to produce news stories of the meetings. It is important to note that inviting the media should preferably be done in larger meetings of importance, that is, meetings where the topics for discussion have been clarified (i.e. what is the problem and how to solve it) and where the format for discussion has been tailored and clarified by the reference group and accepted by the participants. Further, should media attendance be deemed as disturbing for the discussion process by the stakeholders and/or reference group then the reference group will have to evaluate postponing of the invitation of the media.

The use of the RISCOM model requires time and thought before being implemented. The success of the model is build upon stakeholder participation. Stakeholder participation involves inviting groups which are important for the topic of discussion (e.g. experts in scientific fields, and/or population groups, relevant for the discussion matter) while keeping the arena open for other individuals or groups to attend which have a stake in the discussion. The organization of the meeting is decided by the reference group (e.g. how many people can actually attend and how one should organize a fair participation for the different groups etc.). The goal is for the different stakeholders to present their point of view on the topical matter. If, for example, identified risk groups do not participate in the discourse arena there are not any incentive for them to follow the discussion. As such, this is no incentive for them to use cognitive effort to analyze and evaluate the discussion and the internal considerations. If they are included, however, then their point of view may be challenged by the health authorities

and vice versa, that is, using the idea of "stretching" (Andersson et al., 2006). Again this will likely promote central route processing for all involved.

In terms of initial implementation of the model during a pandemic, the health authorities could have the responsibility to initiate its use on a national level (and regional or communal level if deemed necessary). Though in theory other governmental agencies, or external organizations and so on, may also initiate its implementation on a national, regional or communal level. The selected reference group will assume overall responsibility for organizing subsequent meetings. It could therefore be the health authorities which have the initial responsibility for evaluating which stakeholders groups are invited to participate in the discussion. Stakeholders to attend are somewhat defined by scientific information (e.g. identified risk groups, children may be more exposed requiring a representative for the parents, etc.). However, the health authorities will beforehand have insight into "traditional" risk groups, groups which are generally at greater risk from diseases, such as people with underlying diseases, very young or old people. Given such a framework the model can be used in the pre-pandemic phase. Further, as said, it is important that the arena is open for all potential stakeholders outside those defined early on by the health authorities to participate, and some thought can be invested in how to announce such invitations.

Lastly, it is important to note that the RISCOM arena is an arena of mutual respect for each other's opinions and views. As already mentioned, the discussions within the arena are built upon the tailored format of discussion decided by the reference group (Drottz-Sjöberg, 2012). The meetings may develop into a situation of heated debate, but the format does not allow the debate to involve, for example, unfounded criticism and accusations. Principles of respectful two-way communication are built upon fair and equal treatment and participant inclusion in the discussion, not indirect exclusion of participants in the discussion through, for example, use of rhetoric strategies aimed at weakening selected participant credibility. It is the role of the reference group, and the chair of the discussion, to ensure that everyone follows and maintain the structured format for discussion. While the process guardian has the responsibility for preventing possible concealed manipulation from any of the discussion partners (Andersson, et. al., 2006; Drottz-Sjöberg, 2012).

To summarize, it is advised to use both the mental model approach and the RISCOM model of transparency to promote individual central route processing in the populace. The mental model approach is more educational in its approach while the RISCOM model is more

practical, an arena where points of view can be discussed and challenged, and therefore helpful in developing better "tools" of communicating risk and evaluating message content. The result of central route processing is more durable attitudes and subsequent behavior resistant to contrary information (Petty et al., 2009). It is important to note that the central route processing means that the individual may decide to adopt an attitude or behavior which is not in line with, or contrary, to that promoted by the health authorities. According to ELM this decision is made because it is the most helpful for the individual to get through the pandemic (c.f. Petty et al., 2005). However, providing the population with "tools" for evaluating message content is not meant to be only the individual in relation to oneself. Successful use of the mental model approach and RISCOM model means that the individual would also be made aware of the risks one may impose on others by ones actions. Should a significant portion of the public decide to adopt a behavior which can be defined as unhealthy for the individual and/or others, given the pandemic risk, then something has clearly gone wrong. The health authorities must then quickly readdress their messages and use suggested methods to see if they can identify what has gone wrong.

4.4 Risk communication during the main pandemic phase

The main pandemic phase presents more direct challenges to risk communication since the pandemic virus have been introduced into the country. As always the health authorities will continue with giving regular situational updates and promoting protective measures. However, should the pandemic reach the country relatively early, before one have acquired enough scientific information to produce specific risk communication, then this phase will continue with the promotion of "common sense" measures started during the pre-pandemic phase. However, should this be the case then the promotion of "common sense" should be (i) more aimed towards commonly known risk groups and (ii) known high risk places. Information specifically aimed at the risk groups involves an increased emphasis on providing them with information about the known symptoms of the pandemic virus along with recommendations of preventive measures, such as, contact the local doctor or hospital if one shows these symptoms. The goal is to protect their health and secondly to present more direct information about the pandemics health risks to such groups. Effects on the general public will be observable over time; the priority is the known risk groups. Information aimed at high

risk places are locations where many people gather, such as schools or hospitals where the pandemic virus may spread quickly and/or put risk groups at greater risk of infection.

As more scientific information becomes available over time during this period one can assume that one of four selected situational alternatives will characterize the pandemic risk. The situational alternatives are based upon estimations of likelihood and severity of the pandemic risk, that is, how probable is it for the average citizen to get infected by the virus and what are the consequences of subsequent infection. It is the role of the risk assessor (i.e. FHI in Norway) to identify the current and/or possible future situation. Note that the selected situational alternatives discussed here are generic and illustrate the overall national pandemic situation and is not necessarily applicable to regional and communal situations which may arise. Further, should there be enough scientific information during the pre-pandemic phase to make reliable estimations of likelihood and severity then they will follow the examples of specific risk communication described here.

Alternative 1: Low probability – low consequence situation (LPLC). A LPLC situation is characterized by a low probability of getting infected, and if one is infected the consequences are also low. Mitigation of the pandemic risk can be described as routine with little to no acts of concrete preventive measures or acts of risk communication, simply because there are no problems due to the mildness of the pandemic. The risk communication strategy can therefore be the same as described up to this point, since there may still be risk groups at higher risk, with a constant surveillance of the pandemic situation should the virus mutate and develop into one of the other situational alternatives.

Alternative 2: High probability – High consequence situation (HPHC). A HPHC situation is characterized by a high probability of getting infected, and if one gets infected the consequences are likely to be severe or deadly. This situation is close to the "worst case scenario" defined by the Pandemic plan (HOD, 2006) and can be defined as a crisis. The main concern for the risk manager in Norway is to maintain and increase the essential community services, and through this, try to reduce sickness and deaths (HOD, 2006). This situation would require short time decision making and likely authoritarian risk management (e.g. forced quarantine, mandatory vaccination, etc.) and communication of risk and risk mitigation to ensure public health and lives. This situation falls into the area of crisis communication and therefore outside the framework of this thesis due to its focus upon risk communication as detailed in the introduction.

Alternative 3: High probability – low consequence situation (HPLC). A HPLC situation is characterized by a high probability for the average citizen of getting infected but a low consequence of any adverse effects from infection. This alternative is relatively similar to the latest pandemic. There are three main characteristics of this situation. Firstly, even though the pandemic virus is not dangerous to the average citizen it is still likely to be dangerous for known and identified risk groups. In other words, the risk groups are statistically likely to get infected and run a statistically larger risk of severe consequences from infection compared to the average Norwegian citizen. Secondly, even though the average citizen if not at great risk the virus may still causes some cases of severe illness and fatalities in the general public. Lastly, there will be a relatively large main pandemic wave in this situational alternative which will cause a high sick leave from work which may be disadvantageous for the society as a whole, and specifically adverse for the personnel in health services.

Risk communication during this situation is therefore posed with two main problems which will require the promotion of specific measures. Firstly, one must promote specific risk mitigation measures to the risk groups themselves. Secondly, one must promote protective measures to the general public designed to (i) ensure the health of the risk group, and (ii) minimizes the chance of fatalities and sickness in the general public. The thesis will address the risk groups first and then the general public.

Risk groups: Specific measures for the risk groups during this situation are aimed at providing them information on how to protect themselves from infection. First and foremost it is important to provide regular information about a potential vaccine if it is not available yet. If it is available then the risk groups become the first priority along with critical personnel such as hospital employees (HOD, 2006). The communication of risk will then largely follow the patterns seen during the first vaccination campaign during the latest pandemic. However, if the vaccine is not available this situation presents a greater risk to the risk groups than in the other situational alternatives due to the relatively ease of getting infected by the virus. As always it is important to communicate "common sense" measures such as hygienic measures, along with more specific "common sense" measures this situation would require for the risk groups, such as avoiding public areas with a large concentration of people.

Cause for concern when communicating risk to the risk groups in this situation is if they do not follow the promoted protective measures from the health authorities. It is possible that the risk groups might have become habituated to the risk; that is, denying or avoiding, or

otherwise decreasing perceived risk, if the general media and health authorities do not report any adverse events relevant for this group which may mitigate this effect (c.f. Lima, 2004). It is then important to continually update who constitutes the risk groups to avoid possible undetected "gray areas" (e.g. people with underlying diseases, pregnant etc., some risk groups will be identified through scientific information, some are known beforehand) and remind them of the possible severity of the pandemic risk so they do not forget or lower their risk estimates (c.f. Wåhlberg & Sjöberg, 2000). Another likely scenario however, is reports of fatalities belonging to the risk groups, as seen during the latest pandemic (DSB, 2010). Individuals in the risk groups should theoretically perceive the pandemic risk as severe for them. If the individuals in the risk groups do not follow the health authorities' advice it may be because they are not aware they belong to a risk group, or maybe deem the promoted measures as inadequate in mitigating the pandemic risk. In other words, the individuals will trust their own knowledge to make judgments about the pandemic risk and not rely on the health authorities (c.f. Drottz-Sjöberg, 2003; Siegrist & Cvetkovich, 2000).

It is important for the health authorities to identify possible misunderstandings and misrepresentations of the pandemic risk which may cause the individuals to ignore health authority advice. Again, this is an arena best addressed by the mental models approach which may be used to identify knowledge gaps or cognitive "barriers" which limits or prevents the adaptation of healthy behavior. Identified knowledge gaps or cognitive "barriers" may then be challenged and new knowledge can be provided which, if the recipients judge the knowledge as relevant, may supplanted the knowledge gaps thereby promoting healthy behavior.

The general public: Communicating risk to the general public during this situational alternative should most importantly be aimed towards decreasing the chance of infecting potential risk groups, as well as limiting spread in general. Should the vaccine be available then risk communication will be the same as seen during the second vaccination campaign during the latest pandemic (DSB, 2010). Should the vaccine not be available then it is important for the health authorities to continually emphasize the use of "common sense" protective measures designed to limit the spread of the virus.

However, as opposed to the risk groups the general public is more likely to become gradually habituated to the pandemic risk unless adverse events are being reported that would mitigate this effect (c.f. Lima, 2004). The public is likely to reduce their risk estimates over time, possibly choosing to forego protective behavior. It is also reasonable to assume that as

the public derive more knowledge about the pandemic risk, and does not experience any adverse events which may contradict this knowledge, they are likely to increasingly trust their own knowledge to judge the pandemic risk and not rely on the warnings from the health authorities' (c.f. Drottz-Sjöberg, 2003; Siegrist & Cvetkovich, 2000). For the average citizen this in itself is not a wrongful judgment leading to risky behavior towards themselves and other people. However, should the general public forego protective measures to limit spread then it will increase the risk of infecting risk groups. As such it is important to formulate messages specifically aimed towards the general public, informing them and making them aware of also the intention to safeguard risk groups, and in other words, to promote solidarity.

In general terms this would require repeated communications of the pandemic risk and the general public responsibility towards the risk groups so they do not forget and lower their risk estimates (Wåhlberg & Sjöberg, 2000) due to a habituation effect (Lima, 2004). More specific messages can be constructed by using the mental model approach which may identify knowledge gaps which may be used to develop more concrete messages aimed at protecting the risk groups. Further development of the "tools" of evaluation provided by the health authorities in the pre-pandemic phase is also important since something has gone wrong if the general public fails to take into account risk groups when evaluating the pandemic risk in relation to their own behavior towards others. This would be facilitated by the use of the RISCOM model, in addition to mental modeling, to promote "stretching" of argumentations in the different stakeholders in the discussion; most importantly between the representatives of the risk groups and those representing the major population groups (i.e. the general public).

Alternative 4: Low probability – high consequence situation (LPHC). During a LPHC situation an individual will have a low chance of getting infected by the virus but would experience severe adverse effects from being infected. In this situation merely getting infected may have dire consequences for the average person; however, as always, known and identified risk groups will be considered to be at greater risk from infection. Should this situational alternative be clear during the pre-pandemic phase then reports from the general media and the health authorities will be of severe effects and fatalities abroad. Should the situational alternative arise during the main pandemic phase then it is reasonable to assume that the severe effects and possible fatalities have already been reported within Norway. Whichever the case the early reports of severe incidents and fatalities will create a tense situation due to the severity of the pandemic for the average citizen. As such this situation will

likely not be remedied by communicating expert assessment of low probability of infection, what matters for the public are the consequences if one is infected (c.f. Sjöberg, 1999b).

The main challenges for risk communication during this period are therefore to limit the potential spread of the pandemic and, more importantly, inform the public of what to do *if* they get infected as to minimize the consequences of getting infected. Since both the average citizen, and individuals in the risk groups, are at risk of suffering severe consequences the message to both groups are more or less the same. Given that scientific information do not provide information proving otherwise such as people with respiratory illnesses *will* die. This would again likely require mandatory quarantine of such groups falling into the area of crisis communication. Should a vaccine be available then risk communication efforts are aimed towards promoting the use of the pandemic vaccine to limit spread and ensure public immunity. As per the pandemic plan (2006) the risk groups are still prioritized as, all things being equal, they are theoretically more likely to experience more extreme adverse effects from infection. Should the vaccine not be available then risk communication during this situational alternative will face challenges contingent upon the development of the pandemic risk and its effect upon public perceived risk.

As already mentioned, one can assume that initial reports of severe cases of infection will generally increase the public risk perception. If a vaccine is not available it is important that communications of risk emphasize the continued use of "common sense" measures to protect oneself and others from infection. However, cases of infection will undoubtedly occur and the health authorities will have to prepare for such cases. In terms of general risk communication this involves providing information to the public about the measures they have prepared, such as crisis centre on hospitals, to ensure the health of infected individuals. It is not possible to let infected individuals take care of themselves due to the severity of the pandemic virus. Should such measures not be followed then the thesis advice the use of the mental model approach as described above to effectively address possible knowledge gaps and misunderstandings which may be salient. Lastly, it is important that the health authorities give regular updates about the condition of those infected for three main reasons. Firstly, the public will want to know about the seriousness of the pandemic and the health of those infected. Secondly, providing information about what the health authorities are doing to ensure public health and lives will further ensure public trust in the health authorities as capable of handling the pandemic risk. Lastly, providing regular updates about the seriousness

of the pandemic risk will further prevent the chances of a habituation effect taking place over time should reported incidents be far in-between each others (c.f. Lima, 2004).

Considerable challenges for the health authorities during this situation will arise should there be reported many incidents within a short time period which are likely to receive considerable media coverage. Such an incidence will break the perceived norm of few incidents of infections even though it cannot be ascribed to the pandemic situation as a whole. However, only time will prove this for certain and the health authorities cannot claim for certain if the sudden increase is a sporadic incidence or because of mutation of the virus. Such a situation will fall under the general area of increased risk communication or even crisis communication; requiring quick response and rapid dissemination of information to the public to prevent other sources of information to draw conclusions. "Normal" risk communication will resume after the crisis have been averted and will follow the procedure described above.

However, it is also important for the health authorities to argue for why such an event can occur and explain the difficulties of predicting if it can happen again. Risk communication needs to strengthen public beliefs in science ability to provide answers, that is, epistemic trust, or public trust in the health authority's knowledge basis, more than ever (c.f. Sjöberg, 2001). Public trust has been maintained so far because the promoted measures and risk estimates by the health authorities have seemed to be correct, giving little reason for the public to distrust them and for other external sources to effectively criticize them. After such an event, as the quick and serious development described above, however, the situation may have turned. It is easy for others to prove that the promoted measures do not seem to work, illustrated by the severe cases, but difficult for the health authorities to prove that the promoted measures do work (e.g. washing of hands X times prevents X infections). This is a difficult situation for the risk communicator to be in and is unlikely to be effectively handled if making time prove their point (another similar situation may occur). A more viable solution would be effective use of the RISCOM model so the situation may be fully discussed and invite claims to truth to be challenged and further reflected upon and thereby enhance epistemic trust. This involves assuming that the health authorities do everything they can with the information they have available. It is also an arena and opportunity where the health authorities may provide information on their mitigation efforts and how they will prepare for a similar event should it occur.

4.5 Risk communication during the post pandemic phase

The last phase during a pandemic is a phase of evaluation and consideration of the health authority's efforts during the pre- and main-pandemic phase. Communication of risk during this period is to some extent to make the public aware that the current risk situation is in decline, but that there will be other pandemics in the future. It is an opportunity to ensure public trust in the health authorities as capable and responsible managers of a future pandemic risk, and other future health risks, which may occur. In terms of risk communication research it is a phase wherein the main goal is to ensure social trust for the management of the next pandemic or health risk. The important thing is to evaluate previous efforts, find out what worked and what did not and communicate this to the public. What is important throughout this evaluation phase is transparency. Let the public get access to the health authorities' evaluation of the decision making processes during the pandemic. More importantly; allow and invite the public to give feedback on the health authority's mitigation and risk communication efforts.

As said in the introduction, rating of risk communication effectiveness will depend upon what one tries to achieve by communicating the risk. The thesis have provided a theoretical framework on how to achieve effective risk communication during pandemic risk situations, that is, based assumptions of public attitude and behavioral change due to risk communication. However, theory cannot supplant real feedback. The post-pandemic phase provides an excellent opportunity where the pandemic and the health authorities risk communication efforts is still fresh in the minds of the public. Feedback from the public thus gives a real rating of what was effective and what was not and may provide suggestions to what can be improved and what can be removed. The RISCOM model of transparency provide an ample method of discourse where issues of risk management and risk communication efficiency can be evaluated and put under the critical eye of the public. Again, the goal of using the model, and utilization of the general feedback, is not meant to decide the course for handling of the next pandemic. It is meant to be a two-way process of evaluation to create awareness for the health authorities, and the public of what, transpired during the pandemic and provide suggestions of improvement on mitigation and risk communication.

However, the phase is also one of potential concessions and probably accusations. It is important that the health authorities admit their wrongs if mistakes were made and act responsible. Doing otherwise is to act in an antagonistic manner and is likely to result in the

health authorities being perceived as an arrogant or non-caring entity which may severely damage their trustworthiness (c.f. Sjöberg, 2008). It is not the goal here to make excuses or deny blame; after all it is given that the health authorities took formal ownership of the case and are formally responsible. Admitting faults and explaining what can be done better, and thus to learn from past mistakes, will instill trust in the health authorities to be able to manage the next pandemic risk. In this regard we also mean it is important that the health authorities let other non-governmental organizations or institutions make professional evaluations of their handling of the pandemic risk. This will provide deeper insight into their handling of the risk as opposed to their own evaluations and that of the public. It will also deny any accusations of biased, subjective evaluations should the health authorities do their own evaluations.

4.6 Final remarks

The thesis has presented a background and general framework of a future pandemic in Norway. General and specific factors of risk perception and situational variables which may affect risk communication efforts have been considered within each phase of the framework and the situational alternatives which may arise (except the HPHC case). A more general risk communication strategy for the duration of a pandemic risk has been outlined. The general as well as the specific risk communication strategies meant to illustrate examples of how to effectively solve problems which may arise within each phase and situational alternative of a future pandemic. Essential to the effectiveness to the risk communication strategy are the impact of risk perception upon risk communication and the choice and use of scientific models of risk communication. The choice and use of the scientific models of risk communication in this thesis were meant as tools to identify public misconceptions, gaps of knowledge or cognitive "barriers" and for providing information to address these issues; while also providing "tools" for evaluation of message content. Lastly, the thesis has aimed at highlighting the importance of dissemination of information, and public involvement in the evaluation and consideration of the latest pandemic to further ensure risk communication effectiveness for future health risks. Done correctly the efforts of risk communication during the post-pandemic phase are expected to help ensure public trust in the health authorities' as competent and responsible managers vis-a-vis future health risk.

5.0 Conclusions and last comments

The thesis has reviewed communication of risk during the A (H1N1) situation for a discussion of how best to prepare for a future pandemic. Risk perception theory, specifically based on the psychometric paradigm, has shown the need to include factors of how people react and respond to risk information to be able to communicate more effectively. Two selected approaches, one firmly based in social cognition (mental modeling) and information processing (ELM), and one developed in the risk communication field work (RISCOM), have shown that structured analysis of both message content and context can assist in and further develop risk communication efficiency. History of, and more details on, previous pandemics, have especially shown that:

- The difficulties attached to predicting future pandemics, for example with respect to probability and severity, are substantial.
- Uncertainties are predominant in the early phases of risk assessment.
- One must expect a close relationship between risk estimates and risk communication content and strategy. For example, highly uncertain estimates usually demand more general countermeasures, whereas more precise risk estimates allow for more specific communication efforts.
- Data collected in Norway and Europe have shown that reactions reflect both the development or spread of the disease as well as the information about the situation.
- The data based on survey results show that the Norwegian population generally scored high on trust.

The discussion focuses on the need and importance of a continuous monitoring, for example regarding perception changes and their bases, risk assessment developments across time, and collecting feedback on communication efforts as well as evaluate the lessons learnt. In all, there is much to be learnt from past events, but the future always holds uncertainties and surprises.

The central problem of the thesis concerned the question of what is an effective risk communication strategy for informing the public about a pandemic health risk. It has been underlined that risk communication effectiveness is contingent upon providing the public with regular correct information and good advice which they can use to mitigate the (pandemic) risk. However, uncertainty in scientific risk assessment limits what information the risk managers have available; making risk communication difficult, especially at the early stages

of a pandemic. Until the risk managers know more they are in a position where it is important to communicate what they know, and do not know. Risk communication under uncertainty is therefore reliant upon prior knowledge from similar situations and involving, for example, promoting protective measures to the public which are known important to succeed in mitigating the pandemic risk, but cannot entirely hinder or solve it. As more scientific information is made available risk communication can be more specific, involving targeting groups and individuals, to ensure public health and lives.

Essential in strengthening the efficiency of the risk communication strategy is the use of available scientific models of communication. As this thesis has shown, scientific models such as mental modeling and the RISCOM approach are more systematic approaches to guide risk communication, for example for updates and availability of information, to effectively identify and address public risk perception. To systematically plan the use of models that outline thinking and reactions in greater detail may avoid limitations or hindrances of protective behavior. If correctly used such models may also provide the target population with "tools" for evaluation of message content from different sources of information. Lastly, the risk communication strategy ought not to stop when the pandemic risk subsides. It is recommended that an effective risk communication strategy aim at providing a strong basis for future risk communication in a health risk event. This entails learning from successes and mistakes from the latest pandemic, as well as continued efforts ensuring public trust in the authorities as capable and responsible managers of a future health risk.

This general conclusion on effective risk communication strategy is supported by selected available data from the latest pandemic. However, the knowledge of specific effects of various communication models are limited by the current lack of empirical research to give accurate measurements of the scientific models' effectiveness. Future research should therefore investigate in more detail the use of scientific models and their practical use and effectiveness in health risk settings. Lastly, the role of risk perceptions as a determinant of future behavior is a contested issue in risk research. More research is needed to determine its precise role in influencing and determining behavior, and thus, to better specify its role in future effective risk communication. Nevertheless, ignoring risk perception when communicating risk would be contra productive, and ignoring public concern during a health risk situation would severely undermine risk managers' credibility. It is the belief of the author that continuous and strategic work in the future risk communication arena should involve evaluations of specific communication models and their validity in various situations

(e.g. high or low expected consequences or probabilities), as well as further the understanding of the roles of risk perception components (e.g. emotions, cognitions, and situation framing) in risk perception.

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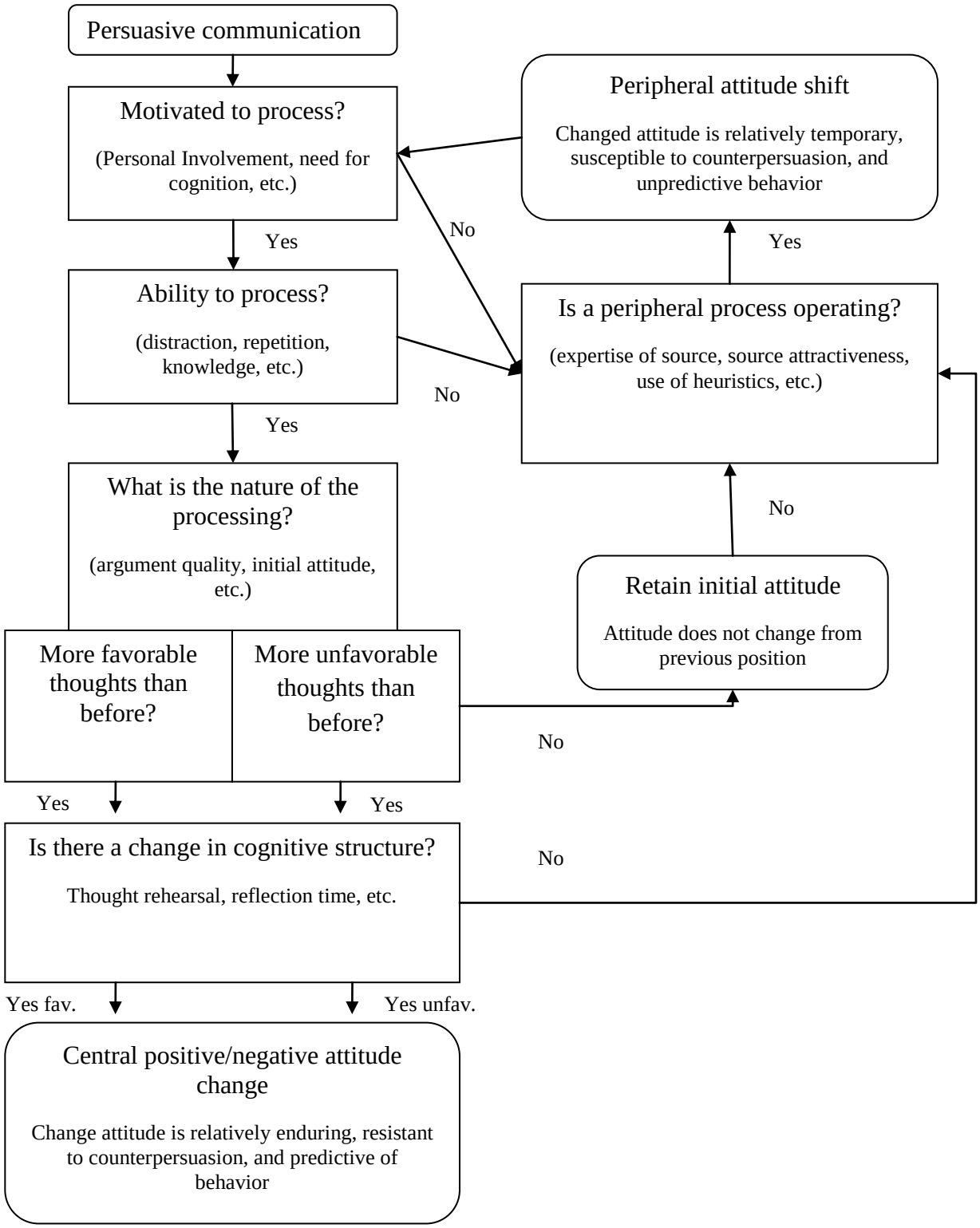
Appendix A Illustration of the Elaboration Likelihood Model (ELM)



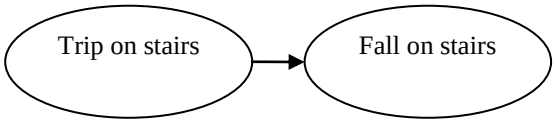
Note fav. mean favorably and unfav. mean unfavorably.

Illustration of Elaboration Likelihood Model. Adapted from "The elaboration likelihood model of persuasion: Developing health promotions for sustained behavioral change," in In R. J. DiClemente, R. A. Crosby, & M. Kegler (Eds.), *Emerging theories in health promotion practice and research* (2nd ed.) (pp. 185-214). San Francisco, California: Jossey-Bass.

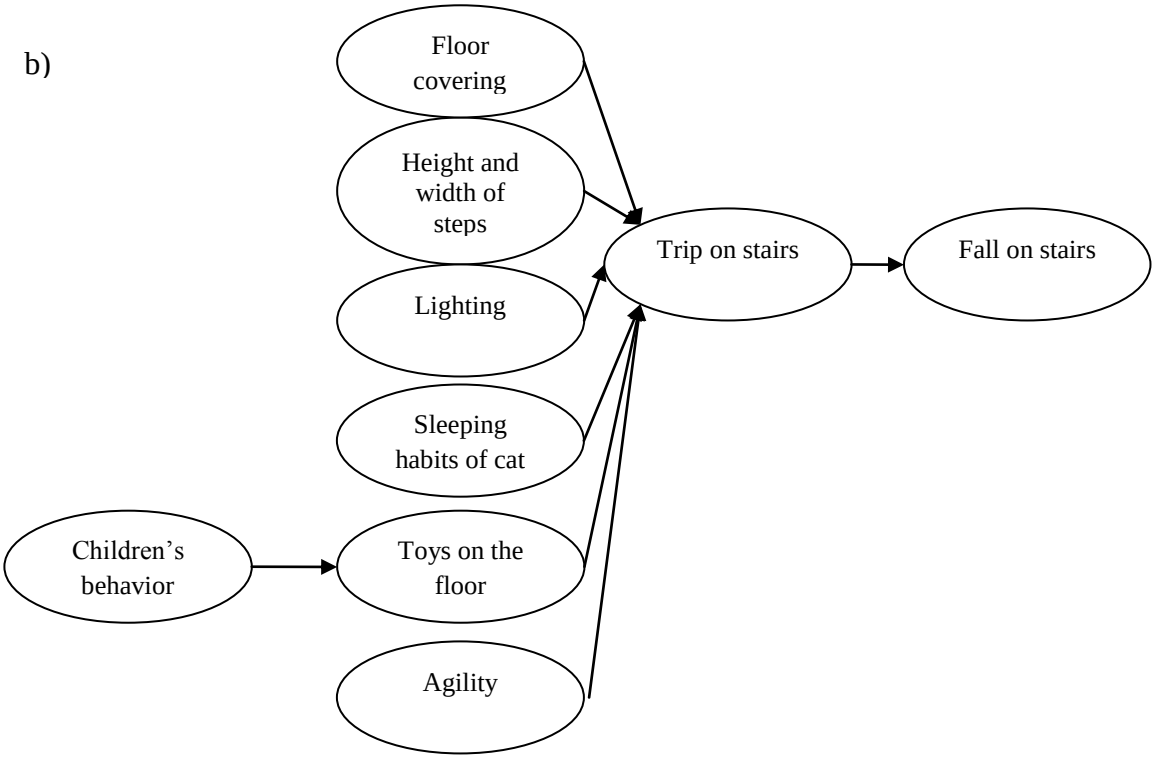
Appendix B Illustration of influence diagram

All materials here are extracted from Morgan, Fischhoff, Bostrom and Atman (2002, p. 37). Illustration of influence diagram adapted from Morgan and colleagues (2002, p. 37).

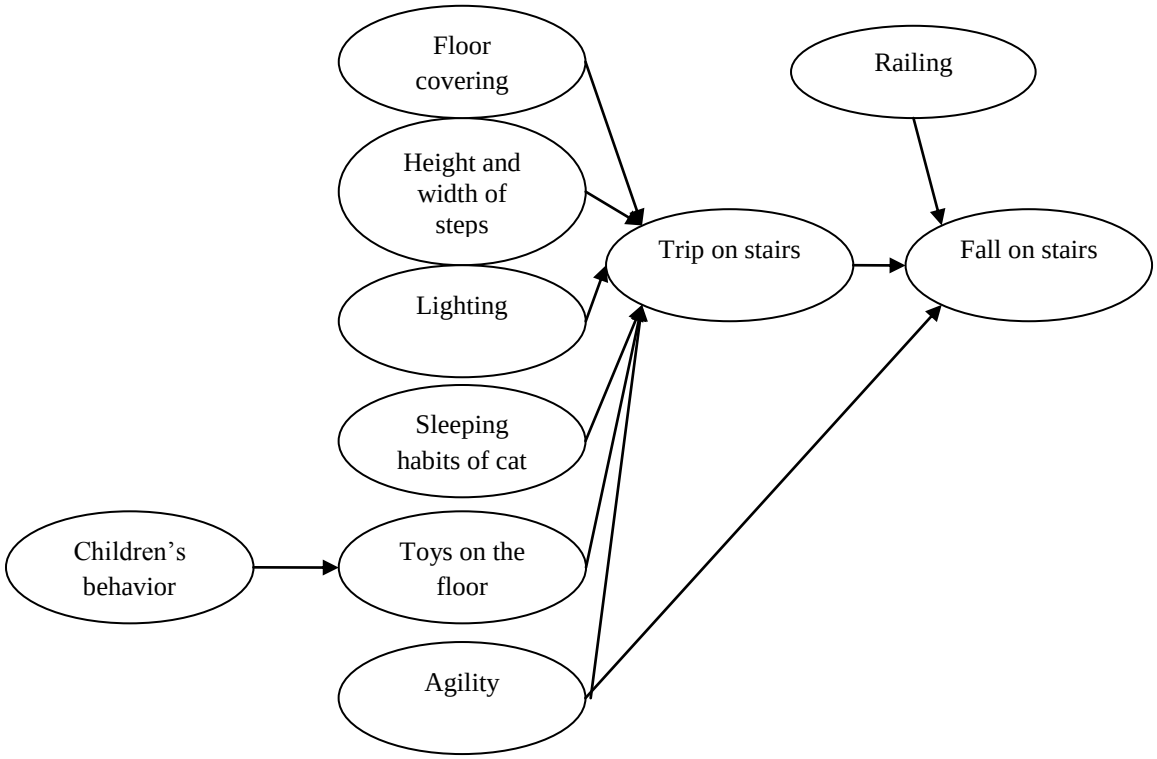
a)



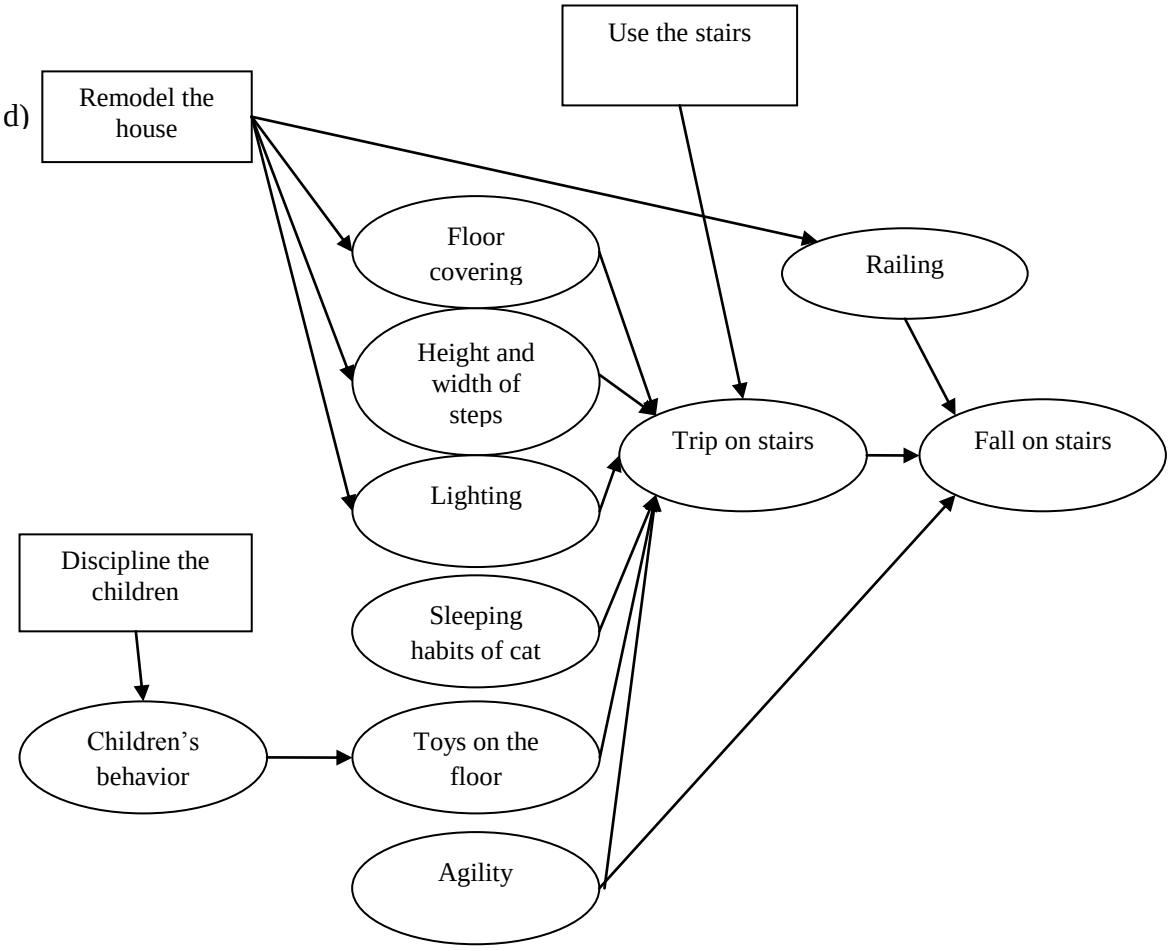
b)



c)


Floor covering
Railing
Height and width of steps
Trip on stairs
Fall on stairs
Lighting
Sleeping habits of cat
Children's behavior
Toys on the floor
Agility

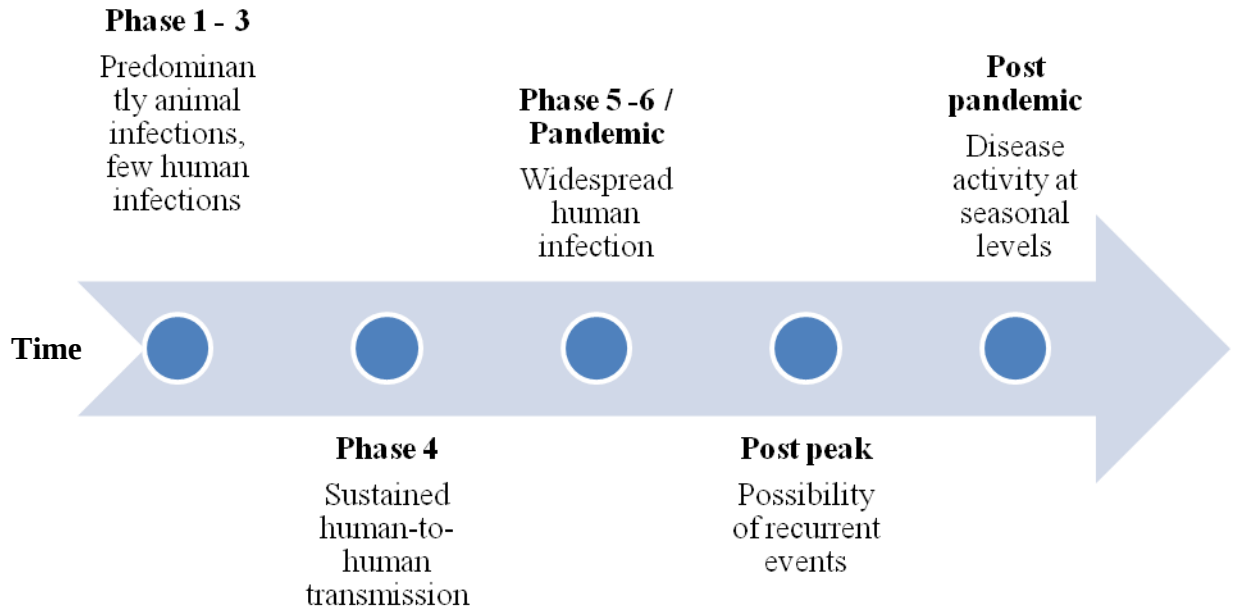
d)


Use the stairs
Remodel the house
Floor covering
Railing
Height and width of steps
Trip on stairs
Fall on stairs
Lighting
Discipline the children
Sleeping habits of cat
Children's behavior
Toys on the floor
Agility

“Illustration of the construction of influence diagram for the risk of tripping and falling on the stairs: a) shows just two elements; b) adds factors that could cause a person to trip; c) adds factors that might prevent fall after a person trips; and d) introduces decisions that residents could make that would influence the probabilities of tripping and falling”. Morgan and colleagues (2002, p. 37).

Appendix C The WHO pandemic phases

Text extracted from WHO (2009b, p. 25 – 26).



Illustrated are the WHO pandemic phases and their general meaning. Adapted from WHO (2009b).

"**Phase 1:** No viruses circulating among animals have been reported to cause infections in humans.

Phase 2: An animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans, and is therefore considered a potential pandemic threat.

Phase 3: An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for example, when there is close contact between an infected person and an unprotected caregiver. However, limited transmission under such restricted circumstances does not indicate that the virus has gained the level of transmissibility among humans necessary to cause a pandemic.

Phase 4: Is characterized by verified human-to-human transmission of an animal or human-animal influenza reassortant virus able to cause "community-level outbreaks". The ability to cause sustained disease outbreaks in a community marks a significant upwards shift in the risk of a pandemic. Any country that suspects or has verified such an event should urgently consult with WHO so that the situation can be jointly assessed and a decision made by the affected country if implementation of a rapid pandemic containment operation is warranted. Phase 4 indicates a significant increase in risk of a pandemic but does not necessarily mean that a pandemic is a foregone conclusion.

Phase 5: Is characterized by human-to-human spread of the virus into at least two countries in one WHO region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize organization, communication; and implementation of the planned mitigation measures is short.

Phase 6: The pandemic phase, is characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. Designation of this phase will indicate that a global pandemic is under way.

During the **Post-peak** period, pandemic disease levels in most countries with adequate surveillance will have dropped below peak observed levels. The post-peak period signifies that pandemic activity appears to be decreasing; however, it is uncertain if additional waves will occur and countries will need to be prepared for a second wave.

In the **post-pandemic** period, influenza disease activity will have returned to levels normally seen for seasonal influenza. It is expected that the pandemic virus will behave as a seasonal influenza A virus. At this stage, it is important to maintain surveillance and update pandemic preparedness and response plans accordingly. An intensive phase of recovery and evaluation may be required".

Appendix D Poster: Habits that prevent influenza

Poster published by the Norwegian Institute of Public Health. Permission to copy the poster granted by Per Kristian Svendsen from the Norwegian Institute of Public Health 18th of April, 2012.

Translation of the poster are given per picture.

Picture 1: "**With a paper hankerchief** in front of the mouth and nose you shield others when you cough or sneeze. Discard the paper hankerchief after use. Then wash hands".

Picture 2: "**Use the crook of the arm** when you have to cough or sneeze and do not have a paper hankerchief available".

Picture 3: "**Was hands** often and thoroughly, especially when you have been among people".

Picture 4: "**Hand desinfection** with substances that contain alcohol is a good alternative when you cannot wash your hands, for example when travelling".