Social Amplification and Policy Making: Understanding the Roles of Power and Expertise in Public Health Risk Communication

By

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Abstract

This thesis presents detailed accounts of policymaking in contemporary risk communication arenas where strong power dynamics are at play, but which have hitherto lacked theoretical depth and empirical validation. Specifically, it expands on the understanding of how policy decisions are made where there is a weak evidential base and where multiple interpretations, power dynamics and values are brought to bear on public health risk issues. The aim of the study is to understand the role of power and expertise in public health risk communication as it relates to policy making. This research describes case studies and relied largely upon published sources of data because it was determined that these captured stakeholder inputs, reflected the debates, drew differentially on evidence and experts, would provide greater insight to each of the cases and were more readily comparable across cases. These sources included published peer reviewed articles, press releases, statements and official documents from government departments and organisations, reports from non-governmental organisations, scientific committee reports, media and newspaper sources. The findings indicate that public health risk communication as it relates to policy making is a process embedded in institutional, productive and structural dimensions of power. This suggests that there are several underlying (and salient) mechanisms of power that shape how risk is communicated and in particular, whose expertise is called upon and whose voices are heard. Further analysis of the cases indicates that 'power' in public health risk communication may be expressed through technical expertise, control of communication and creation of trust (through scientific credibility) such that an argument (within a set of risk arguments) may become amplified (or dominant) in the policy context. These findings are conceptualised into a new model - a policy evaluation risk communication (PERC) framework by identifying key themes that shape social amplification (or attenuation) of risk.

The study contributes to the growing literature on risk communication by advancing knowledge about the role of power and expertise. Testing of the PERC framework further enabled this study to extend the existing conceptualisation of social amplification of risk framework (SARF) from the power and expertise perspective, and to inform the critique of the framework in extant literature. The study also shed light on policy making in situations of risk and uncertainty. Further research should aim at using primary data (such as elite interviews) in investigating the role of power and expertise in risk communication.

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Author’s Declaration

I declare that, except where explicit reference is made to the contribution of others, this thesis is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Abbreviations

EC – Electronic Cigarette

MMR – Measles Mumps and Rubella

PERC – Policy Evaluation Risk Communication

SARF – Social Amplification of Risk Framework

UK – United Kingdom

WHO – World Health Organisation

MH - Ministry of Health

MRC - Medical Research Council

CHSC - Central Health Services Committee

SACCR - Standing Advisory Committee on Cancer and Radiotherapy (SACCR)

CMO - Chief Medical Officer

BMJ - British Medical Journal

1 The Concept of Risk and Risk Communication

1.1 Introduction to the Study

Risk communication as a public health measure

> "Risk communication is one of several policy instruments to achieve risk management goals in areas as diverse as health, safety, technology, environment, and finance" (Gutteling, 2015).

Risk communication is a key component in understanding the nature of health risk faced by the public (Bennett, 2010, Fischbacher-Smith et al., 2010, Veland and Aven, 2013) and has become a key measure designed to improve public health in many countries, including the United Kingdom (UK) (Alaszewski, 2005, de Jong et al., 2014, Plough et al., 2013). Risk communication is defined as the exchange of information about health risks resulting from human and natural processes (Löfstedt, 2008, Veland and Aven, 2013) amongst various stakeholders' groups, such as government agencies, professional organizations, scientists, corporations and individual citizens (Covello et al., 1986), and it is a key platform for risk management stakeholders. Therefore, it contributes immensely in shaping public understanding of risk and the policy perspectives taken in the management of that risk (Smith, 1988, Smith, 1990, Wynne, 1996, Stilgoe et al., 2006b, Stilgoe, 2007, Fischbacher-Smith, 2012, Irwin, 2014b, Welsh and Wynne, 2013). However, risk communication has become the means by which powerful interest groups have sought to exploit their resources in a bid to protect their interests in public health policy making (Smith, 1988, Warner and Kinslow, 2013, Veland and Aven, 2013, Demeritt and Nobert, 2014, Hardy and Maguire, 2016, McKell and De Barro, 2016). Yet, understanding of the role of 'power' in public risk communication has, to date, lacked both theoretical depth and empirical validation.

Different disciplinary perspectives of risk communication

The field of risk communication is by no means uniform as there are different disciplinary perspectives that exist around risk communication (Demeritt and Nobert, 2014). Three major disciplinary perspectives can be identified in the literature. These are (a) science and

technology studies (STS), which is concerned with the relationship between social-political values, scientific research and technological innovation (Aarden and Barben, 2013, Jasanoff, 2015, Stilgoe, 2016), (b) the communication disciplinary perspective, which focuses on the exchange of information about risk amongst stakeholders (Covello and Sandman, 2001), and (c) the management disciplinary perspective, which relates to how affected or interested stakeholder or groups engage and understand the processes of risk assessment and management, in order to form valid perceptions of the likely hazards, and to participate in making decisions about how risk should be managed (Irwin, 2014b, Renn, 2015). This study sits within these three disciplinary perspectives. However, it is more inclined towards the management disciplinary perspective.

Risk communication as a field of play and competition

This study subscribes to the view that risk communication is 'a field of play and competition' (Bourdieu, 1998) between competing stakeholders' interests (Pidgeon and Barnett, 2013, Petts et al., 2001), and where each of the actors seeks to frame the agenda in a way that serves their own interest and drives the communication dynamics of their own discourse (Murdock et al., 2003, Pidgeon and Barnett, 2013). According to the extant literature, framing is used to define the risk problem, establish the source of the hazard, and suggest policy solutions to the risk problem (Entman, 2014). This view recognises and sets out the parameters of risk communication as a process that is about the competition for resources (such as profit, health etc.), and winning an argument. Unfortunately, risk communication is prone to abuse by powerful interest groups, especially where there exists in a risk arena large residual uncertainties and vested interests combined with an unequal status between stakeholder groups (Collingridge and Reeve, 1986). The danger here is that, this may create inadequacies or even errors in understanding and framing of the risk (Taghavifard et al., 2009), especially in new and emergent forms of risk where there is little or no prior scientific understanding of the nature of the risk and its emergent properties.

Why the understanding and framing of risk is important in a policy context

Indeed, the understanding and framing of risk is a crucial part of the policy process, as it determines how public health problems are perceived and whether risks are evaluated in terms of gains or losses (Kahneman and Tversky, 1979). It also determines the policy strategies put in place (Fischer, 2003, Bovaird, 2007, Fischer, 2009), which condition both individual behavioural and policy responses to the associated health risk (Bradbury, 1989).

However, it is very important to add here that where there are inadequacies or errors in the understanding and framing of the risk, negative impacts are expected. Such negative impacts may occur in form of delays in developing appropriate health policy interventions (Bero, 2003) that could potentially be lifesaving or used as a means of improving public health and safety standard. Errors in understanding the framing of risk may also lead to situations where timely interventions may not reflect available evidence or local experiences of those in close proximity to the risk. Within the policy context, this may result in over-regulation that could be costly and over precautionary or under regulation (Diggle, 2010) that have real consequences for health, resulting from longer periods of public exposure to health risks and danger, which could cost lives and be detrimental to health. Efficient and timely policy interventions and risk communication (Glik, 2007) minimize the possibility of poor outcomes associated with uninformed or inappropriate decision making. It is also taken by the public as an indication of the seriousness of the risk to the health. Furthermore, delay in policy intervention undermines trust and credibility, eroding public trust in government and public health officials, or state responses to protecting public health and ensuring safety standards. Moreover, government bodies and those individuals seeking medical interventions could incur high costs while attempting to resolve negative health outcomes; together, these negative outcomes present significant health risks to the public.

The consequences of such negative impacts can be heightened in situations of large residual uncertainty, especially in new or emergent forms of risk (e.g. nanotechnology) or diseases (e.g. flu viruses and Ebola virus), where there is little or no clear scientific understanding (Fischbacher-Smith, 2012) of the nature of the risk and its emerging properties. The problem here in making sense of the limited, or lack of, available evidence is the multiple interpretations and worldviews that are brought to bear on the risk assessment (Renn, 2008, Bennett et al., 2010), especially in situations where there exist multiple and powerful vested interests, each competing to legitimise its health risk argument above the others. This makes a key priority for public health and safety of the understanding of public health risk communication processes and how a risk signal is interpreted and framed. This is particularly challenging, given the uneven distribution of costs and benefits associated with risk issues. Typically, it is the less powerful groups (such as ordinary citizens) among larger sections of society that will bear the consequences of such errors in policy perspective, and interventions taken on the risk issue. For example, Chigwedere et al. (2008), concluded that South Africa's human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS) *denialist* policy under President Thabo Mbeki's was to

blame for the deaths of over 330,000 ordinary citizens in South Africa. Proponents of HIV/AIDS denialism deny that HIV exists or that it is the cause of AIDS (Kalichman, 2009).

Risk amplification and attenuation

Despite the various contributions to knowledge in the area of risk communication, where there are large residual uncertainties in the existing knowledge and understanding of public health risk and its emergent properties, there exists a potential for risk amplification (or attenuation) (Kasperson et al., 1988) in how emerging risk signals are interpreted and framed (Latour, 1987). Such a scenario makes it possible for powerful interest groups to exploit the resources within their means to their advantage, as they often have the means to purchase the scientific expertise that supports their interests (Collingridge and Reeve, 1986). In contrast, the most vulnerable and poorer sections of society that do not have the resources or technical expertise often rely on information and expertise provided by open sources to advance their positions. These open sources (some of which are often seen as credible sources, e.g. scientific experts) may have interest taken to risk-related activities, and be prone to influence by powerful interest groups. The danger here is that, risk information, even if incomplete or misrepresented by a (perceived) credible source, may be relied upon as the ultimate truth or taken as the outcome of an actual technical analysis of risk. The question that then arises is: *how do we analyse and communicate the message of safety or danger where there are unknowns, especially where the management of risk perception is crucial?* This question is important from the everyday societal perspective where *power* differentials exist between different and unequal stakeholder groups engaged in risk communication. The fact that some stakeholders may experience advantages while others disadvantages from the public perception and policy framing of risk, underscores the very critical question raised by Kasperson et al. (1988) social amplification of risk framework (SARF). The SARF framework focused on why certain perspectives of risk are amplified, while risks that are potentially more dangerous are reduced or less amplified.

The social amplification of risk framework

The SARF developed by Kasperson et al. (1988) attempts to provide a conceptual framework for selecting, ordering and classifying social phenomena relevant to risk communication and perception. The framework describes various processes whereby some hazards and events seen by experts as of low concern, become a focus of social and political concern (i.e. risk amplification), while other, more potentially seriously perceived events receive comparatively little attention (i.e. risk attenuation). One of the strengths of the SARF is its ability to combine research from several fields of study, for example, from psychometric and cultural research to provide a perspective on risk communication and perception. However, the framework has been criticised for failing to account for the role of power and knowledge/expertise in risk communication (Petts et al., 2001); the impact this may have for public perception of risk and its associated health and other consequences remains unclear. Other theories of risk, such as the cultural theory, focus on group and cultural perspectives on risk (Douglas and Wildavsky, 1983, Rayner, 1992, Rippl, 2002), and the psychometric theory of risk focuses on affect, emotion, and stigma (Marris et al., 1998, Krimsky and Golding, 1992). However, none of these or any other theories of risk, has considered how underlying, yet salient mechanisms of power shapes public health risk communication and its subsequent health and socio-political consequences.

Risk and policymaking

Existing debates in the interdisciplinary field of risk and policy science have paid some attention to the issue of power in policy inquiry relating to health risk and safety (Wynne, 1989, Irwin, 1995b, Wynne, 1996, Smith, 1990, Fischer, 1998, Funtowicz and Ravetz, 2003, Stilgoe, 2004, Renn, 2008). One commonality within these studies is the promotion of post-positivist logic. This views science as rooted in a social and historical contexts, and, as such, not value free (Wynne, 1989, Irwin, 1995b, Wynne, 1996, Smith, 1990, Fischer, 1998, Funtowicz and Ravetz, 2003, Stilgoe, 2004, Renn, 2008). This post-positivist logic makes a radical move away from the neo-positivist ideology that relies largely on technocratic policy-making, which views science as speaking the truth to power. Central to the neo-positivist ideology is the reliance on technical expertise as a sense making aid in policy decisions in what Jasanoff (2009) refers to as the fifth branch of government. Jasonoff talks about the expanding role of technical expertise as adviser, and argues that the increasing dependence of regulatory agencies on science and its experts is such that has granted scientific institutions and their experts a greater influence in policy decision-making when compared to other non-scientific groups (e.g. ordinary citizens).

Post-positivist scholars such as (Wynne, 1989, Irwin, 1995b, Wynne, 1996, Smith, 1990, Fischer, 1998, Funtowicz and Ravetz, 2003, Stilgoe, 2004, Renn, 2008). Fischer (2003) argue for a deliberative and participative approach to policy inquiry where public (in particular, non-scientific) input is equally valued in risk assessment. For example, Fischer (2003) advanced the idea of 'democratic policy science' where he elaborated on how scientific knowledge and normative evaluation of risk occur in his practical logic of policy formulation framework. He identifies four interactive stages (of both scientific and non-scientific discourses) in the negotiation around policymaking. These include technical verification, situational validation, societal vindication and ideological choice. In his study of Cumbrian sheep farmers and their responses to scientific advice after a radioactive exposure, Wynne (2007) argues for a more scientific reflection upon the relationship and epistemological status of scientific expertise to localized (non-scientific) expertise. Irwin (1995b) highlighted the need to recognize and value the contribution of citizens' expertise in policy inquiry. This, according to him, is "a form of science generated outside of [the] formal walls of [a] scientific institution … developed and enacted by ... citizen[s] themselves" (p.xi) in what he calls "citizen's science". Using a case study of the impact of corporate power on risk assessment in Canvey Island and Ellesmere Port, Smith (1988) suggested the need for more scrutiny of technical risk analysis, which he argues 'can be used to support the interests of powerful groups'. He explains that "corporate bodies are able to exert considerable influence on the decision-making process due to their economic power and technical expertise" (p1).

Furthermore, Funtowicz and Ravetz (2003) advanced the notion of 'post-normal science' that addresses challenges to epistemology and governance when confronted with issue-driven science. Issue-driven science describes a situation where there are large residual uncertainties, values at stake, and urgent decisions to be made, yet science is expected to provide a ready answer (Funtowicz and Ravetz, 1995). Such situations, according to Funtowicz and Ravetz (2003), require an extended peer community that includes all those affected (including scientists and local citizens), who are prepared to enter into dialogue to deliberate and negotiate the processes of measuring the probability of risk and its consequences. Where the risk issue is well understood, routine techniques or procedures will likely be adequate (Funtowicz and Ravetz, 2003). Moreover, Collingridge and Reeve (1986) have argued that there is an unhappy marriage between science and policy making. They suggested that the effect of science within policymaking is determined by the absence and presence of power that could either result in an under critical or overcritical model.

The under critical and over critical model

The under critical model occurs where scientific evidence is accepted without much scrutiny because powerful interests determine what is legitimate science and what is not. It may also be because of the fact that it fits with existing policy, ideology and interests, or where the argument is already institutionalised in policy practices, even though it might be uncertain. The under critical model may also occur as a result of the suppression of other scientific conjectures which threaten policy consensus (Collingridge and Reeve, 1986). The over critical model on the other hand, is a situation where disagreements exist within the scientific community and where those with power cannot suppress or constrain other perspectives, leading to endless technical debate (Collingridge and Reeve, 1986).

While the under critical or over critical model of Collingridge and Reeve (1986) provides valuable insight on how power shapes the relationship between science and policy making, what is however missing from this model is the question of 'how' power shapes the transition or negotiation of arguments between the under critical and the over critical model (Fischbacher-Smith, 2012). Several factors have been highlighted that could potentially influence the transition or shift of policy arguments from one model to the other. These include the interdisciplinary nature of the risk problem (Collingridge and Reeve, 1986); powerful nature of elites involved in the debate, information availability, location of hazard and processes around policy making in its wider political context (Fischbacher-Smith, 2012); privileged interaction amongst certain public groups (Sutton, 1999); the discourse characterisation of the risk (Kasperson, 2012a); and the manner in which trust and credibility are brought to bear on the risk (Frewer, 2003). Within these are the processes of expertise and power, and also communication and trust/credibility, shaping arguments about the negotiation of risk between over critical and under critical models. However, there is no clear understanding of how these elements interact to shape these transitions of argument between the two models; this will therefore require further research attention.

Gaps in literature and why they are significant

Therefore, this study is motivated by two research gaps in extant literature, both of which are linked to the notions of power and expertise. On the one hand, the research is driven by the critiques of social amplification of risk framework, where it was argued that the SARF paid too little attention to the issue of power and knowledge in social amplification (or

attenuation) of risk processes. On the other hand, this research is driven by the critique of over critical and under critical model (Collingridge and Reeve, 1986) where it was argued that the negotiation of risk argument between one model and another remains undocumented (Fischbacher-Smith, 2012).

Developing knowledge in these areas will provide valuable insight into how policy decisions are made where there is a weak evidential base and where multiple interpretations, power dynamics and values are brought to bear on risk issues relating to public health and safety. This research is also timely, especially in this post-truth[1] era (Keyes, 2004, Pazzanese, 2016, Flood, 2016) where there are big voices (such as the UK's former justice secretary Michael Gove or in the case of the United States, Donald Trump) challenging intellectualism and the role of evidence and experts in making sense of risk issues in times of uncertainty. Gove, in the last days leading up to the UK's European Union (EU) referendum campaigns attempted to dissuade the public from expert interpretations (of gloom and doom if Britain existed from the EU) (Brown, 2016). He stated that "people in this country have had enough of experts." (Brown, 2016); his contention was however fiercely and immediately challenged. It would therefore be interesting to understand the role of experts in shaping our understanding of risk in public health risk communication.

Understanding the role of power and expertise in public health risk communication is crucial because it can reveal salient factors that may, in the public understanding and policy perspective taken towards risk, shape risk communication (which otherwise would go unnoticed or unscrutinised) in ways that may benefit or disadvantage certain public groups. Powerful or resourced stakeholders' groups for instance, can use the resources within their means to influence the credibility of information flow stations (such as media, technical expertise and educational institutions), which in effect may influence public perception of risk. In addition, they can extend their influence to different response mechanisms of society by introducing bias to individual perception (see (Lukes, 2004)) through media such as marketing, advertising and film and documentary production. Furthermore, there is the possibility that stakeholder groups may use their influence to engage in relationships with powerful groups, which in turn influences member responses and the type of rationality brought to risk issues (Collingridge and Reeve, 1986). Barnett and Duval (2005) described

[1] The 'post truth era' refers to a culture in which facts or evidence are discounted or rendered secondary to emotional appeals *see* KEYES, R. 2004. *The post-truth era: Dishonesty and deception in contemporary life*, Macmillan, PAZZANESE, C. 2016. Politics in a 'post-truth' age. *Harvardgazette*, FLOOD, A. 2016. 'Post-truth' named word of the year by Oxford Dictionaries. *TheGaurdian*, Tuesday 15 November 2016..

this type of power as ‘structural power’, in which actors control others by virtue of their membership of social groups. Furthermore, powerful groups can also extend their influence to tarnish the reputation of persons or groups who are opposed to their interests by amplifying negative events associated with these people or places in order to reduce their credibility, and therefore any claims made by them.

This multi-dimensional exercise of power that amplifies or attenuates risk perception is one weakness of the SARF. One way to improve existing models (such as the SARF) would be to explore ‘the human element’ in situations where dominant actors or resourced groups can deliberately amplify or attenuate risk debates and messages that shape risk perception. There is therefore a need to explore the key concepts of power and expertise that can inform a critique of the aforementioned frameworks, and that leads to the development of a new approach to enhancing the understanding of public health risk communication and its associated policymaking. Henceforth, this study takes the view that social amplification is a multi-dimensional and multi-channelled process (Fischbacher-Smith, 2012) (as will be argued in chapter ten of this thesis).

Contribution of study

By drawing together, the interdisciplinary literature on risk communication and policy science in the context of public health and safety, the study will contribute to the growing literature on risk communication by advancing knowledge about how certain risk perspectives or issues within the policy domain become amplified or dominant. Thus, there will be greater understanding of how policy decisions are made where there are multiple legitimate viewpoints and where a strong power dynamic is at play. On the other hand, insight from this study will be used to extend existing conceptualisation of social amplification of risk from the ‘power’ and ‘expertise’ perspective to inform a critique of SARF. As a result, the study sheds light on the transition of risk argument between the over critical and under critical model (Collingridge and Reeve, 1986). Based on these two research gaps, a predicted outcome of this study will be the development of a new and/or extension of an existing framework for understanding public health risk communication as it relates to policy making.

1.2 Research Aims and Question

Therefore, the main aims of this study are

1. To examine the role of power and expertise in public health risk communication as it relates to policy context.
2. Design a (and/or extend an existing) framework for understanding how a certain risk argument becomes dominant in a policy context.
3. Draw out lessons and identify best practices for public health risk communication

The research question underpinning this study is:

How does a set of risk arguments evolve such that a particular perspective becomes amplified in a policy context?

The research question highlights two key elements in this thesis; these are – risk amplification and policy-making. The research question has been carefully constructed to address the two research gaps identified in extant literature (which are linked). The following sections will explore the key constructs of risk and risk communication, highlighting current debates and the perspective taken to study them. This is essential at this point in order to clarify the study perspective, considering the different disciplinary perspectives that exist around risk and risk communication. The rationale of the context of study is also explained thereafter.

1.3 The Construct of Risk

The construct of risk has become a subject of considerable debate within the academic community and across various communities of practice (Fischbacher-Smith et al., 2010, Rogers, 2000). 'Risk' has been popularly associated with negative or undesirable events or outcomes (Renn and Roco, 2006) and framed differently to include the probability of an adverse event occurring (Warner et al., 1992); the probability of loss in an outcome (Brearley and Hall, 1982) or a situation where something of human value is put at stake (including human health and lives) (Jaeger et al., 2013); a combination of hazard versus outrage (Sandman, 1993); an anticipation of a catastrophe (Beck, 2006) and a chance for

mishap (Cranor et al., 2007). Douglas, (1992) defines risks from a cultural perspective as a collective (rather than individualistic) product of shared social and cultural meanings.

There are three schools of thoughts that shape our understanding of risk. The differences between the first and second of these exemplify a contentious area of scientific debate - the objective and subjective schools respectively (Hansson, 2010).

The objective school of thought views risk as objectively given and determined by physical facts, independent of any assumptions, prejudices, or values (Hansson, 2010). The assumption here is that risk can be understood without it being a reflection of, or being dependent on, any features of the particular subject who assesses it. This viewpoint has been long held by engineers and natural scientists (Renn and Swaton, 1984) and even described by Cohen (2003) as the "only meaningful way to evaluate the riskiness of a technology" (p909). However, this is difficult when the technology is new as there is no means of determining the probability in any meaningful way. The objective school of thought has been criticized for ignoring subjective decisions around risk measurement, the methodology used, and the fact that a community of researchers often shares certain ideas and assumptions that adjust the lens through which risk is viewed (Douglas and Wildavsky, 1982). It also undermines structural, institutional and organisational factors that shape risk measurement (Wynne and Jasanoff, 1992). The notion of scientific objectivity works for laboratory based science where the variables can be controlled and the test-retest validity of the experiment monitored under controlled conditions. However, there are problems involved with intervening variables when science is moved out of the laboratory into the real world.

The subjective school of thought argues that all risk is essentially a social construction or an outcome of social processes (Douglas and Wildavsky, 1982). It explores risk as a social phenomenon and holds that risk has meaning only to the extent to which risk is perceived (Hilgartner, 1992, Lupton, 1999, Zinn, 2008, Douglas and Wildavsky, 1983). The assumption here is that there is no risk out there waiting to be measured, rather a reflection of perceived harm or hazard (Slovic and Weber, 2002). This school of thought assumes that the understanding of risk is shrouded with values and assumptions, which are brought to bear on the measurement or assessment of the risk. This raises the following questions: (a) whether risk can be measured with any degree of accuracy; (b) if the tools for measurement are meaningful; and, (c) the extent to which the impetus for measurement is perceptual. Gephart et al. (2009) argue that risk is never "fully objective and knowable outside belief

systems and moral positions" (p.144). From this perspective, risk practices are pluralistic and as such disputable (Hood and Jones, 2003). The subjective school of thought has however, been criticised for over emphasizing the value associated with risk (which is something of a social construction) (Shrader-Frechette, 1991a), and because it seems to deny that harm does occur whether you believe it or not.

The criticism of the objective and subjective school of thought for advancing extreme views of risk (Shrader-Frechette, 1991a) led to the emergence of a third perspective on risk, one that views risk as a combination of both objective and subjective elements (Kasperson et al., 1988, Shrader-Frechette, 1991b). The assumption made here is that regardless of our subjectivity, there is a real threat or hazard. However, this is only effectively realised when harm is shown to have occurred. Even then, it may still be disputed. Scholars such as (Shrader-Frechette, 1991a), who embody this assumption, question the perspective of the first two schools and view them as a failed attempt to get rid of much of the complexity of risk assessment. For instance, Shrader-Frechette (1991a), accused the first school of thought of viewing ordinary citizens as ignorant of science and assuming that a technical expert alone has the expertise and ability to make a rational risk assessment. On the other hand, the second school was criticised for assuming that citizens' unwanted behaviour in relation to risk arises because they are a product of biased thinking (Shrader-Frechette, 1991a). The alternative perspective is that the understanding of risk requires the identification of factual and value components (Shrader-Frechette, 1991a) in order to create a robust understanding of the construct of risk.

This study aligns with the third school of thought, recognising that while there are values associated with risk that often are an issue of perception, the consequences of associated health risk are real. This study therefore, subscribes to a definition that views risk as: the probability of a negative or undesirable event occurring (Renn and Roco, 2006) where something of human value is at stake (Jaeger et al., 2013). This definition recognises that our understanding of risk is conditioned by both objective (scientific estimate of potential loss) and subjective (value and emotive) elements that are often associated with risk issues. While there is an indeterminate but real risk (especially in the absence of sufficient information about the hazard), the perception of the risk plays a significant role in magnifying the consequences of the risk, which makes the management of risk and its perception crucial. This highlights therefore the importance of risk communication in the understanding of risk and the policy perspective taken towards it.

1.4 Risk Communication

Risk communication has been defined differently by several authors. For example, Rohrmann (2008) defines risk communication as "a social process where people become informed about hazards, to influence behavioural change and participate in risk related decision-making in an informed manner" (p. 1). It is a "process of exchanging information among interested parties about the nature, magnitude, significance, or control of a risk" (Covello, 1992 p.359). There are those who define risk communication as 'a field of play and competition' between competing interests (Pidgeon and Barnett, 2013, Petts et al., 2001) where each of the actors seeks to frame the agenda in a way that serves their interest and drives the communication dynamics of their story (Murdock et al., 2003, Pidgeon and Barnett, 2013). However, it is important to note that the definition of risk is determined by the disciplinary practices by which risk communication is viewed (Demeritt and Nobert, 2014). The main disciplinary perspective of risk communication are: (a) science and technology studies (STS) which is concerned with the relationship between social-political values and scientific research and technological innovation (Aarden and Barben, 2013, Jasanoff, 2015, Stilgoe, 2016); (b) the communication disciplinary perspective – that focuses on the exchange of information about risk amongst stakeholders (Covello and Sandman, 2001); and, (c) the management disciplinary perspective that pays attention to how affected or interested stakeholder groups engage and understand the processes of risk assessment and management, to form valid perceptions of the likely hazards, and to participate in making decisions about how risk should be managed (Irwin, 2014b, Renn, 2015).

This study straddles the interface between communication and management disciplinary perspectives of risk communication; however, it is more inclined towards the management disciplinary perspective. As such, the study subscribes to the view that risk communication is a 'a field of play and competition' (Bourdieu, 1998) between competing stakeholders' interests (Pidgeon and Barnett, 2013, Petts et al., 2001), and where all the actors seek to frame the agenda in such a way that serves their own interest and drives the communication dynamics of their narrative (Murdock et al., 2003, Pidgeon and Barnett, 2013).

There are several considerations relevant to the present discussion on risk communication. First is the fact that the assessment of risk, especially new and emergent forms of risk, is

masked in uncertainty and ambiguity (Jaeger et al., 2013), and this creates problems for risk communication and decision-making, especially in terms of multiple interpretations brought to bear on the risk (Fischbacher-Smith et al., 2010). There is the fact that something of human value (including human health and lives) is deemed to be at risk, such that an emotive element is added to the risk concern that will permeate the entire risk communication processes (Adekola et al., 2017). Finally, there are the costs and benefits associated with most forms of risk (Zerbe, 2008). However, the benefits are not always borne by those who are exposed to the negative aspects of the risk and as such there can be considerable distributive inequalities when the consequences of such risk are encountered. When combined with the emotive aspects associated with 'value' noted above, it is clear that risk communication will encounter complex objective and vested interests, as well as emotive value-laden issues and technical issues that may require a certain level of scientific expertise to be appreciated in full (Adekola et al., 2017).

1.4.1 Evolution and Revolution of Risk Communication

Historically, risk communication has been viewed as a process that frequently moves from expert to non-expert, typically referred to as the 'deficit model' (Wright and Nerlich, 2006, Sturgis and Allum, 2004). Irwin, (2008) termed this model of risk communication as the 'first order of thinking' that views the public as ignorant; science is presented as speaking the truth to power; scientific claims are often based on the language of certainty; and the diversity and knowledge-ability of the public are ignored by risk managers/communicators. This top-down, one-way model of risk communication has proven to be unsuccessful, as the public has a greater ability to deal with issues of risk than was previously acknowledged (Hansen et al., 2003). In addition, this one-way model of risk communication has been criticised for failing to open up risk assessment and rationality for public input and scrutiny (Petts, 1997). According to Petts et al. (2001), the effectiveness of risk management requires that the locus of control be extended beyond the institutional and political domain to that of the individual. Against this background, there is an increasing recognition, and now a general consensus, that risk communication is a two-way, interactive process between communicators and recipients of the message (Shannon, 1961, Grönroos, 2004).

The "two-way communication model" recognises that the nature of feedback is essential in ensuring the effectiveness of the communication, and where there is an appreciation of how information and knowledge are exchanged between the individuals, groups and the

public at large (Petts et al, 2001). This, according to Irwin (2014b), is a shift to a second order of thinking that encourages greater transparency and public engagement. The move towards greater transparency and engagement has been attributed to the rising recognition of the merits of deliberative democracy and to discussions around the need to invigorate the political processes (Fischer, 1999). Democratic accountability and engagement have also become central to contemporary political and social life (Beck 1992, Irwin, 2008).

Irwin (2014b) also identified a third order of thinking where there is "more critical reflection – and reflection-informed practice about the relationship between technical change, institutional priorities and wider conceptions of social welfare and justice" (p.169). Here differences amongst interest groups, including those within scientific communities, are perceived as a resource rather than an impediment (Stilgoe et al 2006). This, according to Irwin (2014b), "opens up fresh inter-connections between public, scientific, institutional, political and ethical visions of change in all their heterogeneity, conditionality and disagreement" (p.169). Irwin (2014b) remarks that the three different orders of thinking are neither about developing a new toolkit for communication or superiority. Rather they are about interrogating the 'operating assumptions and mode of thoughts' (p.167) on which each individual initiative is based. Nonetheless, a choice of either a first, second or third order of thinking will raise questions around the notion of power and the nature of expertise brought to bear on risk communication, especially where there are large residual uncertainties and where something of human value has been put a stake.

The next section rationalises the context of this study, highlighting why public health risk debate is used as the situational context to investigate the role of power and expertise in public health risk communication.

1.5 The Rising Trend in Public Health Risk Debate: Rationalizing the Context of Study

The last few decades have seen a rise in risk communication relating to public health and safety in United Kingdom some of which are outlined below (see Table 1.1).

Table 1.1: Summary of some of previous public health debates in the UK

Public health debates	Main Issues	References
Smoking debate	Public health risk communication around the effects of tobacco on health and the public. Some argue that smoking is linked to cancer. Those on the side of the argument point to the inadequacies and gaps in the scientific understanding of the risk associated with smoking.	(Doll and Hill, 1950a, Van Lancker, 1977, Lima and Siegel, 1999)
Measles, Mumps, Rubella	Public health risk communication around safety, risk and efficacy to MMR vaccines. A study published in 1998 links MMR vaccine to rubela, against the dominant view that it was safe for consumption. The study was later dismissed for lack of evidence and faulty interpretation due to an undisclosed interest.	and Rubella debate (Wakefield 1998, Taylor et al 1999)
Genetically modified food	Public health risk communication around the use of genetically modified crops in place of conventional ones, and other genetic engineering in food production. Some argue the GMF can be used to solve the world's food crisis. Others argue that the health implication is not adequately understood therefore putting public health at risk.	(Gaskell et al., 1999)
Mobile phones and phone masts	Public health risk communication around potential health risks of mobile phones and their associated masts. Some claim local residents living close to mast complain of health issues ranging from nosebleeds to headaches. Others point to the lack of evidence, as mobile phone use is still in its early stage.	(Stilgoe, 2004, Drake, 2010)
Sugar and Salt consumption	Public health risk communication around obesity and other health conditions relating to sugar and salt intake. Some call for government intervention (e.g. higher taxes), others point to the 'nanny state' ideology and the need to leave consumption decisions within individual control.	(Cordain et al., 2005, He et al., 2008, Grimes et al., 2013)
Electronic cigarette	Public health risk communication around the safety and efficacy of electronic cigarettes (EC). Some argue that EC could renormalize smoking, undermining many years of effort deglamourizing smoking. Others argue that EC could save over 50,000 lives a year, if people switch from conventional smoking to EC.	(Cahn and Siegel, 2011, Vardavas et al., 2012, McNeill et al., 2015)

Table 1.1 (above), summarises some of the public health communication that has taken place in the UK since 1950. It conveys a range of issues as well as a common thread of power and disputed evidence. One commonality of these debates is that in no case is there any clear scientific evidence because they are all risk events with of which there is

no prior experience, nor clear understanding of the risks involved. There are other emergent problems due to new technologies and new information. These debates were characterised by disagreement amongst stakeholder groups over fundamental values, technical disputes about evidence and its interpretation, and differences over what precautionary measures to take in mitigating risk.

The rise in risk communication relating to public health has been linked to many factors. First, the continuous advancement in information and communication technology (ICT) has made access to information and more general interaction possible at almost any time and place. For example, Riedlinger and Rea (2015) note the redistribution of power associated with internet-based communication, although it must be acknowledged that some information is sometimes inaccurate or incomplete. A good example of such inaccurate or incomplete information can be observed in debates around the United Kingdom's exit from the European Union (Brexit) during which a lot of claims were made with no evidence to support them. With advancement in ICT, the public is able to seek knowledge, engage in public debates relating to science and risk, or even seek opportunities to disrupt existing states of knowledge and challenging existing assumptions. Advancement in communication has also enhanced the speed of information allowing visual and real time communication (e.g. through the use of social media). Social media (such as Facebook or Twitter) for instance have given the public access to a social space where grievances and sensitive issues can be discussed, debated or shared.

The rise in risk communication has also been linked to the fact that the mechanisms put in place to mitigate or reduce risk have themselves become sources of further risk (Fischbacher-Smith et al., 2010) because of unforeseen emergent conditions. For example, certain technological advances (e.g. vaccination, medicine, nuclear weapons), which were developed for the improvement in the quality of human lives, have become threats in themselves (Tenner and Rall, 1997, Renn and Roco, 2006, Singh and Nalwa, 2007). Concerns have been raised by some groups within the public that vaccines invented to protect infants from diseases may in fact be damaging to their health (e.g. the measles mumps and rubella vaccine debate). This has generated a lot of interest about the rationality and scientific protocols used to make policy decisions involving such risk. There is also an increasing societal emphasis on corporate social responsibility (CSR), focused on issues around the precautionary principle, which has shifted the boundaries

of CSR in contemporary political life beyond the domain of legality into that of ethics and morality (Irwin, 2014a) thereby extending the scope of risk debates.

Given advances in ICT, a more knowledgeable and aware public and societal emphasis on CSR, there is the expectation that public health risk communication will continue to be witnessed as a means of forging public health policy-making, and it is on this basis that this study adopts public health risk debates (communication) as the situational context in which the role of power and expertise in public health risk communication is investigated.

1.6 Thesis Structure

This thesis is structured into eleven chapters. Chapter one (this chapter) situates the study within extant literature on risk and risk communication. Chapter two situates the discussion on risk and risk communication further within the policy context. It considers the role of expertise in policymaking and emerging debates around technical expertise in policy making that may amplify or reduce certain perspective of risk. Chapter three provides an account of the social amplification of risk framework (SARF) and then explores key concepts within the literature that can inform a critique of this framework. Chapter four theoretically illustrates the transition of risk argument from the anecdotal stages of risk to its policy formation. Insight from this literature led to the development of the Policy Evaluation Risk Communication (PERC) framework, which was set out to advance the understanding of public health risk communication within its policy context. The PERC framework synthesizes insights of the alternative perspective taken to social amplification of risk in this study and the over critical and under critical models of Collingridge and Reeve (1986). Chapter five presents the thesis methodology and methods, and explains why a case study approach was adopted. It also discusses in detail the sources and processes of data collection, the data analysis and how the data was interpreted.

Chapter six, seven and eight represent the results and analysis chapters of this thesis and aim empirically to explain how power and expertise shape risk communication and the policy perspective taken to risk. Chapter nine discusses the study findings through the lens of the policy evaluation risk communication framework described in chapter four.

The implication of the findings for risk communication is also discussed here. Insights from the study lead to the development of a modified account of social amplification of risk in chapter ten. This is based on the assumption that social amplification of risk is a multi-channel and multi-dimensional process. The final chapter summarises and illustrates how the work carried out in this thesis addresses the study's aims and objectives. It also makes recommendations for future research and reflects on the PhD journey.

2 Policy Inquiry and Expertise

2.1 Introduction

The previous chapter (one) has set out the problem space and the study aims, which ultimately is to examine the role of power and expertise in public health risk communication as it relates to policymaking. The study views risk communication as a field of 'play and competition' between the interests of competing stakeholders (Pidgeon and Barnett, 2013, Petts et al., 2001), recognising that the process is about both winning an argument and the competition for resources.

This chapter (two) sets the present study within the policy-making context. The policy context will allow the study to examine those whose expertise was called upon in the negotiation of risk in the policy domain, those whose argument is legitimised, and which precautionary measures are put in place (that may bring about socio-political, health and economic consequences). The chapter begins by reviewing the literature on public health policy making and unpicks the nature of the problems faced in public health risk. It then considers the technique of risk assessment and examines the role of expertise in policy inquiry relating to risk.

2.2 Public Health Policy Making

Public health policy has a significant impact on how public health risk is perceived and on subsequent individual and group behavioural responses. This has implications for human health generally (Brownson et al., 2009). Dewey (1927) defines public policy as the public and its problem that is concerned with how public issues are defined, framed and viewed in the political agenda; a process rooted within risk communication. It can be viewed simply as what government chooses to do or not to do (Dye, 1992). Cochran et al. (2015) define public policy as both the actions of, and intention of the government that determine those actions, shaped by the outcome of struggle within the policy domain over what is legitimised and who gets what. However, public policy can be viewed as the sum of government activities carried out directly or indirectly, and which affect or have consequences for the daily life of people within society (Peters, 2015). The management of public health risk functions at the forefront of science and policy by informing

measures that will maintain and create improvements in human health (Public Health Sciences Working, 2006).

There are both linear and non-linear approaches to policy making. Thomas and Grindle (1990), for instance, describe a simple and linear approach to policy development in which policy development starts from setting the policy agenda, then moves to decision and implementation. This approach has been criticised for viewing the public as passive consumers of ready-made policy; the public should instead be seen as a collection of multiple agendas and players actively engaged in those decisions (Howlett et al., 1995). The linear approach is argued to be naïve and idealistic, and to fails to see the public as constituents of social communities (Harrison and Mort, 1998) that require policy to be framed within a social and political context in an evolutionary, non-linear and interactive manner (Tödtling and Trippl, 2005). Policy inquiry relating to public health risk often requires that risk is framed within international, national, and local contexts (Holland et al., 2004). In an ideal situation, this would require the input of experts (both technical and local), considering the power differentials amongst groups engaged in the process and the multiplicity of values, ethics and principles. As a result, a non-linear approach to policy development is a more appropriate reflection of modern day evolutionary and interactive policy making, especially when confronted with issues of ambiguity, complexity and uncertainty.

2.3 The Nature of the Problem in Public Health Risk

Public health risk, like many other forms of risk, is confronted with issues of ambiguity, complexity and uncertainty (Renn et al., 2011); these are the key concepts underlying the transition of risk argument in a policy debate. Ambiguity, complexity and uncertainty have consequences for public health risk communication, within both the public and scientific community. For instance, disagreement within the scientific community may bring about conflicting theories, speculations, and wild assumptions owing to a weak evidence base (Fischbacher-Smith et al., 2010) resulting in situation where science becomes irrelevant to policy making (Collingridge and Reeve, 1986) and as such, further politicizing the decision-making process and any resultant policy formulation.

Ambiguity is the existence of multiple values where different legitimate viewpoints exist in calculating the consequences of risk and its acceptability. It may also be as a result of the different perspectives on the justification, severity or wider meanings associated with a perceived threat or risk (Stirling, 2003). Renn and Klinke (2015) identify two forms of ambiguity – interpretive and normative. Interpretive ambiguity refers to the differences in legitimate interpretation, which may be due to the lens through which a risk is viewed. For example, experts and non-experts' interpretations often differ due to the nature of their familiarity with the risk, assignment of blame and locus of control (Renn et al., 2011). Normative ambiguity refers to disagreement about what should be considered to be priorities, and about assumptions and value and how these can be applied in the definition of risk (Renn and Klinke, 2014). The problem that ambiguity creates in a public health risk communication is the multiple legitimate interpretations that are brought to bear on the risk compounded by multiple vested interests competing to legitimise their own argument among others. This compounds the challenges faced by policy makers and risk regulators in mitigating the risk.

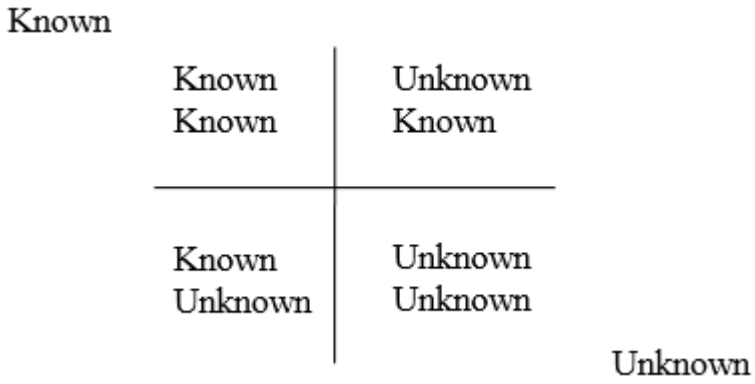
The issue of complexity is exemplified by emergent conditions associated with risk. Complexity is defined as the difficulty in demonstrating and estimating causal links between multiple factors and adverse effects (Underdal, 2010). The difficulty in determining causal relationships and calculating the probability and consequences of risk has been linked to several factors, including the tight coupling and interactive complexities of the system (Perrow, 2011), complex multi-causal factors surrounded by uncertainty and ambiguity (Klinke and Renn, 2002), long delay periods between cause and effect, inter-individual variation, positive and negative feedback loops, and external intervening variables (Renn et al., 2011). A non-linear relationship may also be experienced where cause and effect relationships do not follow a linear pattern, due to the evolving nature of the risk, or errors in judgement (Fischbacher-Smith and Calman, 2010). Complexity may bring difficulty in estimating a causal link in public health risk communication and may also lead to errors in policy decisions that may be costly to public health and safety (Fischbacher-Smith and Fischbacher-Smith, 2009), and that may be blamed for any emergent problems.

Furthermore, there are issues around uncertainty referred to as 'unknowns' - especially in new and emergent forms of risk and diseases. Uncertainty arises as a result of limited or a complete absence of scientific knowledge that makes it difficult to make any conclusive calculation of probability or judge the consequences of a risk (Renn, 2008, Filar and

Haurie, 2010). Donald Rumsfeld in a Press Conference at NATO Headquarters in Brussels, Belgium, highlighted a three dimensional view of uncertainty in what he termed as 'unknowns'.

"There are things **we know that we know** *'known knowns'*. There are *'known unknowns'*. That is to say there are things that **we now know we don't know**. But there are also *'unknown unknowns'*. There are things **we don't know we don't know**. So when we do the best we can and we pull all this information together, and we then say well that's basically what we see as the situation, that is really only the known knowns and the known unknowns. And each year, we discover a few more of those unknown unknowns" (Rumsfeld, 2002).

Figure 2.1: A four dimensional diagram of Uncertainty
Source: Adapted from Donald Rumsfeld three dimensional view of uncertainty



Rumsfeld acknowledges that uncertainty is relative; as there are things we may not even be aware that we do not know, and this only becomes known when effectively realised, or when new knowledge or information sheds light in the area in question. This also means that there may also be things we do not know, we know. New information and more data may reduce uncertainty (Kasperson, 2012a) or may serve to uncover new uncertainties (National Research Council report, 2005). Renn (2008) distinguishes uncertainty based on five components. These are: 1) *variability* – different target of existing vulnerabilities; 2) *inferential effect* – modelling errors; 3) *indeterminacy* – different interpretation in the cause and effect relationship due to variation in a random event; 4) *systematic boundaries* – focusing on a limited parameter; and, 5) *ignorance* - lack or absence of knowledge. Renn and Klinke (2015) explain that while the first two

components are epistemological issues that can be resolved with improved knowledge and better re-modelling techniques, the last three components, according to them are genuinely uncertain and can only be characterised with a scientific approach but not necessarily resolved by it. Uncertainty is inevitable even in familiar circumstances (Hammond, 1996) and presents a challenge for public health risk especially around systemic evaluation, policy decisions and the management of risk.

The nature of problems in public health risk suggests that public health risk communication is embedded within a larger societal context complicated by ambiguity, complexity and uncertainty. The implication of this is that powerful interest groups, which are able to use the resources at their disposal, or those who are able to shout the loudest, will dominate the risk communication arena, pushing forward their arguments and protecting their interests. The less disadvantaged groups will however be left to bear the consequences of the misunderstanding the risk. This makes public health risk communication and its associated development a challenging task for risk regulators and policy makers. This especially is the case where available evidence does not relate to the amplified claim of risk, thereby creating response-based problems, particularly in relation to budgeting, taking precautionary measures and the experience of policy and management decisions as non-linear, cause and effect relationships. The situation is amplified where there are emergent properties of risk that can make calculations of probability and consequences of risk difficult.

2.4 Risk Assessment

The judgements, perceptions and decisions regarding the nature of risk and its acceptability largely rely on the technique of 'risk assessment'. Risk assessment is "the process of estimating and evaluating risk, understood as the possibility of beneficial and harmful outcomes and the likelihood of their occurrence in a stated timescale" (Titterton, 2005 p.83). It enables the generation of "probability distribution or similar quantification that describes uncertainty about the magnitudes, timing or nature of possible health and environmental consequences associated with possible exposure to specified substance, processes, actions or events" (Covello and Merkhoher, 2013 p.3). The aim of risk assessment is to identify and explore the nature, likelihood and magnitude of

consequences related to a particular risk (Renn and Sellke, 2011). Rowe (1980) views risk assessment as having two main components – risk analysis (identification, estimation of risk and a determination of the consequences) and risk acceptability. This is further subdivided into three components by Renn and Walker (2008) to include the identification of risk and its causal relationships; an assessment of the exposure and vulnerability of a risk target and; the estimation of the risk establishing the validity of the causal link.

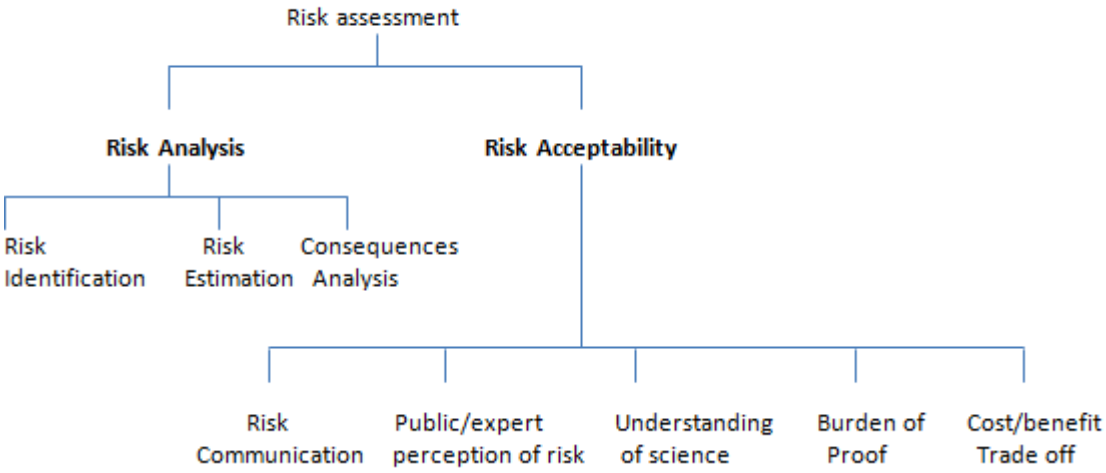
Risk assessment involves both technical and social evaluation of the nature, magnitude and likelihood of a risk occurring (Slovic, 1999). Science typically carries out only technical analysis. However, the problem here lies in the weight given to the technical analysis of risk (and technical expertise) over other normative concerns or that privileges (or amplifies) scientific perspective over non-scientific perspectives (or local expertise) in risk communication. Jasanoff (1998) describes how formal analytic practices (such as quantitative risk assessment and cost-benefit analysis) privileges authoritative and technical knowledge to the detriment of social/personal perceptions of risk in way that may exclude valid viewpoints of disadvantaged or less resourced groups.

Technical expertise has been relied upon by policy makers as a means of making rational decisions on a technical, rather than, on a political basis and, to defend the legitimacy of such decisions (Nelkin, 1975). This traditional model of risk assessment (where there is large reliance on technical experts) is thought to thrive where there is prior knowledge or evidence. This is not often the case in relation to new and emergent forms of risk, where there are large residual uncertainties. This is because there is little or no prior scientific knowledge or evidence upon which technical experts can effectively rely. Fischbacher-Smith et al. (2010) explain that risk assessment often uses established tools and techniques for calculating the probability and consequences of risk. However, in situations of risk and uncertainty where there is little or no prior knowledge, relying on such tools and techniques becomes questionable, as the data available for technical experts to make effective judgements is insufficient. Such situations, according to Funtowicz and Ravetz (2003), require an extended peer community that includes all those affected (including scientists and local citizens), who are prepared to enter into dialogue in order to deliberate and negotiate the processes of measuring the probability of risk and its consequences. Where the risk issue is well understood, the use of routine techniques or procedures is regarded as adequate (Funtowicz and Ravetz, 2003). Moreover,

Collingridge and Reeve (1986) have argued that there is an unhappy marriage between science and policy making.

The limitations of the traditional model of risk assessment has led to a suggested model (Figure 2.2) adapted by both Irwin et al. (1982) and Fischbacher-Smith et al. (2010), which goes back to the work of Rowe (1977) on 'anatomy of risk'. According to Irwin et al. (1982) and Fischbacher-Smith et al. (2010) this is suitable in situations of new or emergent forms of risk where there exists little or no prior knowledge or evidence that will allow learning and co-production of knowledge to occur from (and between) all interested stakeholder groups.

Figure 2.2 The process of risk assessment (after Rowe)
Source: (Fischbacher-Smith et al., 2010). Pg. 28



The risk assessment model of Rowe (1977) adapted by both Irwin et al. (1982) and Fischbacher-Smith, et al., (2010) separates the process around risk analysis (technical process) from risk acceptability (social process). But, they argue that risk assessment especially where there are large residual uncertainties should not be two distinct (technical and social) processes but a socio-technical process that allows input from all stakeholders in the identification, construction and communication of the risk. The socio-technical process recognises that those potentially at risk or in close proximity to various hazards may have valuable insight into the nature of the risk. This according to Irwin et al. (1982) and Fischbacher-Smith, et al., (2010) could be useful in bridging the knowledge gap where there is insufficient scientific evidence to be relied upon by risk technical experts and policy makers. This model of risk assessment is immersed in post positivist

logic; one that views knowledge, as grounded in and shaped by the normative assumptions and social meanings of the world it explores (Fischer, 1992).

The socio-technical risk assessment model to policy making comes with added advantages, as it avoids the 'pitfalls of individualism' in terms of omission, divergence, and counter-production; and one that encourages a bottom up (Schreurs, 2008) and 'bottom top' (Adekola, 2012) approach to policy making in a nonlinear and interactive way. It also enhances the ability of policy makers and risk regulators to deal with 'wicked problems' (Rittel and Webber, 1973) while enhancing its risk acceptability. Wicked problems are issues that are difficult to resolve (Grint, 2010) because they are difficult clearly to define, they are associated with unforeseen consequences that are politically and socially complex (trans-scientific issues), present conflicting goals, entail policy and risk issues that evolve and mutate, and have multiple interdependent and causal factors (Australian Public Service, 2012). Where 'wicked' problems exist, as they do in many public health risk issues, the use of a collaborative (Weber and Khademian, 2008) and socio-technical approach (Westbrook et al., 2007) that draws on multiple expertise and inputs, is regarded as an effective solution to complex policy problems that require complex solutions.

The practical logic of the policy evaluation framework developed by Fischer (2003) attempts to advance knowledge of a socio-technical policy inquiry approach to policy making. The framework sheds light on the interaction between technical and normative discourse in policy inquiry.

2.4.1 Practical Logic of Policy Evaluation Framework

The practical logic of the policy evaluation framework (Fischer, 2003) is concerned with how knowledge is incorporated into policy processes and describes how a set of policy arguments transitions between technical evaluation and normative evaluation. The framework identifies four levels of discourse that allow a "marriage of scientific knowledge with interpretive and philosophical knowledge about norms and values" (Fischer 1995, p.243). These levels are: the technical analytical discourse (technical verification), situational validation, societal vindication and ideological choice. These four layers are set in such a way that the process of technical verification is influenced by

and influences those normative processes of local validation and societal vindication that determine the outcomes of ideological choices made by policy makers (Fischbacher-Smith, 2012). Technical evaluation of the risk is carried out at the technical verification stage to shed light on what is known, and on areas of uncertainty (Fischer, 2003). Disagreement may exist between different expert and public groups based on available evidence and its interpretation, as the debate here determines where the burden of proof lies (Fischbacher-Smith, 2012).

The outcome of the technical verification then leads to evaluation and social construction that raises questions of validation and whether a particular line of argument can be adopted in a local context; "validation is an interpretive process of reasoning that takes place within the framework of the normative belief systems brought to bear on the problem situation" (P.21) and discussed within societal context where the problem lies. According to Fischer (1995), this type of policy evaluation "steps outside of the situational action context … [and is] applied and implemented in order to assess empirically the instrumental consequences of a policy goal in terms of the system as a whole." (p. 21). The processes around situational validation and societal vindication then shape the ideological choice made by policy makers as they seek to establish and examine the selection of a critical basis for making rationally informed choices about societal systems and their respective ways of life (Fischer, 2003). Fischbacher-Smith (2012) has suggested that technical analysis of risk takes place between technical verification and situational validation. Risk acceptability debate takes place between the processes of situational validation and social vindication, and, as we move towards social vindication and ideological choice, the risk debate becomes more politicised, and political power is perceived more as shaping the risk arguments (Fischbacher-Smith, 2012).

The practical logic of policy evaluation framework is useful in terms shedding light on how technical and normative discourse interacts in deliberative and socio-technical policy making. However, the framework did not explicate the outcome of science and expertise in policy making. It is in this arena that the Collingridge and Reeve (1986) 'under critical and over critical model' becomes useful. The under critical and over critical model more explicitly sets out the outcome of science-policy relationship that describes how scientific experts influence policy-making.

2.4.2 Under critical model and Over critical

The over-critical model and under-critical model is based on the assumption of an unhappy marriage between science and policy making, where science is argued to have only marginal influence on policy decisions (Collingridge and Reeve, 1986). Collingridge and Reeve (1986) regard science to be used only to back up or refute arguments or policy perspectives that have been already decided. In the under critical model, criticism of scientific evidence is absent or not openly expressed because: (a) powerful interests determine what is legitimate science and what is not; (b) little or no scrutiny is given to the facts that fit with existing policy, ideology and interests; (c) the argument is already institutionalised in policy practices, even though it might be uncertain; and, (d) there may be suppression of other scientific conjectures which threaten policy consensus (Collingridge and Reeve, 1986). In this scenario, there is greater influence of political power shaping how science and expertise is expressed than in an expert advisory situation (Fischbacher-Smith, 2012).

The overcritical model describes a situation where disagreements exist within the scientific community and where those with power cannot suppress or constrain other perspectives because: (a) the evidence base is weak or inconclusive; (b) scientific evidence presented by different groups of experts is subjected to intense scrutiny with the aim of undermining the evidence of the other; and (c) there are challenges associated with interdisciplinary risk problems, which lead to different and conflicting worldviews. In the over critical model, less political power is perceived to determine the outcome of technical evidence (Fischbacher-Smith, 2012). The result is endless technical debate, which could carry on as long as actors involved are motivated and interested to remain in the debate.

The over critical and under critical model described by Collingridge and Reeve (1986) provides useful insight into how technical expertise is incorporated into policy making. The nature of political power within this is made explicit by Fischbacher-Smith et al, (2012). However, what Collingridge and Reeve (1986) did not do, was to shed light on how in an evolving policy debate, arguments transition from one model to the other (Fischbacher-Smith, 2012). Fischbacher-Smith et al, (2012) argue that the over critical and the under critical model are two ends of a continuum that leaves the understanding of the negotiation of policy arguments between them unclear and poorly documented. The

negotiation of policy arguments between the under critical and over critical models is an essential *gap* in the literature that needs to be filled. This is the context of this study. This will help advance understanding of how a certain policy perspective become dominant and legitimised in a policy context, especially where multi interpretation, values and strong power dynamics are brought to bear in policy debates relating to risk. Policy inquiry relating to risk is a process at the forefront of science and technical expertise in shaping public understanding and policy perspectives taken to the risk. Therefore, understanding the construct of 'expertise' and emerging debates within this literature becomes essential, especially when dealing with interdisciplinary public health risk issues that are further associated with uncertainty, ambiguity and complexity.

2.5 Expertise

Technical experts play an important role in helping the public make sense of the risk faced (Fischbacher-Smith, 2012) both in the technical analysis of the risk, and in the social or normative evaluation that weighs in other social concerns. Technical experts are important in the communication of risk to the public and policy makers for two reasons. Firstly, scientific expertise is often perceived as a credible source and is therefore are more likely to be believed. Although, this does not always translate into public uptake of scientific advice, as 'known sources' are also powerful sources that impact upon public uptake of risk information (Adekola et al., 2017). Secondly, technical experts help the public process risk signals or scientific information, as they often have the requisite knowledge to decode the meaning embodied in scientific ideas. While this is advantageous in terms of aiding end users in making sense of the risk information, the negative implication of this is that where there are vested interests or reputational issues, risk information may be subjected to distortion, amplifying or reducing certain aspects to suit the receiver, hence impacting on the manner in which the risk message is decoded and how the risk is perceived. As a result, technical experts are influential actors in shaping the understanding of risk since they play central roles in identifying, negotiating and communicating risk.

Technical analysis of risk entails an inter-disciplinary process that combines several scientific disciplines and techniques (Fischbacher-Smith, 2012). However, the weight given to technical analysis of risk over the social evaluation of risk privileges (or amplifies) scientific perspectives and its experts over other non-scientific perspectives or

groups within risk communication (Jasanoff, 1996). The suggestion here is that, there are different types of experts (e.g. technical experts and local experts). However, most definitions of experts in the literature favour a scientific expert who is not necessarily expert in lay knowledge. A scientific expert has been defined as a performer who "no longer relies on an analytical principle (rule, guideline, and maxim) to connect understanding of a situation to an appropriate action" (Benner, 1984 p.127) and who is able to recognise underlying principles, rather than focussing on the surface features of the problem (Cross, 2004). For Neils Bohr, an expert is a person who has made all the mistakes there are to make in a very narrow field, *cited in* (Otway, 1987). While expertise commonly describes the report of an expert on a subject-specific problem, it also means the knowledge-ability of the particular expert in question (Kleimann, 1996). The issue of contention within the arena of expertise lies in the manner in which scientific evidence is interpreted and communicated. Debates relating to evidence and interpretation are discussed below while those relating to communication are discussed in section 3.5.

2.5.1 Evidence and Scientific interpretation of risk signal

Within the literature, a number of important issues has been raised that may influence the manner in which evidence or risk signals is interpreted by experts, such that a certain perception of risk may become amplified or reduced. These include conflicting and longitudinal disciplinary practice; domain specificity; paradigm blindness; vested interest and bias; and institutional, structural and organisational culture or conditions.

Conflicting and longstanding disciplinary practices

Many public health risks are interdisciplinary risk issues that encounter problems in relation to competing, differing and conflicting longstanding disciplinary practices and norms. This may bring about epistemological and ontological differences that may influence the nature of the scientific disputes that are brought to bear in risk communication. The potential outcome in such scenarios is conflicting and contradictory scientific argument and interpretation that may lead to endless technical debate. Moreover, there is the increasing recognition that expertise is domain specific (Schneider et al., 1989, McGraw and Pinney, 1990, Smith and McCloskey, 2000, Castel et al., 2007), which means that any use of expertise outside its specific domain can be deemed questionable and disputable (Fischbacher-Smith, 2012).

Domain specificity

The exercise of technical expertise outside the appropriate domain may lead to error, and costs associated with the understanding of the nature of the risk due to 'intrusions' (Castel et al., 2007) and a lack of understanding and knowledge. Intrusion is interpreting domain-related information that may be unrelated with the risk concerned (Castel et al., 2007). This may involve amplifying (or attenuating) certain aspect of the risk with domain-related information. There is also the issue around experiential expertise (the citizen science argument) versus more traditional academic expertise. For example, local expertise may suffer from the manner in which such local assumptions are tested and validated by domain-specific (and technical) expertise. For example, Wynne (1992) describes how the local expertise of Cumbrian sheep farmers was undermined in the reports of government scientists who were involved in radioactive contamination assessment of the region. The implication of this is that where the expert knowledge does not fit with the real life experiences of those in close proximity to (or who experience) the risk, such expertise or expert advice may be undermined or even ignored (i.e. risk attenuation). When knowledge is taken from a specific (or static) domain such as the laboratory and applied within a 'real world' setting, such knowledge is bound to be confronted by other intervening variables (Fischbacher-Smith et al., 2010). However, when this is combined with 'intrusions', it is bound to generate uncertainty about cause and effect relationships. The implication of this is that it may lead to inadequacies or errors in the understanding of the nature of risk that could be problematic for risk managers in managing the risk and its emergent properties.

Paradigm blindness

There is the issue of 'paradigm blindness' and how this affects the nature of interpretation brought to bear on risk signals by technical experts. Paradigm blindness is described as a situation where experts are unable or unwilling to accept and act on the challenges made to their worldview (Edelsky, 1990, Fischbacher-Smith, 2012). The issue of interest here is how experts are able to accept challenges towards their worldview and how paradigm blindness can prevent experts from accepting such challenges (Fischbacher-Smith, 2012). This raises the question of - *are experts able or willing to frame their risk interpretation in a way that accounts for such challenges to their paradigm and are such contentions highlighted in policy decision relating to risk by policy makers?* Collingridge and Reeve

(1986) have suggested that an expert's worldview is often left unaltered as long as evidence exists to support it. The danger here is that where such views are combined with the politicization of evidence, this prevents experts (who are an important sense aiding in risk communication) from seeing (or attenuating the significance of) other alternative worldviews beyond their own. This is significant because of the emergent properties of public health risk and the implication that may have for public health and safety.

Vested interest and bias

Other factors, such as vested interests, may impact on the expert judgement and interpretation brought to bear on risk signals (Fischbacher-Smith, 2012). Where there is a vested interest, motivational bias (Tversky and Kahneman, 1974, Slovic, 1999, Shrader-Frechette, 1996) may arise to cloud an expert's judgments (Kunda, 1990, Garthwaite et al., 2005). Vested interests also expose an expert to powerful interest groups that may use them to their own advantage, especially as many public health risk debates occur in situations of uncertainty. The importance of this lies in the perceived credibility of expertise and the weight given to technical expertise in risk assessment.

Institutional, structural and organisational culture or conditions

There also is also a debate about how expertise is organized and developed, and the organisational culture or conditions that affect how evidence is interpreted (Fischbacher-Smith, 2012). Fischbacher-Smith (2012) for instance, argue that expertise exists within a range of overlapping networks of professional, organizational, national and international dimensions and each of these agencies will have an impact on the ways in which experts are trained, validated and developed over their careers. Experts who function in such overlapping networks may be conditioned by institutional or organisational rules and principles that shape their behaviour, worldview and the attitude they take to risk. The danger here is that, where there is vested interest, institutional or organisational rules and principles may be intentionally positioned to produce certain effects in the worldview, attitude and behaviour of experts, and hence, the interpretation they bring to bear on risk.

The above scenario suggests that the interpretation of risk signals by technical experts may be shaped by numerous factors (as discussed above) that may bring about social amplification (or attenuation) of risk. This raises a fundamental question; to what extent should technical expertise should be trusted and relied upon in public health policy. This

question is significant in situations of risk and large residual uncertainty where there is little or no scientific understanding of the risk. Consequently, this highlights the need to improve the accountability of technical expertise in public health risk communication especially in new (or emergent forms of risk) and where the science is contested. It is at this juncture that other expertise such as local expertise (or experiences) may play a significant role in enhancing the accountability of technical expertise in risk communication.

2.5.2 The alternative view - categorizing expertise

The alternative option in situations of risk and uncertainty is to view technical expertise as one form of expertise in the midst of many in risk communication and policy inquiry relating to risk, rather than, one taken as absolute in the judgement of risk that shapes the policy perspective taken to it. Moreover, there is the so called 'citizen's science argument' (Irwin, 2015) that highlights the importance of experiential knowledge and expertise in shaping the understanding of risk, especially where there are gaps in scientific knowledge. This is in no way to undermine the significance of technical expertise in public health risk communication, but rather to emphasise that the health risk policy arena is by no means reliant on any singular form of expertise. This undermining of technical expertise can be seen in some recent global political events where influential and powerful voices are challenging intellectualism and where 'technical expertise' is seen as the game of a liberal intellectual elite, out of touch with the popular view of what everyday people think, need and want. For instance, the UK's former justice secretary Michael Gove's, remarks in public campaigns leading up to Britain's referendum about whether to exit from European Union (BREXIT), and in the aftermath of the decision illustrate that intellectualism and the role of technical experts is far from uncontested. Gove suggested that "people in this country (Britain) have had enough of experts" (Brown, 2016) focusing his argument on the failure of economists and economic organisations to predict the financial crisis (Mance, 2016). His contention was fiercely and immediately challenged because those with technical expertise have skills and capabilities essential for critical analysis and the evaluation of ideas and events (Suleiman, 1977), which cannot be undermined when dealing with intellectual and risky challenges facing society and communities. Besides, there is a recognition that the value of careful, evidence based argument, and reflection, and the capacity to be open to contrary views has allowed humankind to explore who we are and to better understand the physical, social, political, and economic forces that shape the world around us (Muscatelli, 2016).

This study argues that there is a place for technical expertise and also other forms of expertise (such as experiential expertise) in public health risk communication (as long as these are not over-arching). Technical expertise can be relied upon when confronted by 'knowns' (although, there are 'unknown unknowns'), and in static and predictable situations (assuming the stakes are not high). This is not necessarily the case in new and emergent forms of risk, where the knowledge about the nature of a risk and its emergent properties are largely unknown. Such a scenario will require a socio-technical approach to risk assessment and policymaking where the input of all stakeholders (including ordinary citizens) is equally valued and weighted in the policy decision-making. Of importance is the need for the different stakeholders to understand the inevitable trade-offs or compromise in minimizing risk (Adekola et al., 2017) hence, reducing the chances of vested interests while encouraging democratic participation, transparency and opening up science for public scrutiny (Stilgoe et al., 2006a). This study therefore takes the view that an expert is a qualified or experienced individual who has knowledge or experience of a particular domain and who is able to translate this knowledge and to determine its significance in every day societal settings. This definition de-emphasises the focus on technical expertise and recognises the value of every day experiential knowledge and expertise. Consequently, it becomes important to consider different forms of expertise in the literature and what this means for public health risk communication (see section 9.6).

2.5.3 The different categories of expertise

Hoppe (2010) makes a distinction between a technical expert and a public expert (technocrat) that forms the first two categories of expertise. According to Hoppe (2010), 'technical expert' is an expert recognised as qualified scientist who works within the rigour of scientific methodology in a specific field and who has received specialised training in an institution of higher education (Suleiman, 1977). 'Public expert' (or technocrat) on the other hand, is a technical expert who works in public offices or government institutions (e.g. Chief Scientific officer) whose role is to support government in achieving its aims and objectives. The third category of expertise is 'industry experts'. This group is those technical experts who work for corporations or industry (e.g. a chemist working for the tobacco industry), and whose interest is in protecting the interest of the corporation or industry for which they work. The final category of expertise is termed 'citizen's scientist' (Irwin, 1995b) or experiential

expertise. This form of expertise is based in the daily life experiences of individuals or groups. This may include local farmers, mothers or those in close proximity to risk location or hazard. These categories are summarised in Table 2.1 below.

Table 2.1 The different categories of expertise

Technical Experts (Ziman, 2002)	Public Expert/ Technocrat (Hoppe, 2010)	Industry/Corporate Experts (Collingridge and Reeve, 1986)	Local/Experiential expertise (Alan Irwin, 1995)
Authoritative or recognised scientists who work in knowledge institution.	Scientists who work in public offices (e.g. Chief Scientific Officers)	Scientists who work for corporations (e.g. a chemist working for a pharmaceutical company)	Ordinary citizens who are experts in their daily routine (e.g. local farmers, mothers)

Having distinguished these four categories, it must be noted that there is the possibility that one person may fit into all these four categories. Spruijt et al. (2014) suggested that the role of experts is influenced by context, type of problem and personal values. This means that the platform in which an expertise is expressed (either as technical, public, and industry or local expertise) may determine the nature of interpretation brought to bear on risk signal or evidence. It is therefore important to declare affiliation when interpreting risk signals, and this should be taken into consideration during associated policy making. Nevertheless, it has been suggested that technical experts (e.g. doctors, academics and independent scientists) are often trusted by the public; environmental and interest groups are somewhat trusted, while government ministers and industry scientist are the least trusted (Petts et al, 2001).

2.6 Summary of Key Points/Conclusion

The purpose of this chapter was to set the discussion of risk and risk communication further within the policy context. In this chapter, it was highlighted that a non-linear approach to policy development is a more appropriate way of reflecting modern day evolutionary and interactive policy making. Therefore, a socio-technical model of public health risk communication that enables interactive policy making was deemed more

appropriate in situations of large residual uncertainties and where there exits ambiguity and uncertainty. With science and technical experts playing a dominant role in policy inquiry relating to risk, a number of debates (such as domain specific and different disciplinary practices) question the rationality of relying largely on technical expertise when dealing with inter disciplinary risk or situations of large residual uncertainty. In such a context, it was determined that technical expertise was only one form of expertise and that the value of other forms of expertise (such as local or experiential knowledge) was essential. The chapter concludes by highlighting different forms of expertise that exist in the literature, categorizing them into four distinct groups of expertise. The study argues that there is a place and important role for both technical expertise and other forms of expertise in public health risk communication (as long as none is over-arching). The implication of this is further discussed in chapter eleven as a means of improving public health risk communication.

3 The Social Amplification of Risk Framework and Power

3.1 Introduction

This study is concerned with understanding the role of power and expertise in public health risk communication. Social amplification of risk framework is a key framework that provides a useful lens in examining how a risk argument becomes amplified in a policy context; therefore, the SARF is central to this study. This chapter thus, provides an account of the social amplification of risk framework (SARF) and explores key concepts within the literature that can inform the critique of the framework that led to the development of a new and an enhanced understanding of social amplification (or attenuation) in public health risk communication. Specifically, the chapter teases out the role of power and expertise, and then communication and trust in shaping social amplification (or attenuation processes) in public health risk communication.

This chapter is divided into three sections. The first section begins by reviewing the SARF and identifying its key elements. The strength and weaknesses of the framework is also unpicked. Ways in which the framework can be improved are then suggested. The second part of this chapter reviews existing literature in relation to the weaknesses identified in existing conceptualisation of SARF. The final part of this chapter ties back insight from the reviewed literature into social amplification of risk framework (which is further developed into an advanced conceptualisation of the SARF in chapter ten).

3.2 Social Amplification of Risk Framework

The social amplification of risk framework (SARF) proposed by Kasperson et al. (1988) provides a perspective on risk communication (Renn, 1991b) for selecting, ordering and classifying social phenomena relevant to risk communication and the perception of risk (Kasperson et al., 1988). SARF incorporate findings from psychometric and cultural research and describes how events seen by technical experts as relatively of low risk based on statistical significance becomes a focus of social and political concern (i.e. risk amplification), while others, adjudged by experts to be more highly perceived risks

receive comparatively little attention in the social and political arena (i.e. risk attenuation). The social amplification of risk starts from a risk-related 'event'. However, how the 'risk event' is presented and then portrayed in both media and other sources interacts with psychological, social, institutional, and cultural processes. By so doing, they might amplify (increase) or attenuate (decrease) the perception of the risk and, through this, shape behaviour (Kasperson et al., 1988).

The social amplification of risk framework is based on the analogy of "dropping a stone in a pond" This is a situation whereby some events seem to create ripple effects with secondary and tertiary impacts which can spread beyond the initial effects of the hazard or event and impact upon previously unrelated technologies or institutions. Such impacts may include financial losses, regulatory actions, loss of institutional trust, stigmatisation and organisational change (Figure 3.1). This implies that the amplification also occurs even in its transmission in a way that may be linked with issue-attention cycle.

Figure 3.1: Social amplification of risk framework

Source: (Kasperson, 2012a)

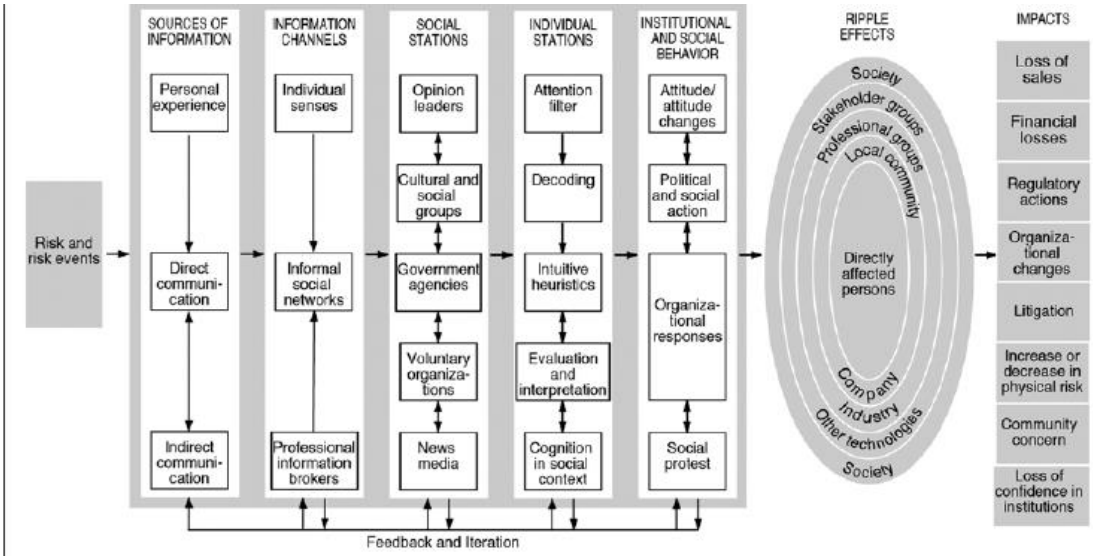


Figure 3.1 describes how social amplification and attenuation of risk occurs. SARF uses communication theory (Lasswell, 1948, Shannon and Weaver, 1949, Shannon and Weaver, 2015) to illustrate the 'amplification' metaphor describing how risk signals are received, interpreted and passed on by a variety of social and individual stations. These signals are subject to changes or distortion as they filter through the 'amplification' stations and this may be individuals, social groups or organisations such as individual scientists, policy makers, government agencies, corporate organisations and, pressure groups (Kasperson, 2012b). Within this, the information sources, information channel, social/individual stations and, institutional/social behaviour are seen as key elements of the social amplification. There are also feedback and iteration processes that shape social amplification of risk. These elements are subcategorised under a higher order category contextualised by Kasperson (2012a) in two stages of social amplification of risk: the information mechanism and response mechanism to risk.

Central to the information mechanism are - the sources of information, the channel of information and the transmitters of the information (individual and social stations). Within this, factors that may shape the amplification process are the - extent of media coverage, the volume of information provided, the degree to which the information is disputed, the extent of dramatization and the symbolic connotation of information including how the risk information is framed, and discourse enlisted, in depicting and characterizing the risk (Kasperson and Kasperson, 1996, Kasperson, 2012b). They see the 'media' as the main amplification station. Institutional and social behaviours are elements within the SARF identified as shaping the response mechanism of social amplification processes (Kasperson, 2012a). Four pathways were identified to be particularly critical within response mechanism of social amplification of risk; these are - heuristics and values, social group relationship, signal value and stigmatisation. In addition to these, trust (Frewer, 2003), culture (Masuda and Garvin, 2006) and emotions (Morganstern, 2016) are suggested also to shape the response mechanism of social amplification of risk.

The SARF has been tested empirically both in the US and the UK *see* (Machlis and Rosa, 1990, Renn et al., 1992, Kasperson, 1992, Freudenburg, 1993, Burns et al., 1993, Kasperson and Kasperson, 1996, Petts et al., 2001, Pidgeon and Barnett, 2013). Some

studies suggest that the framework is able to explain some of the underlying factors that shape social responses to risk (Machlis and Rosa, 1990, Freudenburg, 1993, Renn et al., 1992, Burns et al., 1993, Kasperson, 1992, Kasperson and Kasperson, 1996). However, the secondary and tertiary ripple effects were identified to be more difficult to prove (Metz, 1996, Pidgeon, 1999). The framework has been recognised for making a genuine attempt at providing theoretical coherence to the field of risk communication and perception (Pidgeon and Henwood, 2010) and is believed to offer a comprehensive multi-disciplinary structure that assists in selecting, ordering and classifying social phenomena, and in interpreting empirical data and theoretical insight (Renn, 2011). Table 3.1 depict the elements of the information and response mechanism of the SARF as adapted from the literature.

Table 3.1: Elements of Social Amplification
Source: Adapted from extant literature

Information Mechanism	Response Mechanism
• **Communication processes** – the **sources**, **channel** and the **transmitters, receiver** of risk information. ○ Media coverage ○ Volume of information provided, ○ Degree of information dispute, ○ Extent of dramatization ○ Symbolic connotation of information (including frames and discourse)	• Institutional and social behaviours ○ Heuristic and Values ○ Social group relationship ○ Signal values ○ Stigmatisation ○ Trust ○ Culture ○ Emotions

From Table 3.1, what can be observed in the information mechanism of the SARF is its emphasis on 'who' (that is, sources, channels and transmitters) especially 'the media' and the nature of risk information itself such as media coverage and volume of information available. While this is valuable in shedding light on the amplification (or attenuation) processes, it ignores how underlying factors shape the elements of this information mechanism of the SARF. From this point of view, several weaknesses of SARF

(especially around the information mechanism that influences upon the response mechanism) are discernible (see

Table 3.2).

Table 3.2: Weaknesses of SARF

Context	Weaknesses
Central to information mechanism of social amplification of risk are extent of media coverage, volume of information provided, degree of information dispute, extent of dramatization, symbolic connotation of information.	Ignores underlying factors that shape these elements of the information mechanism of SARF and risk information sharing. For example, SARF is unable to account for structural and institutional factors that shape risk communication (Taylor-Gooby, 2004) and for undermining the role of power in risk communication (Petts et al., 2001).
SARF acknowledges the importance of frames and discourse in characterising the risk.	Science and its experts play an important role in making sense of risk issues (Collingridge and Reeve, 1986, Jasanoff, 1996, Fischbacher-Smith, 2012) and shaping the discourse around risk. However, SARF pays too little attention to the issues that surround expert interpretation of evidence or risk signal (discussed in previous chapter 2).
The SARF uses the basic elements of communication process to describe how risk signal is received interpreted and passed on by individual or social position.	While the SARF recognises the feedback mechanism as depicted in Figure 3.1, the model tended to conceptualise risk communication as a *one-way* transfer of information (Pidgeon and Henwood, 2010), that is, from risk-related events, to sources, through transmitters, and then on to receivers. Risk communication is an interactive, multi-dimensional and multi-channel process (Fischbacher-Smith, 2012). It is conceptualised as an arena of struggle amongst stakeholders over meaning and definition of risk (Petts et al., 2001) and where power dynamics shape risk communication processes and where meaning is continually negotiated and refined through everyday conversation and argument. The model also pays little attention to how the language used in the communication process may inhibit or enhance risk amplification or attenuation.
Sees media as the main amplification station (Petts et al., 2001).	The media is suggested to be a reflection of public mood, framing and interpretation of risk (Petts et al., 2001).

Table 3.2, identifies some of the weaknesses of the SARF. One apparent failure of the framework is that it pays too little attention to underlying or salient factors that shape risk information and communication. For example, it ignores the roles of power and processes around expertise (discussed in chapter two) that shape how risk information is encoded, transmitted, decoded and fed back in risk communication. Besides, it has been argued that the issue of risk communication is not the amount of information provided (e.g.) by the media, but whose interpretation of the risk is legitimised (Petts et al., 2001) and who controls the policy agendas (Majone, 2006), deciding what risk issues enter into the risk arena for debate. In addition, the translation of knowledge to use in risk communication via 'expertise' (Pender, 2001, Power, 2007) and associated calculative practices, points other weaknesses of the SARF. Science (and its experts) is largely relied upon as a means whereby the public make sense of the risk faced (Collingridge and Reeve, 1986, Jasanoff, 1996, Fischbacher-Smith, 2012). Therefore, the manner in which expertise is brought to bear on risk has implications for how a risk signal is interpreted in the public understanding of the risk. Furthermore, the centrality of science and its experts in making sense of risk issues for other non-scientific stakeholders' groups raises questions around the language in use and especially as risk communication involves an interactive process between experts and lay public.

Having stated this, it becomes essential that this study (which focuses on power and expertise) first attempt to address the critique of the SARF in other contexts for this framework to provide a useful and robust lens with which to understand how power and expertise shape the manner in which a risk argument becomes amplified in public health risk communication so as to inform the transition of risk argument within a policy context. This is particularly important in the policy context where the policy perspective taken to risk has far-reaching health, social and political consequences. Accordingly, one way to improve on the existing conceptualisation of SARF is to:

a) Examine how power shapes social amplification (or attenuation) processes in public health risk communication.

b) Investigate how expertise shapes social amplification (or attenuation) processes in public health risk communication.

c) It will also be important to draw on debates about communication and trust/credibility, to stress the importance of communication and trust, in public health risk communication. Communication has been highlighted as an important part of risk communication (Smith, 1988, Smith, 1990) and trust is now generally accepted as a critical underpinning factor that shapes behavioural responses to risk information (Renn and Levine, 1991, Kasperson et al., 1992, Slovic, 1993, Casiday, 2005, Earle and Siegrist, 2008).

This understanding will advance existing knowledge of social amplification of a risk framework and make it possible to draw out best practices for public health risk communications and its associated policy development (see chapter eleven). As a result, to fill the gap made by the weaknesses of SARF requires understanding of power, expertise, communication and trust.

3.3 Power and Social Amplification of Risk Framework

A review of literature on power has suggested that there is no consensus on how power should be defined (Sharp, 2000) and this has given rise to various dimensions of power. Early conceptualization of power such as (Dahl, 1957, Bachrach and Baratz, 1962, Lukes, 1974) tended to focus on the power one has over another when the one is able to dominate or produce certain effects over the other (Russell, 2004, Morriss, 2006). However, recent conceptualizations have emphasized that power is rather more diffused (Foucault, 2008) even if it is in the form of resistance and focused on 'power to' affect outcomes (Barnett and Duvall, 2005).

3.3.1 Four Dimensions of Power

Barnett and Duval (2005) identify four dimensions of power after reviewing the accounts of Dahl (1957), Bachrach and Baratz (1962) and Lukes (1974). These include

compulsory, institutional, productive and structural dimensions of power. In compulsory power, one actor directly controls another, akin to the conceptualisation of power of Dahl (1957). With institutional power, actors indirectly control others by setting rules and controlling the agenda (Bachrach and Baratz, 1962). With productive power, domination is achieved by capturing people's thought processes through the control of information, mass media and processes of socialisation (e.g. language, education) (Lukes, 1974, Lukes, 2004). With structural power, actors control others by virtue of a membership of a social group and by means of social relationships (Barnett and Duvall, 2005). Using the terms offered by Barnett and Duval (2005) in the present discussion, *risk communication can be argued as a process embedded within institutional, productive and structural powers such that social amplification or attenuation of risk is allowed to thrive.* This is especially so in a democratic society where compulsory power is not prevalent in risk communication, and to stress that the emphasis here is on '*salient*' dimensions of power that may be exercised through elements of the communication process in a risk arena.

Within public health risk communication, institutional power (Bachrach and Baratz (1962) enables some individuals or groups (mostly those in charge of managing the risk or a resourced stakeholder group) to control the risk agenda, deciding what risk issue is put forward for policy debate and consideration. The ability of some group to set rules and control the policy agenda puts them in a position of power when compared to other stakeholder groups. This is especially the case where the debate relating to identifying policy priorities and risk agendas is limited to a few elite groups and not subjected to wider public debates. The danger here is that policy priorities relating to risk may then become a reflection of only a few elite group members, and that risk concerns expressed by other groups (or larger sections of society) may be unwittingly neglected or consciously excluded from the risk agenda. In such a scenario, the significance of issues that make it onto the risk agenda is then enhanced (i.e. risk amplification) and that of those concerns that fail to make it to the policy agenda reduced (i.e. risk attenuation). The importance of this is amplified where an individual or group interest is prioritised at the expense of public health and safety. A typical example where group interest is put before public health, is an instance in United States (US), where Tobacco industry Chief Executive Officers (CEO) testify before the US congress that cigarettes are not addictive,

despite (hidden) knowledge that they actually are (Hilts, 1994) to the detriment of public health and safety.

Productive power in public health risk communication is exercised by controlling people's thought process (e.g. through the media and control of information and expertise) in translating meaning to use. There is a productive power associated with media communication. For example, media communication allows certain views to be shared with the larger population and therefore, have greater propensity to shape public risk discourse. The media is an important channel of information for two reasons: (1) they provide access to the majority of society and, (2) they help the public make sense of risks faced (sometimes by calling upon experts in the meaning making). Media sources such as television and newspapers remain an established channel where expert opinions are shared, negotiated and exchanged (Petts et al., 2001), and has been largely relied upon by the public to make sense of the risks it faces. Therefore, the airing of expert interpretation and framing through this medium cannot be undermined (Taylor-Gooby, 2004). However, recent advances in communication technologies (e.g. social media) are redistributing the power associated with media communication (Riedlinger and Rea, 2015). For example, with the increasing popularity of social media and Internet sources, interested members of the public are able to seek knowledge, engage in public debates relating to areas of interest, or even seek opportunities to disrupt existing states of knowledge by challenging existing assumptions. Such technological advances are shifting the balance of productive powers within public health risk communication such that the extent to which risk information is controlled and exploited is reduced. However, there is a problem that comes with the rise of social media and Internet sources, as it has become even more challenging when dealing with public health risk issues to differentiate between credible arguments from propaganda.

Productive power may also come from the control of risk information and expertise (that is, who, when, where, and how much is information is made available or concealed) that shapes the knowledge, argument and burden of proof brought to bear on the risk communication. For example, resourced individuals or groups who have exclusive access to valuable risk information or expertise can use such knowledge as a means to frame

their argument and back up their worldview or interest while accessing evidence or expertise to effectively refute the arguments of the opposition. Technical expertise has long been regarded as a source of power in literature as it is seen as 'indispensable' but also 'a suspect' (Suleiman, 1977) p.36. Those who do not have access to such 'classified' information, or to the necessary expertise, have to rely mostly on third party sources for such information. The danger here is that the information provided may be distorted, incomplete or costly to access by less resourced groups such that disadvantages (i.e. attenuates) their perspective or ability to mount an effective challenge to the powerful interests that lie behind information resource exploitation (Adekola et al., 2017). Such disadvantages are reduced where such information is within the public domain.

In terms of what Barnett and Duval (2005) call structural power, individuals or groups (e.g. scientists) can be argued to have the ability to shape risk communication by virtue of their membership of a professional body or by means of social relationships (Barnett and Duvall, 2005), despite recent objections to intellectualism *see* (Keyes, 2004, Pazzanese, 2016, Flood, 2016). Power here may come from rules and regulation around how expertise is constructed, developed including the surveillance put in place to ensure conformity of such professional practices that creates tension between professional expertise and deliberative policy making (Fischer, 2000). Such avenues of power may not be a direct consequence of been a member of a network but are generated temporally or spatially through institutions or formal norms that can influence the outcome of public health risk communication without any direct interaction with it (Garton et al., 1997). They are however relevant because they shape risk assessment practices and how risk signals are interpreted by experts. Direct social and professional interaction between stakeholders' groups is also a place where structural power may be exercised.

Table 3.3 itemises how these dimensions of power shape public health risk communication.

Table 3.3: Power in risk communication

Power in risk communication	**Manifestation mechanism**

Institutional Power	• Control of risk agenda ○ Who decides what issues makes it to the policy agenda

Productive power	• Technical expertise
	  ○ How expertise is constructed, trained and developed that shapes how evidence is interpreted.
	• Media sources
	  ○ How risk is framed and covered in media and mediated sources
	• Control of risk information
	  ○ Who, where, when and how much is revealed or concealed

Structural power	• Long standing disciplinary practices ○ Rules and regulations that determines how risk is assessed • Social and professional relationship

In addition to the four dimensions of power provided by Barnett and Duval (2005), another perspective of power significant within the context of risk communication is Foucault (1978)'s notion of resistive power. He argued that "where there is power, there is resistance, and yet, or rather consequently, this resistance is never in a position of exteriority in relation to power" (p.95). It would be wrong therefore to ignore resistance as a form of power in public health risk communication. Such a form of power is often displayed by less resourced or disadvantaged groups that feel their perspectives of risk has been ignored and therefore, challenge the dominant or legitimised risk perspective, even if in the form of protest, rallies and boycotts. Such action has been seen in the past to influence or change policy strategy taken to mitigate public health risk. A typically example where such resistive power has proven to be effective in the policy domain, was the scenario where the Canadian government had to reduce the increase in cigarette tax (initially aimed at curtailing smoking). This reduction was due to a rise in the illegal sale of tobacco on the black market or easy access to cheap contraband tobacco products (Gabler and Katz, 2010) that were equally, and perhaps more dangerously, detrimental to public health. The revision of the tax increase was based on the assumption that while such taxes discourage smoking to some extent, they create powerful incentives to buy and sell contraband tobacco products (Gabler and Katz, 2010). This means resistive power may be exercised as an opposing force to any of the other forms of power. This makes

the exercise of power a double-edged process that may tilt the balance of power in any stage of the communication process. In other words, risk debates and the exercise of power are not one way - they occur within the scientific community and between the scientific community and lay public.

Having discussed power and how it shapes social amplification (or attenuation) processes in risk communication, other important factors are highlighted by the critique of the existing conceptualisation of the SARF and these are expertise, communication and trust. These factors are discussed in the following section unpicking how they may exert influence upon social amplification (or attenuation) in risk communication.

3.4 Expertise

As noted earlier in chapter two, expertise plays a significant and dominant role in policy inquiry relating to risk as it is often the conduit by which a risk signal is interpreted and framed (Fischbacher-Smith, 2012). Hence, technical experts largely shape public understanding of risk and the policy perspective taken to it. However, there are a number of contentions (previously discussed in section 2.5) such as paradigm blindness, intrusion, vested interest and organisational culture or conditions that may impact on expert judgement and interpretation brought to bear on risk signal and that may amplify (or reduce) a certain perspective of risk. There are also institutional and structural issues around expertise that may influence social amplification of risk, especially around how the development of expertise is rooted within a range of overlapping networks of professional, organizational, national and international dimensions (Fischbacher-Smith, 2012) that will have an impact on the manner of interpretation brought to bear on risk communication. This means that expertise is a social construction that is effectively developed by powerful and resourced stakeholders' to actualise certain interpretation of risk. The danger here is the perceived credibility of expertise and the weight given to technical expertise in public health risk assessment. These issues around expertise were

discussed in greater detail in the previous chapter (two) and will therefore be given little attention here.

The following section will now consider emerging debates around communication and trust in risk communication. This is to stress the importance of (Smith, 1988, Smith, 1990) and trust (Renn and Levine, 1991, Kasperson et al., 1992, Slovic, 1993, Casiday, 2005, Earle and Siegrist, 2008) in public health risk communication and that these will have on social amplification (and attenuation) of risk.

3.5 Communication and Social Amplification of Risk Framework

Understanding the nature of risk faced by the public often involves communication between experts across multiple disciplines and between technical experts and other non-scientific groups. However, the way in which risk information is communicated is known to play a key role in influencing how that information is perceived or used by individuals (Kahneman and Tversky, 1984). This raises important issues around the nature of language in use, in particular, the specific forms of language code or frames of reference used by the different stakeholders' groups engaged in the risk communication (Smith, 1988). Basil Bernstein's work on 'language codification' identifies two general type of codes relevant to information reception: "elaborate" or "restricted" codes (Bernstein, 1971). Bernstein (1977) used the terms "elaborated code" (to refer to the language of experts) and "restricted code" (to refer to the language of others not familiar with the knowledge field). The relevance of Bernstein's (1977) work for the present discussion is that it highlights how language could severely inhibit effective transfer of information where the receptor group has little knowledge of, or is unable to decode the meaning inherent in the risk information (Adekola et al., 2017). Jasanoff (1998) for example, describes how professional languages can operate to privilege technical and authoritative perspectives to the detriment or exclusion of other valid viewpoints.

The use of elaborate code to a non-scientific audience has implications for risk communication, as (a) it might prevent some groups within the public (e.g. lay public)

from engaging in the public health risk communication by serving as a barrier. (b) it might push some groups within the public to those groups where less elaborate codes are used and (c) the use of unfamiliar (or technical) terms may be 'intentional', designed to keep those who do not understand these codes outside of the debate and deny them the opportunity to make valuable contributions to risk communication processes (Adekola et al., 2017). The danger here is the 'distortion' that comes from filling in 'gaps' in knowledge and recoding the message (in the case of third person transmitter) for the end users. Having stated this, the interactive nature of communication brought about by advances in information and communication technology (ICT) would be an area for further investigation within the social amplification and attenuation context. Furthermore, the fact that vested interests cannot be ruled out highlights the importance of trust and credibility in public health risk communication.

3.6 Trust and Social Amplification of Risk Framework

Trust is believed to affect judgement of risk and benefit, and risk acceptability (Siegrist et al., 2003) and has been long recognised in the literature as a key element in risk communication (Kasperson et al., 1992, Löfstedt and Horlick-Jones, 1999, Frewer, 2003). The effect of trust in risk communication can be seen in how the lay public often defer to experts in sense making such that makes them immediately vulnerable to the interpretations of experts in their understanding of risk. This vulnerability paradigm has been highlighted in several definitions of trust. For example, Mayer et al. (1995) describes the willingness of one party to be *vulnerable* to the actions of another party, based on the expectation that the other will perform a particular action important to the one, irrespective of the ability of the one to monitor or control the other. It is a willingness to make *oneself vulnerable* to the views, decisions or actions of another person or an organisation (Kjærnes et al., 2007). As such, risk information from a trusted source is believed to contribute to the way an individual perceives and responds to such information (Frewer et al., 2003). Flynn et al., (1992) explains that the more trustworthy a source (all

other factors being equal), the more the information from this source will resonate with the audience. The opposite holds when the source of information is not trusted.

Petty and Cacioppo (1984) identify two routes by which a risk message can be decoded - the central route and the peripheral route. Trust plays a key role in determining which route is used in decoding the meaning inherent in the risk information received. The central route is where the receiver of risk information carries out an intense scrutiny of the risk information received. Here, external clues do not influence how the information is processed; the receiver carries out in-depth analyses of the risk information, in way that may serve either to reassure the decoder, attenuating risk concern, or amplify the risk, especially where uncertainties or gaps in the knowledge are high. The peripheral route utilizes those external clues e.g. the credibility of the source of information, an expert or known source, the timing and how the message is codified. These external cues allow the receptor of the risk information to make simple inferences and judgements about the merits of its content without any elaborate or in-depth processing. The danger here is that errors, distortion and gaps in risk messages are received without scrutiny. This may lead to a false perception of risk that may either amplify or attenuate the perspectives taken to risk. Insight from the work of Petty and Cacioppo (1984) suggests that the central route in decoding risk information is more likely to be used where there is absence of trust and credibility in the information source. The peripheral route is most likely to be used in situations of trust and credibility.

Trust may also impact on the nature of the feedback process, which is recognised as essential for effective communication (Shannon, 1961). Trust is believed to encourage openness, transparency, responsiveness and a willingness to consult with one another (Fischbacher-Smith et al., 2010). A receiver who trusts the sender of the message is likely to be more inclined to have an honest conversation than with a source that is mistrusted (Gabarro, 1978), where difficult feelings and concerns can be shared and understood in such a way that can be dealt with appropriately. This reduces the pressure towards increased risk concern created by other factors. Fischbacher-Smith et al. (2010) argue that where the qualities of openness, transparency, responsiveness and willingness to consult with one another are absent, there will be a greater likelihood of risk intensification.

3.7 An Alternative Perspective to Social Amplification of Risk Framework

The insight drawn from the above literature on power, expertise, communication and trust provides new insight for the SARF.

Table 3.4 ties these factors back to the SARF, describing how they shape social amplification or attenuation and influence public health risk communication. This is discussed here within the context of information mechanisms and response mechanisms of the SARF. A more in-depth account of these new advances to SARF using empirical evidence from this study is presented in chapter nine.

Table 3.4: Factors shaping social amplification (or attenuation) processes

Information Mechanism	Response Mechanism
Power o Setting the risk agenda o Evidence and interpretation o Control of risk information o Long standing professional practices o Media access o Social/professional group relationship **Expertise** o Too much weight attributed to technical expertise o the construction and development of experts o Domain specificity o Paradigm blindness **Communication** o Language in use o Interactive and quality of feedback process to clarify meaning and discuss sensitive issues	**Trust and credibility** o Source of information (experts vs. known source) o Transparency and openness o Inclusiveness **Power (resistance)** **Culture and signal value** **Emotion** o Distribution of cost and benefit o Gains and losses

This new insight of the SARF aligns with the assumption that social amplification of risk is a multi-dimensional and multi-channel process (Fischbacher-Smith, 2012) in public health risk communication; a view to which this study subscribes to (see chapter ten for a more detail and modified account of the SARF).

3.7.1 Information mechanism

From the critical review of the above literature, power, expertise and communication can be said to be factors shaping the information mechanism of social amplification of risk. In terms of power, **institutional power** is exercised by shaping policy priorities and risk agendas. **Productive power** is exercised through media sources that may privilege a certain perspective of risk. Productive power may also be exercised through the control of risk information and access expertise. Expertise may become an avenue of power by means of the nature of the interpretation and framing brought to bear on risk, and in particular, the weight given to technical assessment of risk over other social concerns. **Structural power** may be exercised by means of social and professional relationships. Other avenues of structural power are long standing disciplinary practices that guides the construction and development of expertise that shape experts' thinking and behaviour. Together, these dimensions of power bring about social amplification (or attenuation) of risk in public health risk communication. This view aligns with the suggestion that social amplification of risk is not *only* about media coverage, volume of information provided, degree of information dispute, extent of dramatization, symbolic connotation of information (Taylor-Gooby, 2004). However, the ability of these factors to shape social amplification of risk is contingent upon institutional, productive, structural factors brought to bear on risk communication.

Expertise may become an avenue for social amplification of risk by means of the nature of interpretation and framing brought to bear on risk. This includes the unequal weight given to technical assessment of risk over social evaluation; disciplinary, epistemological and ontological differences that may create differences or disagreement in interdisciplinary risk issues; the fact that expertise is domain specific and that therefore bias or paradigm blindness may bring about errors (amplification or attenuation) in the understanding of risk. Also important within the information mechanism stage are

communication processes. Communication may become an avenue for social amplification of risk by means of the language used in the communication of risk, in terms of language use and the interactive and quality of feedback that may enhance or inhibit effective risk communication and allow for clarification of meaning and discussion of sensitive issues, hence reducing the potential for amplification or attenuation.

3.7.2 Response mechanism

Within the response mechanism, trust has in particular been recognised as shaping behavioural responses to risk (Renn and Levine, 1991, Wynne, 1992, Slovic, 1993, Smith and McCloskey, 1998, Frewer, 2003, Earle and Siegrist, 2008) in particular, by the manner in which risk information is processed and decoded, and whether the central route and the peripheral route is used to bring about social amplification of risk. Culture (Masuda and Garvin, 2006), signal value (Kasperson, 2012a) and emotions (Morganstern, 2016) are other factors identified within the literature that shape behavioural responses to public health risk communication. Resistance (as a means of challenging dominant or legitimised perspectives) is also important in shaping social and policy responses to risk and its emergent properties.

This advancement to the SARF provides valuable insight into the present discussion on how power and expertise shapes risk communication. It also strengthens the potential of the framework and the ability of this study to use it as lens to understand the negotiation of risk argument between over critical and under critical models in the policy domain. The next step will involve using this insight to create theoretical coherence of public health risk communication within the policy context. The aim is to help address the study research question set out in chapter one which seeks to understand - *how a set of risk arguments evolve such that a particular risk perspective becomes dominant in a policy context?* This new understanding of social amplification of risk now makes it possible at this point to state the following hypothesis:

Social amplification of risk is the driver behind the negotiation of public health risk arguments between the over critical model and under critical models in a science-policy relationship.

This hypothesis will be theoretically evaluated in chapter four.

3.8 Summary of Key points and Empirical Evaluation of the Proposed Framework

This chapter has critically reviewed the social amplification of risk framework by identifying areas of strength and limitation within the context of public health risk communication as it relates to its policy making. The critique of the framework formed the basis of the literature review that followed in this chapter. In this chapter, it was argued that public health risk communication is embedded within institutional, productive and structural dimensions of power. Power, expertise and communication were seen as critical underlying factors shaping the information mechanism of social amplification of risk. Trust was identified as critical in shaping the response mechanism of the SARF. Therefore, it was concluded that social amplification of risk is a multi-channel and multi-dimensional process (Fischbacher-Smith, 2012). The review of literature carried out in this chapter led to the hypothesis that Social amplification of risk is the driver behind the negotiation of public health risk arguments between the over critical model and under critical models in a science-policy relationship. The next chapter builds on the insight from this chapter to theoretically illustrate how a set of risk arguments evolves from a risk event to its policy formulation. The aim is to understand theoretically the research question presented in chapter one.

4 Public Health Risk Debate and Policy Making – A Theoretical Perspective

4.1 Introduction

This chapter theoretically describes how a set of risk arguments evolves from the occurrence of a risk event to a policy formulation. The aim is to explicitly address the research question set out in chapter one – *how does risk argument evolve such that a particular argument becomes dominant in a policy context?* The chapter begins by illustrating the evolution of a risk argument from its anecdotal stage of risk communication to the technical verification of the risk and policymaking stages. It describes the 'bias' against anecdotes within the arena of contested knowledge, unpacking its relevance in shaping public understanding of health risk. The chapter sheds light on the relationship between public concern, and technical and policy debates in public health risk communication as it relates to policy making.

Later on in the chapter, emphasis is placed on the transition of risk arguments between technical and policy debates. This is the arena in which it is hoped this study will make a theoretical contribution. With emphasis in this arena, the synthesis of the alternative perspective to social amplification of risk (set out in chapter three) and the over critical and under critical model (see chapter two), led to the development of policy evaluation risk communication (PERC) framework. The PERC framework describes how an argument within a set of risk arguments becomes dominant in a policy context. This framework is founded on the proposal set out in the previous chapter that the social amplification of risk is a driver behind the negotiation of policy arguments between the overcritical model and under critical models in a science-policy relationship.

In chapter one of this thesis, it was noted that an understanding the transition of policy arguments between over critical and under critical models in public health risk communication is essential. This is because it expands on how policy decisions relating to health risk are made, where there is a weak evidential base and where multiple interpretations, power dynamics and values are brought to bear on the communication process. It also sheds light on how policy ideologies are formed.

4.2 Public concern (Anecdotes)

Public health risk communication (debate) often begins from personal or group anecdotes after an incident or the identification of a hazard, based either on observation or subjective interpretation of a physical event (such as an accident), or the recognition of a hazard (Kasperson et al., 1988). These may be narratives of witnesses, or a doctor reporting an observation such as an increase in incidences of lung cancer amongst smokers (Kasperson et al., 1988). It may also be a mental construction based on perception of harm (Aven and Renn, 2010, Renn, 2010). In contemporary society, anecdotes are typically seen as providing poor quality evidence or even regarded as 'bad science' (Aronson and Hauben, 2006) in the face of gaps in or contested knowledge or expertise. They are often discounted either as a primary source of risk information (Roth, 2003) or as the basis of forming a rational argument within the policy domain (Stilgoe, 2004). The assumption that 'if science does not validate it, then it is not a generally accepted claim' has pervaded public risk discourse to the extent that any arguments that cannot lay claim to be scientific are often discounted or even rejected on the basis of weak evidential base. For instance, the mobile phone legal case filed by David Reynard in the US court in 1992 claiming that mobile phones pose a health hazard and were the cause of his wife's fatal brain tumour was dropped on the basis that there was no sufficiently reliable and relevant scientific evidence to support such a claim (Foster and Moulder, 1992). Similarly, parents' claims that the Measles, Mumps and Rubella (MMR) vaccine damaged their children were dismissed within scientific communities and policy domains for lack of credible scientific evidence (Wakefield et al., 1998).

Scientific evidence has become the measure increasingly used in society to verify and validate risk claims (Fischbacher-Smith, 2012) and has been largely relied upon as a means to cope with uncertainties (Renn, 2008) and to ease the burden of proof (Fischbacher-Smith, 2012). The fact that society looks to science for answers creates a seeming 'tacit' risk communication practice that undermines any knowledge constructed outwith scientific boundaries, curtailing the boundary of their relevance within public health risk communication. Consequently, such 'tacit' risk communication practice

amplifies the significance of risk arguments that function within scientific boundary. There are however scholars who contend that anecdotes play a central role in shaping both the public perception of and the policy perspective taken to risk, even if it is only in the form of providing hypotheses for scientific research (Moore and Stilgoe, 2009).

4.3 Expert Speculation and Media Attention

Concerns around public health risk issues coupled with anecdotes and negative tales of personal or group experiences often attract media (Bromley and Segerson, 2012) and public attention to create issue attention (Shih et al., 2008). Issue attention is where a risk issue suddenly becomes a focal point of media and public debate for a period of time (Downs, 1996). This may create enough political pressure (Downs, 1996) to form the basis of a political action to further assess the risk. Before the formal report of any risk assessment and in the absence of available evidence, gaps in knowledge or information are often filled in by seeking out sources of expert speculation (Kandlikar et al., 2007). There are however different levels of acceptability when moving from anecdote to expert speculation. For instance, unlike anecdotes, a technical expert's estimate (even if unscientific) is often received with greater degree of credibility, since technical experts are seen to have the requisite mandate and authority to speak in certain domains of risk and uncertainty. The advantage of this is that, it makes the accountability of expertise possible where such experts can be held responsible for their claims. However, such privileges allow the domination of technical expertise (even if anecdotal) over other 'non-scientific' or experiential expertise in public health risk communication.

In a new or emergent form of risk where there are large residual uncertainties, an expert is expected to qualify his/her risk estimate, stating clearly the best and worst case scenarios (Athanassoglou and Bosetti, 2015). However, the credibility of such a qualification is reduced and disputable owing to the fact that there is little or no scientific evidence to support such an assertion (Imwinkelried, 1992). The danger here is that other stakeholders may dwell on the worst-case scenario as if it were the final outcome of a technical analysis of the risk. In such an instance, conspiracy theory cannot be rejected where there are vested interests and where something of human value is a stake. The

debate prior to formal technical verification is important because it links public concern of risk (anecdotes) with technical and policy debates around public health and safety.

4.4 Technical Debate

Technical verification of public health risk is essential for rationalising policy decisions and risk mitigating strategies that are already in place (Pendrill, 2010). The verification process involves the use of scientific methodology in determining areas of knowns (Fischer, 2003) and whether identified areas of uncertainties are of significance to public health and safety (Funtowicz and Ravetz, 1990). Evidence from the technical verification of risk shapes the state of knowledge, and the manner in which this is communicated may continually shift the burden of proof amongst competing stakeholders (Funtowicz and Ravetz, 1990). Technical verification is often conducted by technical experts and informs the way expertise and knowledge are incorporated into the policy process (Fischer, 2009). The dominant role played by experts in the technical verification of risk means that some perspectives or stakeholder groups are immediately removed. As a consequence, non-scientific groups take a back seat, becoming spectators to experts engaged in the exchange and negotiation of the so called 'credible' public health risk communication (Murdock, 2010).

The technical verification process is often confronted by objections about what constitute evidence and how accepted evidence should be interpreted (Fischbacher-Smith et al., 2010, Fischer, 2003). Problems may arise from inter-disciplinary conflict around knowledge creation because of epistemological and methodological differences (Bella and Williamson, 1976) with regard to facts, rigor, causal explanation and research goals (Brister, 2016). Professional disciplines (e.g. medicine, public health, environmental science) often differ in their disciplinary practices. Such differences may become a source of conflict in the development of knowledge and interpretation of evidence that may lead to endless technical debates. For example, natural scientists often use positivist philosophy in data collection, interpretation and analysis (the quantitative approach). Social sciences, on the other hand, are more inclined to use interpretive philosophy and a social constructionist orientation in the collection, analysis and interpretation of data (the

qualitative approach). These competing/differing paradigms may lead to different conclusions, thereby creating ambiguity and tension in the manner by which risk is identified and framed around policy debates, risk tolerance and acceptability (Bradbury, 1989). Risk tolerance is the extent to which there is a willingness to accept uncertainty when making decisions relating to risk (Klinke and Renn, 2010). Risk acceptability is where there is no need for additional risk reduction effort due to the fact that its occurrence has been reduced to a minimal level (Klinke and Renn, 2010).

Within the policy context, the ability of experts to shape the policy perspectives taken to risk is further conditioned by those whose expertise is called upon to verify and pass judgement on the technical analysis of risk as it relates to policy making (Morgan, 2014). It is here that the dominant ideology (Collingridge and Reeve, 1986) and core belief (Sabatier and Jenkins-Smith, 1993) of technical experts combines with their relationship with powerful interests (e.g. policy makers) to heighten the potential of powerful (and expert) influence on the policy perspective taken to the risk (Leahy, 2013).

4.5 Policy Debate: Science and Policy Relationship

Collingridge and Reeve (1986) suggest that the outcome of technical verification is either an under critical or overcritical model. The under critical model accepts evidence without much scrutiny; this may be because it fits with existing policy ideology and interests or because the argument is already institutionalised, even though it might be uncertain. It may also be suppression of other scientific conjectures which threaten policy consensus (Collingridge and Reeve, 1986). The overcritical model describes situations where disagreements exist within the scientific community, and where those with economic power cannot supress or constrain other perspectives, which leads to endless technical debates (Collingridge and Reeve, 1986). For Collingridge and Reeve (1986), the effect of science within policy making is determined by the absence and presence of ‘power to’ influence the outcome of the risk assessment and the resulting interpretation taken to the risk. Several factors have been highlighted that could potentially influence the transition between an under critical and over critical model. These include the interdisciplinary nature of risk problem (Collingridge and Reeve, 1986), power of elites involved in the

debate, information availability, location of hazard and processes around policy making in its wider political context (Fischbacher-Smith, 2012). Others are, the privileged interaction amongst certain public groups (Sutton, 1999), the discourse characterisation of the risk (Kasperson, 2012a) and the manner in which trust and credibility are brought to bear of the risk. Within this are processes around expertise and power, and communication and trust that shape the shift of policy argument between the over critical and the under critical model. The outcome of technical verification (either over critical or under critical model) may then influence debates around risk tolerability and acceptability. This is deemed one of the most controversial aspects of public risk debates (Smith, 1990, Fischbacher-Smith, 2012).

4.6 Policy Ideological choices

Regardless of the presence or absence of conflicting risk arguments, policy makers are required to develop arguments within the context of public health and safety in order to develop appropriate risk mitigating strategies (Funtowicz and Ravetz, 1990). It is in this arena that a stakeholder's relationship plays a crucial role in shaping the policy ideology taken to public health risk. The interaction and communication between certain stakeholders' groups allow privileged access to exclusive information and policy makers, which enable such groups to discuss and express certain political opinions that can have powerful influences on policy-choices (Sutton, 1999). Policy framing of public health risk is essential as it is often followed by risk reduction actions (Korn et al., 2003) that bring about the desired behavioural responses.

Figure 4.1: Different stages of risk communication (debate) model

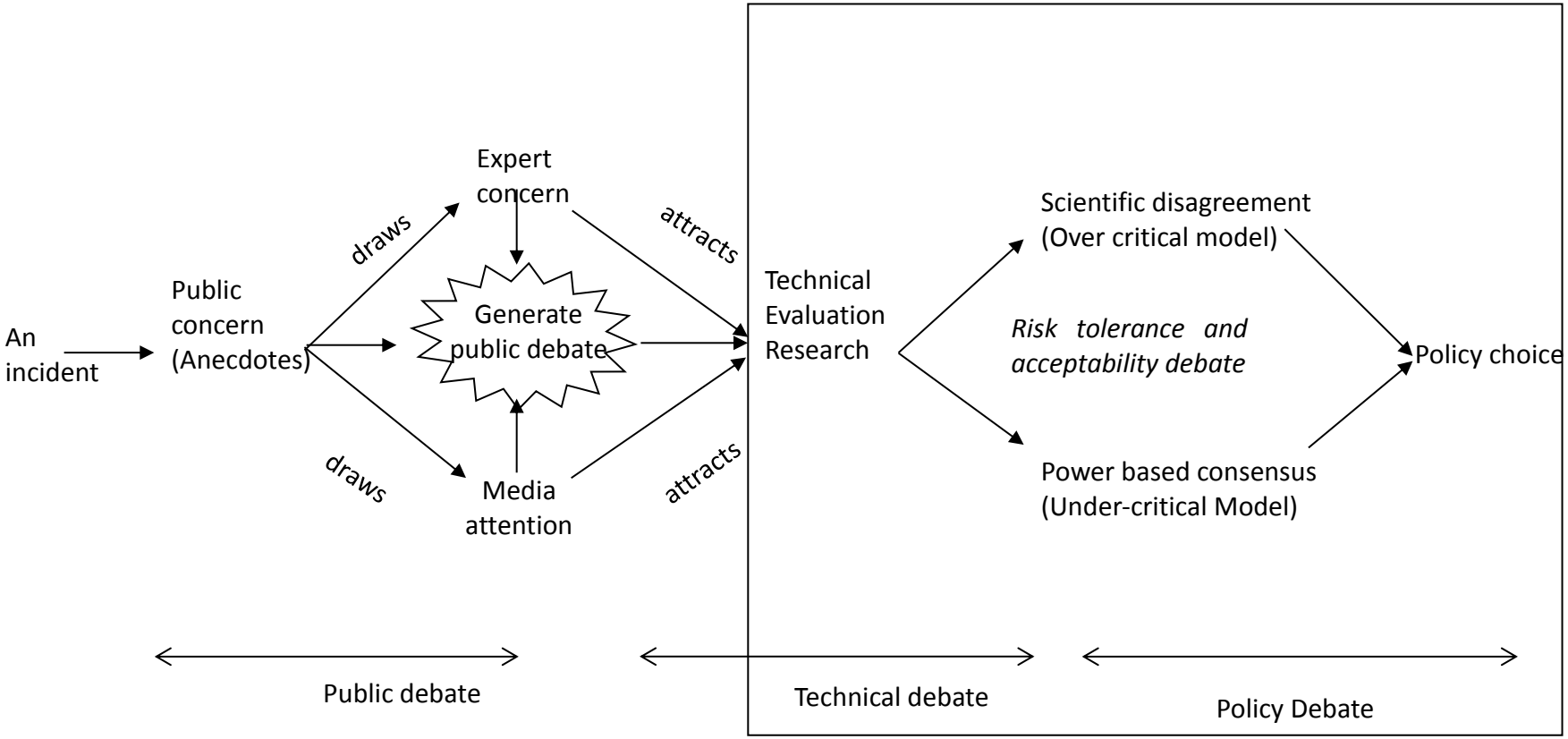


Figure 4.1 depicts the different stages of an evolving risk debate (as described above), from the initial anecdotal stage to the formulation of policy. While Figure 4.1 shows a linear flow from public concern to policy debate, in reality, risk debate may begin at any stage, moving forward or backward, and public health risk arguments may emerge at all stages at the same time. The relationship between technical evaluation of risk and policy debate is highlighted by a box in Figure 4.1; this is the arena to which it is hoped this research henceforth will make a theoretical contribution. Fischer (2003)'s policy evaluation framework already sheds light on the (horizontal) transition between technical evaluation and policy choice (see section 2.4.1). However, there is little or no technical understanding of the (vertical) transition between the over critical and under critical models (Fischbacher-Smith, 2012). The importance of understanding the vertical transition (as depicted in Figure 4.1) is that, it expands on how policy decisions relating to health risk are made where there is a weak evidential base and where multiple interpretations, power dynamics and values are brought to bear on the communication process. It also sheds light on how policy ideologies are formed.

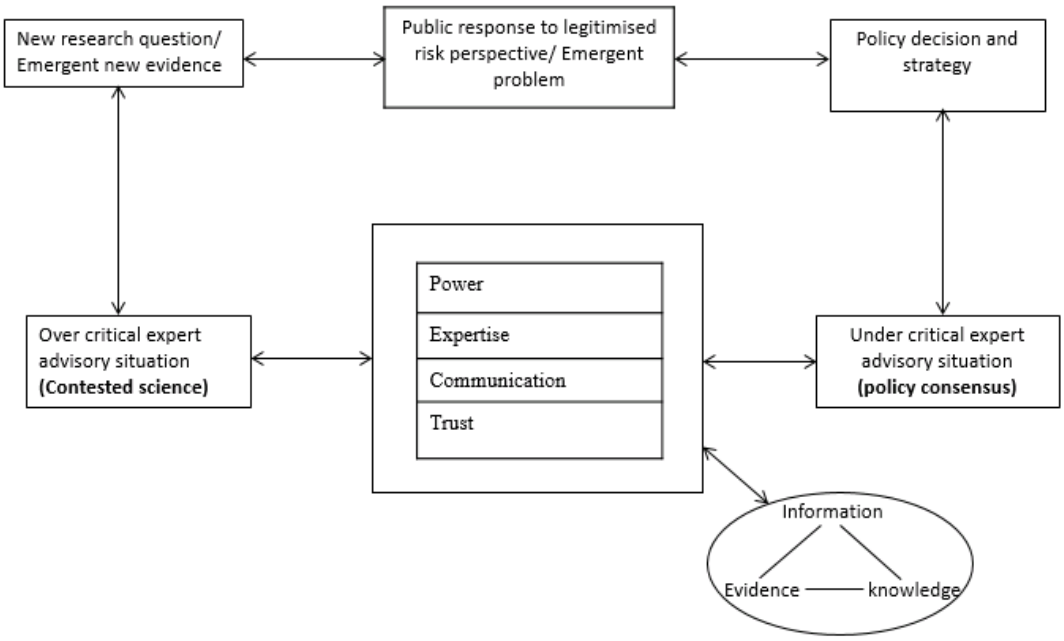
4.7 Understanding the Negotiation between Over-critical and Under-Critical Model in Public Health Risk Communication

In order to shed light on the understanding of the negotiation of policy arguments relating risk between the over critical and under critical models, the research draws insights from chapters one to four of this thesis. In particular, it will use the insight from the previous chapter (three) on the social amplification of risk framework, and attempts to use this to understand this negotiation, in unpicking the role of power and expertise and also communication and trust in the risk communication process within the policy context (see

Figure 4.2).

Figure 4.2 attempts to advance the understanding of how a particular public health risk argument becomes dominant in a policy domain, synthesizing this study perspective of social amplification of risk and the over critical and under critical models.

Figure 4.2: Policy Evaluation Risk Communication (PERC) framework



The Policy Evaluation Risk Communication (PERC) model illustrates the underlying factors that influence how policy makers reach certain policy perspectives to risk, where there are multiple perspectives, strong power dynamics and values are at play. The PERC framework is based on the assumption that social amplification of risk is the driver behind the transition of risk arguments between over critical and under critical models. The framework identifies power, expertise, communication and trust as key factors shaping the amplification (or attenuation) of certain risk perspectives within the policy context. In addition, the evolving nature of information, evidence and knowledge

is likely to shape the nature of the power, expertise, communication and trust that is brought to bear in risk communication, and this may further shift a risk argument forward or backward between the two models. Each of these driving factors is discussed below.

Power

Policy arguments relating to risk are embedded within institutional, productive, structural and resistive forms of power, which suggest that power is fluid and creates imbalances of power in ways that enhance or inhibit certain stakeholder groups in shaping public health risk communication. Power in public health risk communication within the policy context may be exercised by shaping the policy agenda relating to risk (Bachrach and Baratz, 1962), the control of risk information and expertise (Lukes, 2005), the establishment of stakeholders relationships (Barnett and Duvall, 2005), and also boycotts and protests (Foucault, 1982) that challenge dominant worldviews or arguments.

By shaping the risk agenda and prioritising policy objectives, policy makers or risk regulators are able to curtail or enhance certain issues or perspectives from consideration, thereby shaping the direction of the risk debate and what issues are deliberated upon. The ability to control risk information and expertise and to decide what, when or how much information or expertise is made available or concealed, may also drive or create the amplification (or attenuation) of certain policy arguments relating to risk. In addition, there is the power that comes with a stakeholder relationship (e.g. technical experts and policy makers) that allows an exchange of views and political opinions and how that brings about hegemony and domination of certain risk discourse. In addition, risk communication practices (Power, 2007) that view science as superior to other forms of knowledge and expertise and which shape how risk is accessed, interpreted and communicated are further avenues for social amplification (or attenuation) of public health risk. Considering the interactive nature of risk communication, there is also the resistive power by which stakeholders are able to

contest dominant views and perspectives. Such power may be exercised through protest, boycotts or even through research sponsored by other stakeholder groups. Together, these factors drive the amplification (or attenuation) of risk, driving argument between the under critical model and over critical models. Where power or the influence of power is absent or reduced, the chances for over critical model to prevail are enhanced.

Expertise

Another important factor driving the amplification (or attenuation) of a particular risk argument within the policy domain is how evidence is interpreted and framed by means of expertise. The important issue here concern questions of what constitute evidence and whose expertise is called upon, believed and legitimised. There is the debate around experiential knowledge and expertise (Irwin, 2008) versus more traditional technical expertise. However, the latter seems to enjoy more 'credibility status' than the former so that technical expertise is often called upon, believed and legitimised within the policy context. However, several problems around the use of technical expertise have been identified to impact on the manner in which evidence is interpreted and risk signals framed that may allow the amplification (or attenuation) of a certain risk argument within the policy domain to thrive. These include the domain specificity of expertise that reduces the validity of expertise beyond its domain, considering the interdisciplinary nature of public health risk and paradigm blindness that influences the manner in which experts acknowledge challenges to their worldview in their interpretation. Given the weight attributed to technical expertise over experiential expertise, the importance of this is amplified. This scenario is further amplified given that technical expertise is a social construction in its training and validation (considering powerful and vested interests).

It is important that other forms of expertise are considered especially the experience of those who are in close proximity to the risk to improve on the robustness of evidence (Stilgoe 2007) and ease the burden of proof (Fischbacher-Smith, 2009).

Communication

How the risk is communicated between the various stakeholder groups is another factor that shapes how a particular risk perspective in a policy context becomes amplified (Smith, 1988). Using language relevant to all stakeholders (including policy makers) involved in risk communication (Adekola et al., 2017) is essential in terms of translating the language of an expert in a way that is usable by decision or policy makers (Choi et al., 2005, Aitsi-Selmi et al., 2016), while highlighting uncertainties where they exist (Smith, 1988). The use of language where the receptor cannot decode the meaning reduces or amplifies the significance of such expert proposition and how it is used for decision-making. The use of inappropriate language might also push information users to adopt expert perspectives that are well understood so as to justify their behavioural response.

What is also important is the quality of the feedback in the communication that may allow sensitive issues to be addressed and dealt with appropriately. One-way risk communication may heighten tension around risk acceptability, as it does not allow for clarification of meaning or discussion of sensitive issues. Furthermore, there is the issue of whether language of certainty or uncertainty is used. Where the language of uncertainty is used, the ability of stakeholders to refute or undermine damaging arguments is enhanced. It may also increase speculations and the operating theories that are brought to bear on risk and drive a risk argument towards an over critical model. Where science or experts use languages of certainty, the potential of moving a risk argument towards an over critical model is enhanced.

Trust and credibility

Evidence from the literature has highlighted the importance of trust on perceived credibility of the source of risk information (Mayer et al., 1995). Risk information from sources that are seen as credible contribute to the way such messages resonate with the audience (Frewer et al., 2003), hence increasing the likelihood of driving risk argument towards an under critical model. Distrust, on the other hand, contributes to heightened resistance in risk argument that often lead to distortion of the risk message. It may also

lead to increased contentions around risk mitigating strategies (Kasperson et al., 1992, Petts, 1992, Flynn and Slovic, 1993, Löfstedt and Horlick-Jones, 1999) therefore moving risk argument towards the over critical model. However, under circumstances where there is trust, the receiver of risk information may even become a "walking and talking advertisement" where he actively shares the views of the other actors among his social network that may bring about hegemony of risk discourse in the policy domain.

Information, evidence and knowledge

What is also important is how power, expertise, communication and trust are contingent upon the evolving nature of information, evidence and knowledge and how that can potentially shift risk arguments forward and backward between under critical and over-critical models (Fischbacher-Smith, 2012). As information, evidence and knowledge becomes available, the balance of power may shift between the different stakeholders and potentially impact on the nature of power and expertise brought to bear on the risk in terms the interpretation and frame of the argument used. It influences the nature of communication and trust within the process that determines whose risk argument is seen as credible and who is to be trusted. As risk arguments move closer to the under critical advisory state, policy decisions are made and risk mitigating strategies are put in place. It is the contention of this study that the time scale between policy consensus (under critical model) and institutionalised policy mitigating strategies is dependent on the ability of interest group to muster their power to shape the debate (as will be argued later in chapter nine).

Behavioural response to institutionalised policy perspective

Policy strategy designed to mitigate public health risk often prompts individual or group behavioural responses to the legitimised risk perspective. Critical response mechanisms here are: the nature of social trust in policy makers and public health institutions (Renn and Levine, 1991); the ability of individuals or groups to resist (power) a legitimised risk perspective; signal value (Kasperson, 2012a); and, distribution of costs and benefits that can steer (positive or negative) emotional responses (Adekola et al., 2017) to institutionalised policy perspectives. Undesired behavioural responses or emergent problems may compel the government to change its policy and risk mitigating strategy,

like the case of the revision of the tax increase in Canada because of a rise in the sale of contraband tobacco products that are detrimental to public health (Gabler and Katz, 2010). This is akin to Foucault's resistive power (Foucault, 1978) but not necessarily change deep core policy ideology or belief (Sabatier, 1988) in relation to the risk. Sabatier and Jenkins-Smith (1993) categorised policy belief systems into three hierarchical organisations in order of decreasing resistance to change: the deep core belief (the most resistant to change); near (policy) core; and the secondary and instrumental aspect (the least resistant to change).

Behavioural responses may also create emergent problems due to emergent properties of risk, which may not initially have been envisaged or taken into account in the initial policy considerations. This may raise new areas of uncertainty that raise new research questions or challenge existing policy assumptions or mitigating strategies. These emergent problems can potentially shape both behavioural responses and the policy strategy put in place. Furthermore, new research questions and new evidence following a technical verification may move risk arguments towards over critical model so that the debate may begin all over again.

The PERC framework is based on the argument that policy debates relating to risk arise from, and are conducted within a public space in which there are multiple interactions between power and expertise that enhance or inhibit risk communication, create or destroy trust and credibility, and privilege certain social and professional relationships over others. As such, a degree of bias can arise from the asymmetries of power underpinning these interactions and processes that in turn, perpetuate the domination of certain risk perspectives and/or shape the prioritisation of issues and debates in the policy domain.

4.8 Summary of Key points and Empirical Validation of the Proposed Framework

This chapter addressed theoretically the research question set out in chapter one: *how does a risk argument evolve such that a particular argument becomes dominant in a policy context?* The chapter considers the relationship between public debate (anecdotes), technical debate and policy debate and sheds light on the transition of

policy argument between under critical and over critical models. The synthesis of the alternative perspective to social amplification of risk and the over critical and under critical model led to the development of the policy evaluation risk communication (PERC) framework that describes how a particular risk perspective becomes amplified in risk communication relating to its policymaking. The PERC framework is based on the hypothesis that social amplification of risk is a driver of the negotiation of policy related risk arguments between the over critical and under critical models.

Testing the policy evaluation risk communication (PERC) framework is an essential part of its development in order to examine its robustness and usefulness, and to check for errors. This will require the use of the framework as lens to investigate empirical cases of public health risk communication and its policy development. The next chapter (five) discusses the methodology used in this research, showing how it was developed in line with the research question, and how the methodology used has contributed to the insights that follow in chapters seven to ten. Chapter six, seven and eight present the case studies and findings. Chapters nine and ten discuss the findings through the lens of the PERC framework and social amplification of risk framework respectively. In conclusion, chapter eleven summarises the thesis and sets out a benchmark for best practice risk communication and its policy development.

5 Methodology and Methods

5.1 Introduction

Chapters one to four of this thesis have established the rationale for the research, set out the research aim and research questions, drawn on relevant literature to inform the critique of social amplification of risk framework, and developed a policy evaluation risk communication (PERC) framework. The PERC framework is a lens through which to analyse the role of power and expertise in public health risk communication as it relates to policy making. This chapter discusses the methodology used in the research, showing how it aligns with the research question, and how the methods used contribute to the insights that follow in chapters six to ten. The chapter justifies the approach taken. It also explains how the analysis was undertaken and the ways in which such large quantities of published data was handled.

5.2 Methodology – Qualitative study and Deductive Approach

This research characterizes the different dimensions of an empirical public health risk communication (debate). This will require the selection of a research methodology that aligns the mode of enquiry and research aims and objectives (Edmondson and McManus, 2007). Research methodology is the set of principles that guide research practices in identifying problems and seeking answers (Taylor et al., 2015). It provides an account of why a particular method is used and what counts as the knowledge that informs research. There are two dominant research perspectives in social science research; qualitative or quantitative research perspectives, and a third research perspective that combines both perspectives (Creswell, 2013, Yin, 2015). According to McCracken (1988) the difference between qualitative and quantitative research is that "quantitative research isolate[s] and define[s] categories as precisely as possible before the study is undertaken, and determine[s], again with great precision, the relationship between them. Qualitative research, on the other hand, isolates and defines categories during the process of the research. For one field, there are well-defined categories as the means of the research, for another, they are the object of research" (P.16).

Since this study is exploratory, it fits the qualitative paradigm. This is because, the aim of the study will involve an inquiry process of understanding a social phenomenon, which will consist of building a complex and holistic picture of the problem through the collection of data in the form of words and detailed reports of the views of participants (Creswell, 2003). Qualitative research is characterized by the use of words (instead of numbers) as data, and seeks to understand and interpret meaning, recognizing that data reside within contexts. It also generates detailed and complex data, tends to seek patterns while exploring differences and similarities within data, and often follows an interpretivist stance in making sense of the data (Braun and Clarke, 2013). This makes it possible for the researcher to identify underlying concepts shaping public health risk communication and the relationships that exist between them (Frankfort and Nachmias, 1996). Qualitative research has been chosen because the research aim and question is best answered by this mode of inquiry; it will allow understanding of how a certain perspective or argument becomes amplified in public health risk communication within its policy context.

A Deductive Approach

There are two dominant research approaches to creating new knowledge. These are inductive and deductive reasoning (Saunders et al., 2011). Inductive reasoning entails theory building commencing from observations of specific phenomena in establishing generalizations about the issues being investigated (Saunders et al., 2011). Deductive reasoning, on the other hand, is a theory testing process that begins by establishing a theory and applying it to specific instances (Cavaye, 1996) in order to confirm or refute an hypothesis derived from the theory (Hyde, 2000). Yin (2015) advocates the use of a deductive approach in case study research. A deductive research is chosen in this study because a critical review of extant literature led to the development of an hypothesis and PERC framework, an this can be used as a lens to analyse the data collected, pointing out areas for improvement (Yin, 2015).

5.3 A Case Study Approach

This study requires a research approach that allows the study of complex risk issues within their real life contexts. A case study research is defined as “an empirical enquiry

that investigates a contemporary phenomenon that is set within its real-world context especially when the boundaries between phenomenon and context are not clearly evident" (Yin 2009, P.18). It is a preferred research approach when "how" or "why" questions are asked (Yin, 1994) or where questions asked are intended to shed light on the process of a phenomena (Hyde, 2000). A case study is advantageous because it enables understanding of a complex set of issues or objects in real life setting (Crowe et al., 2011). It can also extend experience or knowledge to what is already known through previous research (Yin, 2013). According to Cavaye (1996a), case study research captures 'reality' and emphasises detailed contextual analysis of events or conditions and their relationships. In addition, case study research can be used to explain, describe or explore events or phenomena in the everyday contexts in which they occur in such a way that allows broad coverage of multiple and complex issues relating to the case (Yin, 2009). However, there are several disadvantages of case study research. These include the fact that a small number of cases can offer no grounds for establishing reliability or generality of findings (Takona, 2002). This suggests that the greater the number of cases that is able to show replication, the greater the rigour with which a theory can be established (Rowley, 2002). Moreover, there is also the issue of lack of trust in the credibility of case study research, however, by using systematic procedures in data collection and analysis, such concerns can be adequately addressed (Yin, 2011). Furthermore, there are reductionist viewpoints which regard the case study as suitable only for exploratory research (Zainal, 2007). These views however ignore the fact that a case study allows exploration of every aspect of a case scenario without requiring the use of another method (Yin (2009)).

For this study, in order to really test for the robustness of the PERC framework and the study hypothesis, it was necessary to consider multiple public health risk communication (debates). A single case study was deemed not to be sufficient a basis on which to develop a theory or test the robustness of the PERC framework. The object of study, as with research relating to controversy or debate, is often defined as issues emerge or evolve (Stilgoe, 2004). Therefore, a chronological presentation of the evolving event was deemed essential to help develop a holistic picture of the cases under examination. It was also determined that a social constructionist viewpoint and an interpretist approach are more appropriate in understanding the various stakeholders' perspectives within the risk debates.

5.3.1 Social Constructionist and Interpretivist Approach

Social constructionism has been defined as a process where the social realities of the world are shaped and perceived (Gergen, 1999). It is an enquiry into the ways objects are seen through different worldviews and how these are interpreted and understood, a process typically carried out through an interpretivist method of enquiry (Schwandt, 1994). A social constructionist view and an interpretivist epistemological approach are utilised in this study in order to understand how different stakeholders make sense of the risks they face in a risk arena. It is a methodological approach that distances itself from objective knowledge and promotes social experiences as a basis of understanding human phenomena (Lincoln and Denzin, 1994, Denzin and Lincoln, 2002, Alvesson and Sköldberg, 2009). An interpretivist epistemological approach assumes that people and the worlds they live in are inextricably linked by common social experience (Berger and Luckmann, 1991, Gadamer, 1994). Therefore, two individuals living in one world will encounter different experiences. An interpretivist philosophy is adopted because the study examines the ways in which scientific facts, perceptions and risk experiences are constructed. The advantages of this approach are that it allows the researcher to capture the individuals' and groups' social experience of their reality. This is essential because risk perception and the experience of individual or public groups are assumed to be shaped by their historical, cultural, ideological, understanding of reality (Sandberg, 2005).

5.4 Selection of Cases

There were several public health risk debates that were considered during the selection of cases for study in this thesis. Three cases where thought to be a better fit in enabling the study to examine the role of power and expertise in risk communication. These cases were also found to match more closely with the identified selection criteria. These criteria are based on four core considerations:

a) A risk communication case study that prompted public health risk debate in United Kingdom. The domain of public health risk was chosen as this is of interest to the researcher, and also because it is one of the most fiercely contested arenas where risk

acceptability is debated (Fischbacher-Smith et al., 2010). The scope of the debate was limited to United Kingdom to avoid any political or geographical issues that may have implications for the conclusions drawn.

b) A case study with contested science and evidence that yet requires policy considerations or action. The aim is to tease out the relationship between science and policy and to understand how a particular risk perspective or issue becomes dominant in a policy context.

c) A case study where multiple legitimate worldviews and values are brought to bear on the public health risk issues.

d) After full consideration has been given to the first set of criteria, the last criterion is that the case involves the delivery of drugs into the human body. Many studies on scientific debates are focused on other public health issues such as nanotechnology, zoonosis, nuclear weapon and climate change. Little attention has been given to public health risk debate relating to the delivery of drugs into the human system.

Some of the cases initially considered were debates relating to genetically modified food, smoking, climate change, bovine spongiform encephalopathy, horsemeat, measles mumps and rubella (MMR), phone and phone masts and electronic cigarettes. After much reflection and a pilot review of some of the cases in order to discern which would best allow a good understanding of the issues under investigation, potential cases were narrowed down to four: (1) smoking debate; (2) measles mumps and rubella (MMR) debate; (3) phone and phone mast debate; and, (4) electronic cigarette debates on the first three aforementioned criteria. The fourth criteria allowed the elimination of the phone and phone mast debate from the choices of cases. The first three case studies were considered sufficient to test the study hypothesis (in chapter two) and the PERC framework (set out in chapter four). Therefore, the cases in this study were carefully and systematically selected to provide a rich evidence base with which to address the research aims and questions outlined in chapter one.

The following section therefore, provides brief background information to the cases used in the study. These are the smoking and vaping debates and the measles, mumps and rubella (MMR) debate.

5.4.1 Smoking and Vaping risk debate

A brief summary of the smoking and vaping debates are presented here as one case study.

5.4.1.1 The Smoking debate

Concerns about the risks of smoking were raised as a result of increases in the number of lung cancer cases; especially in males of about 45 years, with some research estimating up to a six-fold increase (Berridge, 2006). The initial thought was that these increases were due to better diagnoses and record keeping. But studies by (Kennaway and Kennaway, 1947) helped eliminate occupational and environmental factors pointing to a connection with cigarette smoking. In the 1950's, three key epidemiological studies provided the first powerful links between smoking and lung cancer. In May of 1950, Morton Levin and his colleagues published a study linking smoking to lung cancer in the JAMA issue (Levin et al., 1950). In the same issue, Ernst L. Wynder and Evarts A. Graham, in their study found that out of 684 people interviewed in their study in the United States, 96.5% were moderate and heavy smokers. In the UK, the first large epidemiological study published in the British Medical Journal in September by Doll and Hill established a statistical link between smoking and lung cancer (Richard and Bradford, 1950).

Discussions between the Ministry of Health (MH) and the Medical Research Council (MRC) in the late 1940s led to the organisation of an informal conference on cancer of the lung in February 1947 by the Council (Berridge, 2006). The MRC initiated a large-scale statistical study of the past smoking habits of those with cancer of the lung and of two control groups. This was led by Professor Bradford Hill and Dr. Richard Doll of the Statistical Research Unit at the London School of Hygiene and Tropical Medicine (LSHTM). The result published in the British Medical Journal (BMJ) in 1950 concluded that there was a 'real association' between carcinoma of the lung and smoking (Doll and Hill, 1950b). The research found tobacco to be an important factor in the production of carcinoma of the lung. Other studies such as (Richard and Bradford, 1956, Wynder and Hoffmann, 1964, Doll and Hill, 1966, Doll and Hill, 1999) found smoking to be also a

primary cause of preventable cancer diseases of smokers below the 40 years of age. The events that followed Doll and Hill's (1950) publication led to a fiercely contested public health risk debates around the relationship between smoking and cancer. There were also arguments around passive smoking, smoking amongst young people and women, smoking and addiction, and marketing tobacco to developing countries. However, to limit the boundary of this analysis, emphasis will be placed on the smoking-lung cancer debate to allow a thorough and an in-depth analysis of the issues.

In the 1950s, smoking was a socially accepted practice; 80% of men and 40% of women smoked in United Kingdom (Peto et al., 2000). Smoking was considered a natural and sophisticated thing to do and was allowed everywhere including in offices, pubs, restaurants, cinema, and all transport systems (Peto et al., 2000). In 2013, ASH UK estimated that 80% of lung cancer and bronchitis and emphysema deaths could be attributed to smoking, including 17% of deaths from heart disease. 25% of all cancer (lung, mouth, lip, throat, bladder, kidney, pancreas, stomach, liver and cervix) deaths were also attributed to smoking (ASH Factsheet, 2013).

The UK government and Tobacco Control Policy

The UK Health policy on tobacco control is largely formulated and implemented by the devolved administrations of each of the member countries of the United Kingdom (Keating et al., 2002). However, as tobacco falls within the remit of a number of different government departments: e.g. Treasury, Business, HMRC as well as Health (ASH, 2013b, Barber and Conway, 2014), tobacco control policy is partly determined at UK-wide level and partly by the devolved administrations. The four nations of England, Scotland, Wales and Northern Ireland have responsibility for promoting public health, a UK-wide policy and law applies to taxation, smuggling, advertising, and consumer protection issues (e.g. the policies guiding health warnings on tobacco packaging). Some of these measures are also determined by European Union legislation. Procedures for enforcement may vary between the administrations to reflect the differing legal systems (Barber and Conway, 2014). The tobacco industry is of huge economic benefit to the UK government; it is estimated that it earned £12bn in revenue from tobacco duties for the financial year 2011-2012 (ASH, 2013b). According to ASH,

77% of the price of a premium pack of cigarette consists of taxation. The UK tobacco industry employs around 5,000 people.

5.4.1.2 **Electronic Cigarette – Vaping risk debate**

In September of 2008, World Health Organization (WHO) raised concern that electronic cigarettes were being marketed as a safer alternative to tobacco cigarettes, despite an inadequate understanding of the safety and efficacy of electronic cigarettes at the time. WHO made clear that there was a lack of sufficient scientific evidence of the safety and efficacy of ECs and therefore asked retailers to immediately remove any claim that ECs are a safer alternative, or an aid to stopping smoking from their websites and information leaflets (WHO, 2008). They argued that any health claim would require scientific verification. ECs were initially marketed as a consumer product and they can be purchased in most retail shops in the UK. In 2014, it was estimated that 2.1 million adults use an electronic cigarette in the UK according to a survey conducted and published by ASH UK (ASH, 2014). The report estimates that about 700,000 of these users were ex-smokers with a majority (estimated at 1.3 million users) using electronic cigarettes in combination with tobacco cigarettes. The use of EC amongst never-smokers was found to be insignificant in this report.

Electronic cigarettes (ECs) are battery-powered devices that heat a liquid into an inhalable form (Siegel et al., 2011). ECs originated from China and were first introduced to Europe around 2007 (Bates, 2015). ECs are designed to deliver nicotine and other flavourings into the body system. However, unlike tobacco cigarettes, ECs do not emit tobacco tar but vaporised liquid nicotine. Evidence from tobacco smoke suggests that while people smoke for the nicotine, they die from the tar (Russell, 1976). However, toxins and carcinogens, such as tobacco-specific nitrosamines, diethylene glycol, that are harmful to human health were detected in some EC devices (FDA, 2011). Likely harmful effects are increase in lung flow resistance and decrease in FENO concentrations (Vardavas et al., 2012). Since ECs also contain some toxic chemicals, some groups of experts fear that ECs may pose similar health risks to tobacco cigarettes. Many of the chemicals in conventional cigarette smoke causes

chronic inflammation, which leads to chronic diseases like bronchitis, emphysema, and heart disease (Stoller, 2002).

The Regulation of Electronic Cigarette

ECs were new products in 2008, so they were largely unregulated. However their rapid uptake in the UK drew the attention of public health officials. At the moment ECs are currently being regulated under the EU Tobacco Products Directive (TPD). This occurred as a result of the public consultation carried out in 2010 on whether to bring nicotine-containing products (NCPs), including ECs, within the medicines licensing regime (MHRA, 2010, Bryan). This was the contentious aspect of the debate that drew different arguments from different stakeholders. The regulation of ECs came into effect in May of 2016. According to the directive, ECs containing up to 20 mg/ml of nicotine will be regulated by the TPD. Manufacturers and importers may decide to opt for medicines regulation, which will require ECs to be authorised by the Medicines and Healthcare Products Regulatory Agency (MHRA) as over the counter medicines, in the same way as nicotine replacement therapy (NRT) (EC, 2014). Whether this regulation will change following the British exit from the European Union (BREXIT) vote remains unclear at the point of writing up this thesis.

5.4.2 Measles Mumps and Rubella public health risk debate

The public health concern around MMR vaccination in United Kingdom originated from a study led by Dr. Andrew Wakefield (Wakefield et al., 1998). The paper described twelve children aged between three and ten, suffering from developmental regression and gastrointestinal problems. The publication in The Lancet suggested the possibility of a link between MMR vaccine and regressive behavioural disorders. According to the publication, nine of the twelve children examined had become autistic. The paper points to a possible environmental trigger and explained that the parents of eight of the twelve children associated the onset of these problems with MMR vaccination (Wakefield et al., 1998). The triple measles, mumps and rubella (MMR) vaccine was introduced into routine UK childhood vaccination programmes in October 1988 (Miller and Reynolds, 2009), replacing the single measles vaccine (Hilton et al., 2007), and becoming part of the established vaccination protocol in 1988, after successful use in the US since 1971

(Miller and Reynolds, 2009). MMR vaccines contain live, attenuated strains of measles, mumps and rubella viruses (Peltola and Heinonen, 1986, Usonis et al., 1999). The first routine involves giving the vaccine to infants between the ages of 12-15 months. A second MMR injection was added to the schedule, as a pre-school booster in October of 1996 (MRC, 2001b). In the United Kingdom, MMR vaccination coverage for 2-year-old children was over 90% in the early 1990's (Speers and Lewis, 2005), with cases of measles being recorded at historic low levels at this time (Hilton et al., 2007). Routine childhood vaccination programmes are often viewed as bringing about significant improvement in morbidity and mortality (Leach, 2005) and they extend back to the nineteenth century. Childhood vaccination programmes have seen successful eradication of diseases such as small pox in the UK and brought under control other diseases such polio, diphtheria, whooping cough, and meningitis (PHE, 2014). Vaccination is voluntary in the UK, and as such, public education and trust has been relied upon (Leach, 2005) as a means to maintain high uptake to ensure herd immunity (Burgess et al., 2006).

The Nature of the Problem

Autism, a condition at the centre of the MMR vaccine debate, is widely regarded as one of the most severe childhood psychiatric conditions (Frith, 1989, Baron-Cohen and Bolton, 1993). It is a set of neurodevelopmental disorders that affects a person's communication and interaction (Frith, 1989). Wing and Gould (1979) developed the concept of an autistic spectrum and note that the condition covers a range of ability levels and severities, and is characterised by qualitative impairments in social, communicative and imaginative development. Today, autism is recognised as one of a number of related 'pervasive developmental disorders', which also include Asperger's disorder, childhood disintegrative disorder, and Rett's disorder (MRC Report, 2001)[2]. The MRC report suggests that the autism spectrum includes children and adults across wide ranges of severity and intellectual ability. A third of children with autism appear to lose skills in their second year, around the time the MMR vaccination is given (MRC Report, 2001). Before the 1990s, autism was thought to be very rare, affecting 2 to 4

[2] MRC refers to Medical Research Council

children per 10,000 but that has changed, putting figures at an estimated rate of 60 per 10,000 in the 1990s (MRC Report, 2001). The cause of the rise remains uncertain but is thought to be linked to increased professional awareness, better diagnosis, and changes in the prevalence of causal factors (Wing and Potter, 2002).

Table 5.1 provides details of stakeholders engaged in each of the selected case study.

Table 5.1: Stakeholder's mapping

Public groups/ Stakeholders	**Smoking debate**	**Vaping debate**	**MMR debate**
The core debate	Is smoking a cause of cancer?	How should electronic cigarette be framed and then regulated with the public health context?	Is MMR vaccine linked to autism and safe for use on young children?
Policy makers /risk regulators/ Public experts	E.g. UK governments, public health units such as department of health, WHO, European union government.	E.g. UK governments, public health units such as department of health, WHO, European union government.	E.g. UK governments, public health units such as department of health.
Scientific committees	Scientific Committee on Tobacco and Health (SCOTH), Standing Advisory Committee on Cancer and Radiotherapy etc.	E.g. Expert Committee commissioned by public health England	E.g. Central Health Services Committee (CHSC), Standing Advisory Committee on Cancer and Radiotherapy.
Technical experts	Prof. Doll and Hill and other scientists within scientific community.	Prof. McNeill Brose and other scientists within scientific the community.	Wakefield and other scientists within scientific community.
Industry/corporate representatives	Tobacco industry representatives.	Electronic cigarette industry representatives.	Representatives of MMR vaccine manufacturers.
Media sources	UK media sources such as BBC, Daily Mail, The Guardian	UK media sources such as BBC, Daily Mail, The Guardian.	UK media sources such as BBC, Daily Mail, The Guardian.

Local experts/ individual close to source of risk.	Individual or groups in close proximity to source of risk and the general public.	Individual or groups in close proximity to source of risk and the general public.	Individual or groups in close proximity to source of risk and the general public.
Non-profit organisation	E.g. Action on Smoking and Health, UK.	E.g. Action on Smoking and Health, UK.	E.g. Justice awareness and basic support - jabs parent group.
Court of law (legal discourse)	The UK judicial system	The UK judicial system	The UK judicial system

5.5 Using Published Sources in a Qualitative research

This study relied on published sources that are mainly secondary data. Secondary data are increasing becoming a standard source used in much social science research to answer complex questions, especially regarding behaviour (Davis-Kean et al., 2015) that is often shaped by perception. This study is about understanding the arguments and actions of various stakeholders engaged in debates relating to public health risk. Therefore, published sources, were relied upon in this study because it was decided that published sources that captured stakeholder inputs, reflected the debates, and drew differentially on evidence and experts, would provide greater insight to each of the cases, and would be more readily comparable across cases. Published sources were also not prone to the type of selective or post-hoc reflections that might be inherent in interviews. There are other advantages associated with the use of published data, including saving cost and time (Cowton, 1998) and they are often readily available and easy to obtain (Davis-Kean et al., 2015). However, the use of published data does not come without disadvantages. These include reduced control over the data generation, which requires extra effort in understanding the nature and production of the data (Cowton, 1998). Also the issue of bias (deliberate or unintentional or due to intrusions) may arise, as there is the danger of misinterpreting the data and drawing unwarranted conclusions. However, by taking extra care in making interpretations (Stewart and Kamins, 1993), and considering data within the contexts in which they were generated, this issue was adequately resolved in this study.

5.5.1 Sources of Data

The data collected in this study were retrieved from archival and documentary records. Archival and documentary records were used because they contain the exact information about names, references, date and details of events, and also have broad coverage from a long time span of many events and contexts (Yin, 2011, Yin, 2013). However, the nature of this data entails that the evidence used was not created for the specific purpose of this study. Documentary data sources also enable the identification of key features of event that unfolded within the debate, and to establish and test the validity of interpretations (Briggs et al., 2012). It also provides the correct context and culture in which information is generated (Briggs et al., 2012); this is essential in making careful interpretations and drawing conclusions. The sources of evidence used include published peer reviewed articles, press releases and statements, official documents from government departments and organisations, reports from non-profit organisations, scientific committee reports, official statements and announcements of public health institutions, media sources and newspaper publications.

The data collected for the analysis of smoking covered the periods between 1950 and 1998. The data collected for the analysis of vaping risk covered the period between 2008 and Month 2016 as the vaping debate was still ongoing as at the time of the study data collection. The MMR debate was examined from the period of 1998, following the publication of (Wakefield et al., 1998) until 2003. The dates varied because the period of interest within each of the debates is the period between the emergence of the risk debate until a policy consideration (or formulation). Therefore, the period of consideration of each case study varied. The data gathering took place between April 2014 and May 2016.

Table 5.2: Sources of Data Collected

Source	Smoking and Vaping Case Study			MMR Case Study		
	E.g. of some of the Authors	Type of information sourced	No of sources used	E.g. of some of the Authors	Type of information sourced	No of sources used
Peer Reviewed Literature	-Doll and Hill, 1950 -Fisher, 1958 -Peto and Beral, 2010 -Bullen et al., 2010 -McCauley et al., 2012	-Scientific study -Scientific study -Expert Narratives -Scientific study -Scientific study	> 50	-Wakefield et al., 1998 - Taylor et al, 1999 -Elliman and Bedford, 2001 -Farrington et al., 2001 -Fitzpatrick, 2004	-Scientific study -Scientific study -Expert narratives - Scientific study -expert narratives	>14
No peer reviewed literature	-Tobacco publicly available document e.g. memorandum, statements, and announcement -Notes of a Meeting at London School of Hygiene and Tropical Medicine -Industry annual report -Report of the WHO Expert Committee on Smoking Control	-Industry Narratives -Narratives -Expert Narratives	>10	-Press release and statements -Cassidy 2005 -Deer 2004	-Expert Narratives -Citizens / expert -Expert narratives	>6
Electronic and print media	-BBC news -Daily times -Guardian -Mail UK	-Citizens / expert Narratives -Citizens / expert Narratives -Citizens / expert Narratives -Citizens / expert Narratives	>20	-BBC news -Daily times -The Telegraph -The times UK	-Citizens / expert Narratives -Citizens / expert Narratives -Citizens / expert Narratives -Citizens / expert Narratives	>15

Govt. documents and Gazettes	-Department of Health reports (online) -Central Health Services Committee (CHSC) report -Standing Advisory Committee on Cancer and Radiotherapy report -Scientific Committee on Tobacco and Health (SCOTH) Review Medical Research council report -Government Directives, Act, Regulations European Union Directives, Act and Regulations UK government white paper on tobacco -Action on smoking and health (ASH) UK Reports	- expert Narratives - expert Narratives - expert Narratives - expert Narratives - Policy Narratives -Public and expert Narratives	>19	- Medical Research Council (MRC) -(Medicines Control Agency and Department of Health, 2001 -Central Health Services Committee (CHSC) report -Committee on Safety of Medicines report -Standing Advisory Committee on Cancer and Radiotherapy report -Department of Health reports - Policy statements and announcements	- expert Narratives - expert Narratives - expert Narratives - expert Narratives - expert Narratives - expert Narratives	>10
Total no. of sources			>100			>45

Table 5.2, provides details of the sources of data collection and the nature of information collected from them. All the data collected in this study were collected online using the Google search engine, with word search. The search words used for the smoking and vaping debate include: smoking debate, smoking controversy, tobacco controversy, UK smoking debate, UK smoking news, policy response on smoking debate, UK electronic cigarette controversy, vaping debate on the news, UK policy response on vaping debate. The search words used for the measles, mumps and rubella (MMR) debate include: MMR debate, UK MMR controversy, MMR on the new, Dr. Wakefield, Justice, Awareness and Basic Support and Brain Deer and MMR.

The data collected in this study were rich and extensive; it was possible to draw on rich accounts from published arguments and the worldviews of the assorted stakeholders (identified in
Table 5.1) engaged in the public health risk debates. Some of the views used in this study are analyses and interpreted accounts of third parties (e.g. researchers) - this has been referenced accordingly. In addition to archival and documentary evidence, the researcher attended workshops and seminars where investigating scientists discussed the emerging evidence in particular relating to the vaping debate, as the controversy was on-going at this time.

Table 5.3 describes the key themes probed in the collection of the data, and explored the role of power and expertise in risk communication in United Kingdom. These questions will be used to structure the analysis of the case study chapters.

Table 5.3: Data Collection Protocol

Themes:
1. How did the risk debate emerge and evolve? 2. Who were the key stakeholders involved (elaborate on their nature, size, and resources)? 3. Upon whom lies the burden of proof? 4. Whose questions where asked in the policy inquiry relating to the risk? 5. Whose expertise was called upon in the policy inquiry relating to the risk? 6. How did the various stakeholders frame the risk? 7. What was the nature of language used in the risk communication? 8. What were the nature, source and availability of information, evidence, and knowledge? 9. What risk perspective was legitimised, who made the decision and where did the power come from? 10. What policy strategies were put in place? 11. What events occurred to enhance or curtail trust and credibility?

5.6 Analysing Published Data Using Documentary Analysis

In analysing the data collected, close attention was put to the sources, description and scope of published sources used, sampling frames, and summaries of data collection procedures etc. Data were analysed within the rich and complex context of the knowledge sought, typically known as *document analysis*. *Document analysis* is a social science analysis method used for reviewing or evaluating both printed and electronic material (Bowen, 2009). Similar to other methods of textual interpretation, like content analysis, document analysis requires that the data be examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge (Corbin and Strauss, 2008, Rapley, 2008).

The process of presenting and analysing data in this study initially involved the researcher familiarising herself with evolving events and gaining a good understanding of each case study (Elo and Kyngäs, 2008). As case study research often examines research over time; evidence provided in this study is presented in chronological order (Sandelowski, 2000, Baxter and Jack, 2008) so as to explore the selected public health risk debates as they occur. However, one danger highlighted by Yin (2013) in using this structure of data presentation is the often disproportionate

attention given to the different stages of the evolving case study where the earlier part typically receives most attention, and the latter part the least attention. However this problem can be overcome with systematic planning and drafting the cases in actual and reverse order (Yin, 2013). This was not a simple process but involved multiple reiteration processes and this allowed the researcher to determine what was relevant or not to the research theme.

This study involved collection of information (data) regarding the evolution of events from published sources that were not designed for the purpose for this study, which meant that there was a large amount of rich, complex data to be explored. One way of managing this complex set of data was to examine each event and how it related to the research themes under study. Effort was made to analyse each in the context in which it occurred and to interpret evolving events within the study research themes. A key task in this study is to highlight how power, expertise, communication and trust shape social amplification (or attenuation) processes in public health risk communication within the policy domain. The period of focus in the evolving event covered the emergence of the debate until a policy consideration or formulation. Therefore, the period of consideration of each case study varies. Some years may have been excluded because of lack of relevant data or difficulty in retrieving data from a credible published source.

5.7 Research Ethics

Ethical considerations of this research are not similar to those encountered in primary data collection; there is no need for anonymity or pseudonyms because names and information (or data) are already openly available. However, the need to avoid bias while striving for the highest ethical standards is critical in conducting scientific research (Resnik, 2011). Therefore, this study paid attention not only to the sources of information used for data collection but also where possible issues of distortion. One way of avoiding distortion in this study was to compare the interpretations made by the researcher with the interpretations of others in published sources, which can be said to be one of the strength of using published sources. Other issues deemed critical in conducting a reliable case study research are avoiding plagiarising or falsifying statements, being honest, avoiding deception and accepting responsibility for one's own work (Yin, 2015). In this study, care was taken to refer to relevant arguments

within extant literature and this was referenced accordingly. In the interpretation and analysis of the data, the researcher was open to contrary findings and was as honest as possible stating clearly where the theory and hypothesis matched with the data collected and where it did not, and effort was made to avoid deception of any form. Ethical standards also involve maintaining a strong professional competence by keeping up with related research, ensuring accuracy, striving for credibility and understanding, and divulging any necessary methodological qualifiers and limitations (Yin, 2015). The researcher kept updating the arguments made throughout this study by reading new and recent literature. Finally, the sources of and actual data are presented in ways that allow replication to enhance the reliability of the study.

5.8 Conclusion

This chapter describes the study design; the methodology and method used to address the research aim and objectives – a qualitative case study research that uses a social constructionist and interpretivist approach - detailing the rationale behind these choices. It explains the significance of reflecting on well-published, internationally relevant debates and justifies the approach taken. It was also decided that published sources that captured stakeholder inputs, reflected the debates, drew differentially on evidence and experts, would provide greater insight to each of the cases and would therefore be more readily comparable across cases. Effort was also made to explicate how the data or evidence in this study was collected and analysed, considering the complex and large quantities of published data available online.

The next three chapters (six, seven and eight) are the findings and analysis chapters of this thesis. Chapter nine is the discussion chapter that discusses the findings through the lens of the PERC framework set out in chapter four and the implication for risk communication is discussed thereafter. Chapter ten is the second discussion chapter that provides a detailed account of how power and expertise shapes social amplification (or attenuation) in risk communication before the final conclusion in chapter eleven.

6 The Smoking Health Risk Debate

6.1 Introduction

This chapter is the first result chapter of the thesis. It examines the smoking risk debate and assesses evidence on how power and expertise and also communication and trust might shape public health risk communication in a policy context. This case study particularly evidences how *salient power* exercised by stakeholder groups may shape public health communication and its associated policymaking. The events that unfolded within these debates are presented in chronological order (justified in chapter five) and analysed within the context of the research themes. The period examined in the smoking risk debate was not evenly subdivided according to the numbers of years but on the basis of how the researcher felt and judged that the evolving events were significant to the research themes in allowing initial analysis within the presentation of the evolving events. The first period examined the UK smoking debate between 1950 and 1955; the second period covered the debate between 1956 and 1965; and the third period examined the unfolding events within the smoking debate between the periods of 1966 and 1998. Together, these periods covered the emergence of the smoking debate in the UK to the point when concrete precautionary and policy measures were put in place.

The chapter begins by presenting the evolving events in the three aforementioned phases. The results are then analysed within the context of the PERC framework and those findings are highlighted that relate to social amplification (or attenuation) of smoking risk within the policy domain

6.2 The smoking risk debate (1950 -1955)

In September 1950, the first large-scale epidemiological study published in the British Medical Journal suggested a 'real association' between tobacco and lung cancer (Doll and Hill, 1950b). Doll and Hill (1950a) examined the relationship between smoking and lung cancer and concluded that of the 1,357 men with lung cancer in the study, 99.5% were smokers. The researchers interviewed 5,000 patients in British hospitals and established a statistical relationship between smoking and lung cancer (Doll and Hill, 1950b). Earlier that year, two studies published in the issue Journal of the

American Medical Association (JAMA) came to similar conclusions (Wynder and Graham, 1950, Levin et al., 1950). The initial reaction to Doll and Hill's (1950a) publication of a link between smoking and lung cancer from the scientific and medical communities (Lopez, 1999) and even amongst public experts, was one of scepticism. Smoking at this point was considered a natural and sophisticated behaviour and was allowed everywhere including in offices, pubs, restaurants, cinemas, and all transport systems (Peto et al., 2000).

Six months after Doll and Hill's (1950) publication, two key Government advisory groups, Central Health Services Committee (CHSC) and Standing Advisory Committee on Cancer and Radiotherapy, accepted Doll and Hills findings and advised the government that the link between smoking tobacco and lung cancer was proven (CHSC and SACCR, 1951). The groups examining smoking and health reports that

> "Professor Bradford Hill and Dr Doll are satisfied that the case against smoking as such is proven" (CHSC and SACCR, 1951).

This acceptance of Doll and Hill's conclusion is evidence of the weight given to technical expertise within the policy domain, and highlights the power of stakeholder relationships in bringing about hegemony of risk discourse. This acceptance also shows how technical expertise and power exercised through stakeholder relationships play an important role in shaping the transition of risk argument towards the under critical model in a policy context. In November of 1952, Richard Doll and Bradford Hill published a second paper in the BMJ extending their investigation (which had been initially limited to the London area) to Bristol, Cambridge, Leeds and Newcastle-upon-Tyne (Doll and Hill, 1952). This second study reached a similar conclusion to the first, establishing a statistical link between smoking tobacco and lung cancer. However, in February of 1953, the CHSC received a report from Imperial Tobacco Statistical Department attempting to disapprove Doll and Hill's claims that smoking is linked to lung cancer (Teague, 1953). The Chairman of Imperial Tobacco in a statement to shareholders stated that

> "If it should ever be proved that there exists something harmful in tobacco, even in the minutest quantities, which could conceivably make smoking

> one of the causes of this disease [cancer], we should, I hope, be the first to take steps to eliminate it" (Chairman of Imperial Tobacco Statement, 1953).

The above statement from the representative of Imperial Tobacco Statistical Department suggests that the company understood the importance of trust in shaping the risk debate as they demanded they should be trusted; this is evidenced by *"if….. They will be the first to act …."*. Later that year, a statistical panel setup by the Chief Medical Officer at the Ministry of Health to look at the relationship between smoking and cancer confirmed a statistical connection between smoking and lung cancer. The Ministry of Health stated that

> "We are therefore of the opinion that the main conclusion reached by Doll and Hill, that there is a real association between smoking and cancer of the lung, is firmly established" (Statistical Panel and MoH report, 1953).

It is important to note that the nature of evidence as this point was still statistical. The first ever study to show a biological link between tobacco and lung cancer was published in December of 1953. The research found that painting cigarette tar on the backs of mice created tumours (Wynder et al., 1953). In March of 1955, the CHSC advised the Minister for Health to take appropriate action in informing the public of the dangers of tobacco and heavy smoking." (CHSC and SACCR, 1956). They asserted that

> "It must be regarded as established that there is a relationship between smoking and cancer of the lung" (CHSC and SACCR, 1953).

In January of 1954, the UK Health Minister accepted the link between tobacco and lung cancer, while being cautious around the fact that evidence of how smoking is linked to lung cancer remains weak. In a memo written to the Cabinet Home Affairs Committee, the minister stated that

> "[I have] come to the conclusion that the statistical evidence does point to a causal relationship between tobacco smoking and lung cancer, but that there are important qualifications. There is no precise evidence of how tobacco smoking causes lung cancer or indeed of the extent to which one causes the other" (Minister of Health, 1954).

As more evidence continued to point to a link between smoking and lung cancer, see (Hammond and Horn, 1954, Doll and Hill, 1954), a group of leading tobacco manufacturers in the UK, including BAT, Gallaher and Imperial, denied a link between tobacco and lung cancer. They argued that more biological evidence would be needed before any such assertions could be made. The industry offered £250,000 to aid the research of the Medical Research Council (MRC) and expressed in a statement that

> "This can only be the case when medical science is able to provide a causal proof to the claim" (Statement Issued by the Group of Leading Tobacco Manufacturers, 1954).

Despite the strong acknowledgement of the results of Dr Doll and Prof Hill publication by the medical and scientific community, and public health experts at this point, the evolving events suggest that no immediate action was put in place by the UK government to mitigate the dangers of smoking to public health. Aside from the fact that smoking was considered a normal thing to do in the 1950's, the initial response by the government (inactivity) can also be said to be partly conditioned by a number of factors within this period. Firstly, it involves the role of the tobacco industry and its financial importance to the UK government. British tobacco companies paid huge taxes and were a source of huge employment in Britain. As such, the government may not have wanted to interfere with this (at least until there was an alternative source of income and employment). It is possible that for economic reasons, the government turned a blind eye to the excesses of tobacco companies and the dangers of smoking to public health. Besides, public experts and politicians were concerned about the nature of epidemiological evidence as noted above in the Ministers of Health's statement in 1954. Advising a change to such ingrained societal culture or behaviour would require evidence and communication over a good period of time to achieve the desired behavioural goal.

Table 6.1: UK Tax Revenue from the tobacco

Source: HM revenue and Custom (HMRC) and Tobacco Manufacturing Association (TMA)

Year	Excise (billion)	Vat (billion)	Total (billion)
1990-91	5.6	1.1	6.8
1991-92	6.3	1.5	7.8
1992-93	6.0	1.5	7.6
1993-94	6.5	1.6	8.1
1994-95	7.4	1.7	9.1
1995-96	7.3	1.7	9.0
1996-97	8.0	1.8	9.8
1997-98	8.4	1.8	10.1
1998-99	8.2	1.8	10.0
1999-00	5.7	1.8	7.5
2000-01	7.6	1.8	9.4
2001-02	7.8	1.8	9.6
2002-03	8.1	1.9	9.9
2003-04	8.1	1.8	9.9
2004-05	8.1	1.8	9.9
2005-06	8.0	1.9	9.8
2006-07	8.1	1.9	10.0
2007-08	8.1	1.9	10.0
2008-09	8.2	1.8	10.0
2009-10	8.8	1.7	10.5
2010-11	9.1	2.0	11.1

presents revenue from sales of all tobacco in the UK including excise duty and taxes (between the 1990 and 2011). The table indicates the economic importance of the tobacco industry to the UK economy.

Table 6.1: UK Tax Revenue from the tobacco
Source: HM revenue and Custom (HMRC) and Tobacco Manufacturing Association (TMA)

Year	Excise (billion)	Vat (billion)	Total (billion)
1990-91	5.6	1.1	6.8
1991-92	6.3	1.5	7.8
1992-93	6.0	1.5	7.6
1993-94	6.5	1.6	8.1
1994-95	7.4	1.7	9.1
1995-96	7.3	1.7	9.0
1996-97	8.0	1.8	9.8
1997-98	8.4	1.8	10.1
1998-99	8.2	1.8	10.0
1999-00	5.7	1.8	7.5
2000-01	7.6	1.8	9.4
2001-02	7.8	1.8	9.6
2002-03	8.1	1.9	9.9
2003-04	8.1	1.8	9.9
2004-05	8.1	1.8	9.9
2005-06	8.0	1.9	9.8
2006-07	8.1	1.9	10.0
2007-08	8.1	1.9	10.0
2008-09	8.2	1.8	10.0
2009-10	8.8	1.7	10.5
2010-11	9.1	2.0	11.1

Table 6.2 (below) summarises and presents the chronology of unfolding events relating to the smoking debate during the period between 1950 and 1955.

Table 6.2: Chronology of events unfolding in the smoking risk (1950 – 1955)

Year	Event	
1950	i.	September - The first large-scale statistical study by Richard Doll and Professor (subsequently Sir) Austin Bradford Hill suggested a 'real association' between tobacco and lung cancer (Doll and Hill, 1950b).
	ii.	Another study carried out in the US had earlier that same year come to a similar conclusion (Wynder and Graham, 1950).
1951	iii.	March - Central Health Services Committee (CHSC) and Standing Advisory Committee on Cancer and Radiotherapy, supports Professor Bradford Hill and Dr Doll's research findings. (CHSC and SACCR, 1951).
1952	iv.	November - Richard Doll and Bradford Hill publish a second paper in the BMJ extending their investigation (which was initially limited to the London area),to Bristol, Cambridge, Leeds and Newcastle-upon-Tyne (Doll and Hill, 1952).
	v.	November - Representatives from Imperial Tobacco (John Partridge, Secretary and Director, D. A. Clark and G. F. Todd) met with Dr Green from the MRC, and Professor Bradford Hill and Dr Doll. Dr. Green expressed that "It was pretty clear to me that Mr Partridge and his colleagues felt that Hill had answered all their queries in a way which left hardly any loophole for doubt, though they were reluctant to concede this." (Green, 1952) (ash.org.uk).
1953	vi.	February - The CHSC received a report from Imperial Tobacco Statistical Department attempting to refute Doll and Hill's claims that smoking is linked to lung cancer (Teague, 1953).
	vii.	March - in a statement to shareholders, The Chairman of Imperial Tobacco states that "If it should ever be proved that there exists something harmful in tobacco, even in the minutest quantities, which could conceivably make smoking one of the causes of this disease [cancer], we should, I hope, be the first to take steps to eliminate it" (Chairman of Imperial Tobacco Statement, 1953).
	viii.	November - The statistical panel setup by the Chief Medical Officer at the Ministry of Health confirms a connection between smoking and lung cancer. The Ministry of Health asserted that "we are therefore of the opinion that the main conclusion reached by Doll and Hill, that there is a real association between smoking and cancer of the lung, is firmly established" (Statistical Panel and MoH report, 1953).
	ix.	December - A study by Wynder et al (1953) suggested that painting cigarette tar on the back of mice creates tumours (Wynder et al., 1953). This study became the first to provide an experimental, biological link between smoking and cancer.
	x.	The Standing Cancer And Radiography Advisory Committee reporting to the Central Health Services Council, which in turn advises the Minister of Health (MH) recommended that the relationship between smoking and cancer of the lung must be regarded as established (CHSC and SACCR, 1953).

1954	xi.	January - UK Health Minister writes a memo to the Cabinet Home Affairs Committee stating that I have "come to the conclusion that the statistical evidence does point to a causal relationship between tobacco smoking and lung cancer, but that there are important qualifications. There is no precise evidence of how tobacco smoking causes lung cancer or indeed of the extent to which one causes the other" (Minister of Health, 1954).
	xii.	February - The Daily Mirror reported that "The great smoking controversy has been flung into the arena of public discussion again by yesterday's announcement in Parliament that an apparent link between smoking and cancer of the lung has been established."
	xiii.	March - Group of leading tobacco manufacturers in the UK including BAT, Gallaher and Imperial in a statement denied that there is any proof that smoking causes lung cancer. They stated that this can only be shown to be the case when medical science is able to establish a causal explanation for the claim. They however offered £250,000 to fund MRC research in this arena (Statement Issued by the Group of Leading Tobacco Manufacturers, 1954).
	xiv.	June - A study published by Cuyler Hammond of the American cancer society and Daniel Horn on 187,766 men aged between 50-69, shows that around 65 per cent of smokers died in the 50-54 age range than non-smokers and about 60 per cent greater in 55-59 and 102 per cent greater in 60-64 age range (Hammond and Horn, 1954)
	xv.	June – a study which examined British doctors published by Doll and Hill found that out of 789 doctors who had died all were smokers with 35 of them dying of lung cancer (Doll and Hill, 1954).
1955	xvi.	March - CHSC advises the Minister for Health to take appropriate action by informing the public of the dangers of tobacco and heavy smoking."(CHSC and SACCR, 1956).

The burden of proof (between the period of 1950 and 1955) lay on the shoulders of the tobacco industry and public health authorities. In the 1950's, the tobacco industry mainly produced tobacco cigarettes (and cigars) and would have needed to make a case for the continued existence of its business in the face of claims suggesting that smoking is a significant factor leading to lung cancer. For the tobacco industry, the acceptance of this suggestion would question its very existence; capable of prompting mass legal actions, which would be detrimental to the industry's financial assets. The industry largely shared the burden to proof that tobacco cigarettes were safe for public consumption because this was not only about profit but also an issue of morality and ethics. The UK government and public health institutions also shared in the burden of proof as they were charged with the responsibility of protecting and informing the public of the nature of risks faced. In addition, the uncertainty about a causal explanation meant that before they could advise the public of a change in smoking behaviour, more substantial evidence would be needed. Table 6.3 present a sample text of stakeholder's initial reactions to the suggestion that smoking is linked to lung cancer (between 1950 and 1955). However due to limited (or lack of) data, it has not been possible to retrieve any narratives from ordinary citizens.

Table 6.3 Sample text of stakeholder reaction to the suggestion that smoking is linked to lung cancer (between 1950 and 1955)

Stakeholders	Sample text
Scientific committees	"it must be concluded that there is a real association between carcinoma of the lung and smoking" (Doll and Hill, 1950b).
Policy makers /public health institution	"We are therefore of the opinion that the main conclusion reached by Doll and Hill, that there is a real association between smoking and cancer of the lung, is firmly established" (Statistical Panel and MoH report, 1953).
Technical experts	Excessive and prolonged use of tobacco, especially cigarettes, seems to be an important factor in the induction of bronchiogenic carcinoma (Levin et al., 1950) p.336. Tobacco as a Possible Cause of lung cancer (Wynder and Graham, 1950).
The tobacco Industry representatives	"If it should ever be proved that there exists something harmful in tobacco, even in the minutest quantities, which could conceivably make smoking one of the causes of this disease [cancer], we should, I hope, be the first to take steps to eliminate it" (Chairman of Imperial Tobacco Statement, 1953).

Media sources	"The great smoking controversy has been flung into the arena of public discussion again by yesterday's announcement in Parliament that an apparent link between smoking and cancer of the lung has been established." (DailyMirror, 1954)
Public	-

6.3 The smoking debate (1956 and 1965)

The period between 1956 and 1965 saw greater weight of evolving scientific evidence giving credence to the claim that smoking is linked to lung cancer (Schwartz and Denoix, 1957, Stocks, 1958, Haenszel et al., 1958, Dorn, 1959, Doll et al., 1957, Hilding, 1956, Kotin and Falk, Auerbach et al., 1957, Chang, 1957, Leuchtenberger et al., 1958, Bock and Moore, 1959, Engelbreth-Holm and Ahlmann, 1957, Gellhorn, 1958, Orris et al., 1958, Lyons and Johnston, 1957, Van Duuren, 1958, Wynder and Wright, 1957, Wynder et al., 1958); although most studies remained statistical. The absence or near absence of any causal proof (biological or experimental evidence) may be due to the fact that it is difficult and costly in terms of time and financial resources to generate, or even because it was 'intentionally' avoided, since a causal proof would be too damaging for the tobacco industry. This perhaps, is one reason why representatives of the industry were fiercely engaged in undermining the technical case linking smoking and lung cancer. They argued that more research is needed before any causal association or claim can be established.

The evolving events within this period shows that in February of 1956, a study published by Dr Ernest Wynder and his colleagues found a link between the risk of developing larynx cancer and an increase in the amount of smoke consumed (Wynder et al., 1956). In a letter to Sir John Hawton, Ministry of Health, tobacco industry reassures government of their commitment to public health.

> "There is no proof at all that smoking causes lung cancer and much to suggest that it cannot be the cause" (Partridge, 1956)…"We would regard it an elementary duty and responsibility to leave nothing undone that we can do to secure the eradication of anything in tobacco which is found to be harmful to health" (Partridge, 1956).

The above statement again is an indication of the demand for public trust by representatives of tobacco industry. However, this demand for trust was complimented by a call for moderation in smoking. In a statement to shareholders, the chairperson noted that

> "Excessive smoking, like excessive eating or excessive drinking - cannot be good for anyone; but equally obviously what is excessive to one person may be harmless to another" (Imperial Tobacco Company, 1956).

In May, the Minister of Health, Mr. Turton, argued in the House of Commons for the government to take a precautionary stance on tobacco control. He explained that:

> "Two known cancer-causing agents have been identified in tobacco smoke, but whether they have a direct role in producing lung cancer, and if so what, has not been proved...The fact that a causal relationship has not yet been recognised should not be allowed to obscure the fact that there is, statistically, an incontrovertible association between cigarette smoking and the incidence of lung cancer…"mortality from lung cancer is twenty times greater amongst heavy smokers than amongst non-smokers" (Turton, 1956).

However, despite the seeming consensus as noted above (*see also* Table 6.2, events v, viii, x, xi, xvi) and a push by key government official that smoking was linked to lung cancer, the evolving events suggest no immediate or considerable action was taken by the government at this point. In August of 1956, the Tobacco Manufacturers' Standing Committee (TMSC) is formed by British Tobacco manufacturers (TMSC First Annual Report, 1956). The establishment of Tobacco Manufacturers' Standing Committee (TMSC) increased the industry's capacity to exercise stronger power over scientific evidence and its interpretation. In June of 1957, the MRC published a five-year report "Tobacco Smoking and Cancer of the Lung". The report, which was accepted by the minister of health, links the increase in the deaths of lung cancer with smoking, especially cigarettes. The report states that:

> "The most reasonable interpretation of scientific evidence is that the relationship is one of direct cause and effect"… "The identification of several carcinogenic substances in tobacco smoke provides a rational basis for such a causal relationship" (MRC Report, 1957).

The minister in his statement equated this statistical evidence to a causal proof. However, representatives of the tobacco industry immediately challenged his contention. A statement from representative of TMSC for instance reads that:

> "It has not been established with any certainty whether and to what extent there may be a causal relationship between smoking and cancer of the lung. At this stage any conclusions are a matter of opinion" (Tobacco Manufacturers' Standing Committee, 1957).

Dismissing the causal proof claim, the TMSC in December of 1957 issued a report "Smoking and Lung Cancer - The Conflict of Opinion" stressing the conflicting opinions of experts on factors that cause lung cancer. In July of 1958, the evolution of the event suggests that another hypothesis has emerged. For instance, Fisher (1958) suggested that an individual's 'genes' might predispose such a person to smoking and cancer. Fisher who later became a consultant for TMSC argued that the smoking causal hypothesis was unproven. He noted that the genetic hypothesis was more plausible as supported by new evidence - a result of an enquiry into the smoking habits of adult male twin pairs on their list (Fisher, 1958). Fisher in his study examined 51 monozygotic or 'identical' twins (developed from one zygote that splits and forms two embryos) and 31 dizygotic or 'fraternal' twins (developed from two eggs, each fertilized by separate sperm cells) from Tubingen, FrankFurt and Berlin (Fisher, 1959). He concluded that genotype exercises a considerable influence on smoking behaviour and on the particular smoking habit adopted. The study noted that different genotype groups would be expected to differ in incidences of cancer.

In discrediting Doll and Hill's hypothesis, Fisher concentrated on the negative correlation between inhaling and lung cancer in their 1950 study. He questioned the MRC conclusions of Doll and Hill (1950) study arguing that they were jumping from the observation of an association to the conclusion of a causal relationship. To emphasise the point, Fisher noted that if the MRC were to jump to a conclusion on the case of inhaling, it would lead to a conclusion that cigarettes cause cancer but that inhaling cigarettes prevents it. Further study also emerged in support of the genetic hypothesis. In 1960, Eysenck criticised the causal hypothesis, noting that smoking has ameliorating effects with respect to lung cancer (Eysenck et al., 1960).

Royal College of Physicians (RCP) First Report

The Royal College of Physicians (RCP) research committee looking into smoking and atmospheric pollution in relation to carcinoma of the lungs and other diseases published its first report in March of 1962. The report, entitled "Smoking and Health" concluded that cigarette smoking causes lung cancer and bronchitis (RCP Report, 1962). The report also noted that smoking was the most likely cause of the recent worldwide increase in deaths from lung disease. The report says that smoking related death was higher in Britain than in any other country in the world, and that lung cancer exposes people to the risk of developing chronic bronchitis and coronary heart disease, particularly in early middle age. The report recommended restriction on tobacco advertising; increased taxation on cigarettes; more restrictions on the sales of cigarettes to children and on smoking in public places; and more information on the tar/nicotine content of cigarettes. The recommendations from this RCP report became the core of tobacco control policies worldwide over the next 60 years (RCP Report, 2012) and became the origin of many of the arguments that arose within the tobacco debate.

The RCP report received widespread publicity on the day of publication, and there was a press conference to disseminate the findings - a technique used to announce scientific conclusions of high interest to the general public. In 1962, about 70% of men and 40% of women in the UK smoked. Smoking was allowed everywhere including on trains, buses, at work, even in schools and hospitals. BBC archive footage on the Tonight programme, which was aired on the night of the publication, captured public opinion on the suggestion that tobacco causes lung cancer (Hughes, 2012). One man who smoked between 20 and 25 cigarettes per day says:

> "Quite honestly, I think that the end of one's life is probably more in the hands of almighty God you know, than in my own hands or the hands of the tobacco manufacturers."

Another interviewee explains that

> "I think so, yes. If I'm going to die, I'm going to die, so I might as well enjoy life as it is now."

A third interviewee mentioned how she tried to quit but was not able to manage beyond two days. Another thought that if she didn't smoke she would be miserable. This suggests a deep-rooted smoking culture and societal acceptance of smoking in the 1950/60's. In response to the RCP report, G.F. Todd of Imperial tobacco stated that

> "there is no denial of the almost certain relationship between smoking and cancer of the lung although it is possible this is done in the light to confuse the issue" (G.F. Todd, Comments on the RCP report, 1962).

Days after the RCP report, John Partridge, an executive of Imperial tobacco, was interviewed featured on the BBC's Panorama Programme (BBC panorama TV, 1962). He suggested that the RCP report expressed an "unbalanced picture" of existing knowledge, and uncertainties regarding smoking.

> "I do not believe that you will stop the people of this country from smoking …they know the odds are heavily against their coming to any real harm from it".

The Chairman of Imperial Tobacco Company, R W S Clark, in an address to the annual general meeting debunked the idea that commercial interest was the main motivation for the position of the industry on statistical evidence suggesting a link between smoking and other diseases. The Chairman seeking public trust said that:

> "It has been said or implied in a number of quarters that the position taken up by the manufacturers is heavily biased by the fact our commercial interests are involved. I want to say quite categorically that any such imputation is completely unjustified and unfair. It is, of course, self-evident that the industry's commercial interests are involved, but the tobacco manufacturers also fully recognise their responsibility to the public …" (Clarke, 1962).

Sir Charles Ellis, from BAT R&D Department in the BAT annual research conference suggested that the interpretation given to statistical links between smoking and lung cancer was one with an 'emotional gloss':

> "We who have been immersed in the subject for many years know that this report produced no new fact, produced no new arguments, indeed, except

> for the contribution of an emotional gloss, left the subject untouched. We know only too well that there are no conclusive proofs; that there are few, if any, cold scientific facts. However emotional conclusions cannot be disregarded …" (McCormick, 1962).

In May of 1964, Doll and Hill published their third study on Tobacco and cancer. This time, a nationwide prospective survey was carried out on "mortality in relation to smoking: 10 year's observations in British Doctors" (Doll and Hill, 1964). Three years earlier, the researchers had sent a short survey to 59,600 men and women whose names were on the British Medical Register and who were then resident in the United Kingdom. The study found that between 1951 and 1964 about half the UK's doctors who smoked had given up. They also found that there was a dramatic fall in lung cancer incidence among those who gave up as opposed to those who continued to smoke (Doll and Hill, 1964). Table 6.4 summaries the evolving event between (between 1956 and 1965).

Table 6.4: Chronology of events in the smoking risk debate (between 1956 and 1965)

Year	Event	
1956	i.	February –Ernest Wynder and his colleagues found a link between the risk developing larynx cancer and increase in the amount of tobacco consumed (Wynder et al., 1956).
	ii.	March – Imperial Tobacco debunks the link between tobacco and lung cancer stating in a letter to Sir John Hawton, Ministry of Health that "there is no proof at all that smoking causes lung cancer and much to suggest that it cannot be the cause" (Partridge, 1956).
	iii.	March – A statement from UK leading tobacco companies states that "The evidence on the possible relationship of lung cancer and smoking is conflicting and incomplete"(Statement By A Group of Leading Tobacco Manufacturers in the UK, 1956).
	iv.	May - In the house of commons, the Minister of Health, Mr. R. H. Turton takes a precautionary stance stating that "the fact that a causal relationship has not yet been recognised should not be allowed to obscure the fact that there is, statistically, an incontrovertible association between cigarette smoking and the incidence of lung cancer"(Turton, 1956).
	v.	August - Tobacco Manufacturers' Standing Committee (TMSC) is formed by the British Tobacco manufacturers (TMSC First Annual Report, 1956).
1957	vi.	June – A five year report "Tobacco Smoking and Cancer of the Lung" is published by the MRC. The report links the increase in the deaths to lung cancer from tobacco smoking, particularly in the form of cigarettes .
	vii.	June – The Health Minister reported to the House of Common with a view that the interpretation of the MRC as the most credible interpretation and explanation for the increase in the death of lung cancer (MRC Report, 1957).
	viii.	June – The TMSC responds by saying that: "It has not been established with any certainty whether and to what extent there may be a causal relationship between smoking and cancer of the lung. At this stage any conclusions are a matter of opinion" (Tobacco Manufacturers' Standing Committee, 1957).
	ix.	December - The TMSC issues a report "Smoking and Lung Cancer - The Conflict of Opinion" illustrating "the conflict of opinion that exits about the factors that may be active in lung cancer.
1958	x.	Other subsequent scientific studies that provided evidence that tobacco may be a link to lung cancer were (Schwartz and Denoix, 1957, Stocks, 1958, Haenszel et al., 1958, Dorn, 1959, Doll et al., 1957, Hilding, 1956, Kotin and Falk, Auerbach et al., 1957, Chang, 1957, Leuchtenberger et al., 1958, Bock and Moore, 1959, Engelbreth-Holm and Ahlmann, 1957, Gellhorn, 1958, Orris et al., 1958, Lyons and Johnston, 1957, Van Duuren, 1958, Wynder and Wright, 1957, Wynder et al., 1958).

	xi.	This surge of scientific evidence did not deter other technical experts from criticising the validity of the link between smoking and lung cancer *see* (Berkson, 1958, Fisher, 1959, Hueper, 1955, Berkson, Gilliam, 1955).
	xii.	Another scientific hypothesis in the late 1950 suggest that an individual's 'genes' may predispose such a individual to both 'smoking' and 'cancer' (Fisher, 1958).
1962	xiii.	March - The first report by the Royal College of Physicians (RCP) on "Smoking and Health" still of statistical nature concludes that cigarette is linked to cancer and other diseases (RCP Report, 1962).
	xiv.	March - G.F. Todd of Imperial tobacco in response to the RCP report states "there is no denial of the almost certain relationship between smoking and cancer of the lung although it is possible this is done in the light to confuse the issue" (G.F. Todd, Comments on the RCP report, 1962).
	xv.	March – the Chairman of Imperial Tobacco Company, R W S Clark, addressing the Annual General Meeting states that "…It is, of course, self-evident that the industry's commercial interests are involved, but the tobacco manufacturers also fully recognise their responsibility to the public …a general condemnation of cigarette smoking is neither justified nor constructive" (Clarke, 1962).
	xvi.	July – In the Annual BAT research conference, Sir Charles Ellis, from BAT R&D Department downplays the RCP report stating that "…We who have been immersed in the subject for many years know that this report produced no new fact, produced no new arguments" (McCormick, 1962).
	xvii.	September - The TMSC opens chemical and biological laboratories at Harrogate. The Tobacco Institute issues a press release stating that: "The causes of cancer are not now known to science. Many factors are being studied along with tobacco. The case against tobacco is based largely on statistical associations, the meanings of which are in dispute" (Report of Special Master, 1998).
1964	xviii.	May - Doll and Hill published further report of their study on Tobacco and cancer. This time, a nationwide prospective survey was carried out on "mortality in relation to smoking: 10 years' observations in British Doctors" (Doll and Hill, 1964). Doll and Hill in 1961 sent a short survey sent to 59,600 men and women whose names were on the current British Medical Register and who were then resident in the United Kingdom. The study found that between 1951 and 1964 about half the UK's doctors who smoked gave up and there was a dramatic fall in lung cancer incidence among those who gave up as opposed to those who continued to smoke (Doll and Hill, 1964).
1965	xix.	Television advertising of tobacco products is banned in the UK in 1965 under the '1964 Television Act' (ash.org.uk).

After much pressure (mainly from the Standing Medical Advisory Committee (SMAC), The Central Health Services Council (CHSC), many MPs and the Chief Medical Officers at the Ministry of Health) on the government to enforce tobacco control, the first Government response came in 1965. Under the terms of the 1964 Television Act, the UK government, after consultation with the Independent Television Authority, banned television advertising of tobacco products (ash.org.uk).

6.4 The smoking risk debate (between 1966 and 1998)

The period between 1966 and 1998 is the largest period under assessment in this case study. This is because the evolution of events suggests that politicians and government public health departments had formed an ideology in which smoking was considered dangerous to health (see above paragraph). However, there was yet to be any concrete action from the government in mitigating the risks of smoking. The period between 1966 and 1998 saw a ban on tobacco advertisement, greater protection of young children and a change of voluntary agreement governance (which was circumvented in some instances *see (Smith, 1982)* to legally binding rules in relation to advertising and selling tobacco cigarettes.

Within this period, after consulting with the Independent Television Authority, under the terms of the 1964 Television Act, the Government banned television advertising of tobacco products by 1967 (ash.org.uk). Kenneth Robinson, Minister of Health in Parliament expressed the government's intention of introducing legislation to control or ban how tobacco products are promoted (ash.org.uk). However, no immediate legislative action was put in place. By 1968, the UK government established Health Education Council (HEC), later re-organised as the Health Education Authority (HEA) to replace the existing Central Council for Health Education in England and Wales. In Scotland, the Scottish Health Education Unit (SHEU, later SHEG, now HEBS - Health Education Board for Scotland) was established to cover similar activities (McNair-Wilson, 1972) amongst which educating the public on the dangers

of smoking. In January of 1971, the second Royal College of Physicians report "Smoking and Health Now" was published. The report refers to the death toll caused by cigarette smoking as a present day "holocaust" increasing suffering and shortening the life of the public" (RCP Report, 1971). The report, like the first also received widespread publicity and caused a permanent drop of 5% in cigarette consumption (ash.org.uk). The Chief Medical Officer in a statement expressed concern that:

> "some 80,000 premature deaths probably occur in England and Wales each year and for the whole of the United Kingdom the number must approach 100,000 as a result of smoking" (Interdepartmental Group of Officials, 1971).

The report also suggested a clear socio-economic divide in giving up smoking. Those in 'professional classes' (e.g. doctors) were giving up smoking; however, people in the 'manual' and 'unwaged' groups maintained their smoking behaviour. This suggested that there are distributive inequalities associated with the understanding of risk; those in poorer sections of society suffer most from errors in understanding risk. Following the publication, Action on Smoking and Health (ASH) was set up under RCP. Its remit was to make non-smoking the norm in society and to inform and educate the public about the death and disease caused by smoking. In march of 1971, the secretary of state for Health, Sir Keith Joseph, restated government position on its intention to control tobacco use but through voluntary agreement with the tobacco industry (ash.org.uk).

In April of 1971, the first voluntary agreement between the government and tobacco industry was proposed. Its provisions included - all cigarette packs for sale in the UK should carry the words 'Warning by HM Government: Smoking can damage your health'. All press and poster ads were to carry the reference: 'Every pack carries a Government health warning'. The tobacco industry also agreed to establish a scientific liaison committee consisting of industry and Department of Health and Social Security (DHSS) nominated scientists to explore less dangerous forms of smoking and to devise a way of measuring tar/nicotine levels (ash.org.uk). By May 1971, health warnings were put on cigarettes in Britain - "Warning by HM Government: smoking can damage your health." (ash.org.uk). In May of the same year, cigarette advertisements on radio were also banned in the UK.

In January of 1972, 132 MPs in the house of commons voted in favour of a total ban on cigarette advertising, 73 against (ash.org.uk). This signified political support for a ban on tobacco advertising and was essential at this point because advertisements for tobacco would be counter-productive to the government strategy of informing and educating the public on the dangers of smoking. The existing voluntary agreement was also extended to include 'health hints' on cigarette packs, brand ads at sports events and those sent through the post. In May of 1972, Richard Dobson who was to become Chairman of BAT, in a press release issued by the Tobacco Institute states that:

> "It's hard to argue that filling your lungs with smoke can be actually good for you. But surely it is a question of moderation and I do sincerely believe that the tobacco industry, in total, does more good than harm"(ash.org.uk).

By 1975, the UK tobacco industry's joint research facilities in Harrogate were closed down (RJ Reynolds Research Department, 1976). In March, Sir John Partridge, from Imperial expressed the opinion that

> "As a company we do not make, indeed we are not qualified to make, medical judgements. We are therefore not in a position either to accept or to reject statements made by the Minister of Health".

The above statement suggests the industry was tempering its attack on the technical case linking smoking and lung cancer, now accepted by politicians and departments of government. In January of 1977, The HEC launched a TV campaign focusing on the rights of non-smokers and smoking by women. In April, P. L Short, from BAT writes a paper on "Smoking and Health: the Effect on Marketing", commenting on the benefits of Smoking. The report found a direct cause and effect relationship between smoking and improved behaviour in individual 'subjects', in the course of experiments. Two months later, The royal college of physicians issued its third report on "Smoking or Health" (RCP Report, 1977). According to the report, coronary heart diseases are responsible for about half of the total excess deaths among cigarette smokers and that the association between smoking and heart disease is largely one of cause and effect" (RCP Report, 1977). In May of 1978, a finance bill 'Clause 1' which provided for extra taxation on high-tar cigarettes was debated and adopted in a Parliamentary Committee, despite opposition from the tobacco industry. Also a motion tabled by Sir George and signed by 54 MPs, called for a complete ban on

tobacco advertising (ash.org.uk). A year later, the World Health Organisation issued a report "Controlling the Smoking Epidemic". The report which received wide publicity recommends a total prohibition of all forms of tobacco promotion (Alderson, 1979). In November, the Operating Procedure Codes (OPC) report showed a drastic increase in the number of women dying within the last decade. In January of 1980, Dr. Green from BAT wrote a paper on Cigarette Smoking and Causality. In the paper, he stated that:

> "The cigarette industry has made a great issue of cause and effect relationships in response to the many published studies associating smoking with various diseases. Some might say that the industry has led the anti-smoking forces up the garden path by emphasising so much the issue of causality; in fact scientific proof never has been, is not and should not be the basis for political and legal action on social issues; the test is 'What would a reasonable man do faced with the evidence?' Nevertheless many have been led or misled successfully with 'scientific proof" (Green, 1980).

In April of 1980, Patrick Sheehy, former chairperson of BAT wrote to BBC Panorama about the continuing controversy in scientific circles regarding causation. He wrote that:

> "Scientists are [by] no means unanimous regarding smoking and health issues … we would therefore ask you to ensure that the programme disassociates the views of the scientist in question [Dr Green] from those of this company by making an appropriate statement to this effect in the programme" (P. Sheehy, Letter to the BBC, 1980).

BBC Panorama programme aired its report on the tobacco industry, revealing that the chairperson of the Tobacco Advisory Council is on the Sports council. It also showed in-depth how the industry refuses to acknowledge publicly that smoking kills. On the programme, Dr. Green, now retired from BAT, admitted that smoking is a major factor in lung cancer. Meanwhile, Alan Long, President of Santa Cruz, a BAT subsidiary in Brazil stresses that:

> "Medical evidence remains of a statistical nature as no evidence has been produced to establish a causal relationship between smoking and any of the diseases with which it has been associated" (BBC TV, 1980).

In November, the fourth report of the Royal College of Physicians "Smoking still kills" was published. The report urged the government to reverse its present attitude

of inactivity and even of encouragement towards the tobacco industry to tackle this hidden holocaust (Taylor, 1984). That month an RJR (Tobacco Company) advertisement proclaimed that:

> "It has been stated so often that smoking causes cancer, it's no wonder most people believe this is an established fact. But, in fact, it is nothing of the kind. The truth is that almost three decades of research have failed to produce scientific proof for this claim ... in our opinion, the issue of smoking and lung cancer is not a closed case. It's an open controversy" (Report of Special Master, 1998).

In March of 1982, the Presidents of the UK's eight Royal Colleges of Medicine (Physicians; Surgeons of Edinburgh; General Practitioners; Pathologists; Obstetricians and Gynaecologists; Radiologists; Physicians and Surgeons of Glasgow; Physicians of Edinburgh) wrote to the UK Government stating that cigarette smoking is the single most important preventable cause of death and disability in the UK (Smith, 1982). The letter in the BMJ highlighted concerns of sports sponsorship by tobacco interests stating that tobacco sponsorship of sport is one method of circumventing the legal ban on the advertising of cigarettes on television. The letter recommended a complete ban on tobacco sponsorship of sport (Smith, 1982). That same month, the biggest percentage rise since 1947 in cigarette tax was implemented with an increase of 14 pence on a packet of 20 in the year's main Budget. The tax rise was passed on to smokers with the aim of discouraging them from smoking by increasing the price.

By October of 1982, a new voluntary agreement to regulate advertising and promotion with the tobacco industry was announced by the government. Its provisions included display of health warning on cigarette parks and regulation of advertisements at point of sale (ash.org.uk). The industry agreed to reduce expenditure on poster ads and cinema ads by almost 50% and offered to pay £11 million over a three and a half year period to fund health related research except anything to do with tobacco use. The agreement received widespread criticism from both the public and media (ash.org.uk). In March of 1984, a study "The Smoke Ring" revealed how the tobacco industry contrives to remain powerful and in business despite widespread evidence of the health dangers of its product (Taylor, 1985). The study published the following year received massive publicity as a BBC Panorama programme screened it on the day of its

publication (Taylor, 1985). This raises an interesting question in relation to the ability of the government to protect public health and safety in the face of powerful stakeholders with vested interests when something of human value including human lives and health is put a stake.

In January of 1985, churches and health organisations were drawn into the controversy and were embarrassed after the BMA's report showed that they had investments in tobacco companies (ash.org.uk). A study by (Alderson et al., 1985) further implicates tobacco smoking by discovering reduced cases of lung cancers amongst ex-smokers. In April, the HEC TV campaign told women that lung cancer kills as many women as breast cancer (Pollitt et al., 2014). Communicating the scientific underpinning of the smoking risk remained relevant in this debate. As noted by (Renn, 1991a), the information was framed for each audience in a different manner to assure the attention of each. In this case, the HEC launched a campaign targeted at women where the argument framed by saying that lung cancer kills as many women as breast cancer. Breast cancer is of course a major cause of death among women and is dreaded.

In November of 1985, a report by the Health Education Council (HEC) reveals that UK television broadcast over 330 hours of tobacco sponsored programmes a year (HEC, 1985). In December, George Foulkes, Labour MP, introduced a Private Member's Bill designed to urge employers to increase non-smoking places or facilities in the workplace (ash.org.uk). In December of same year, the BMJ condemned the Health Promotion Research Trust funded by the tobacco industry as 'taking money from the Devil'. It was suggested that sponsored research often favours the sponsors (ash.org.uk). In January of 1986, HEC announced it would withhold grants from researchers and academics who receive funds from the tobacco industry supported Health Promotion Research Trust (ash.org.uk).

Flurry of Events

In March of 1986, Clive Turner, Tobacco Advisory Council, stated that tobacco advertising does not aim at recruiting new smokers. He stated that:

> "tobacco advertising or sponsorship has absolutely no influence whatsoever in persuading or motivating a purchase" (Turner, 1986).

In April, the UK Government passed the “Protection of Children (Tobacco) Act”. Henceforth it became illegal to sell any tobacco product to anybody under 16 years old. Previously, this applied to only loose tobacco products (Pollitt et al., 2014). In November, a study which combined data from 13 smaller studies on passive smoking concluded that passive smoking caused lung cancer (Wald et al., 1986). Other studies such as the (US Department of Health and Human Services, 1986), (Hakama et al., 1986) and (National Research Council, 1986) also came to similar conclusions. That same month, a report from WHO suggested that Britain had the highest rate of lung cancer (Pollitt et al., 2014). In February of 1987, Independent Television (ITV) stops the transmission of all tobacco-sponsored sports events on its programmes (BBC, 2009). In September, the European Commission launches “Europe Against Cancer”, a three-year awareness campaign of risky behaviour such as smoking and dietary habits (ash.org.uk). By winter that year, a study into Tobacco Advertising and Consumption (Tye et al., 1987) remarked that brand-switching alone, could not justify the amount of effort, time and money spent on advertising and promotional expenditures of the tobacco companies. The study concluded that advertising and promotion increased smoking, and the resulting disease and death, was sufficiently compelling a reason to warrant societal and government action. In February of 1988, the HEA launched "Smoking and Me", which was aimed at educating 12-13 year olds on the dangers of smoking (ash.org.uk). Government figures, which compared smoking trends between 1984 and 1986, revealed a decline in prevalence of smoking. However, no significant decline was found in the number of women smoking (Pollitt et al., 2014).

In October, the Frogatt report emphasised that passive smoking increased non-smokers’ risk of developing lung cancer by 10-30 per cent (Froggatt, 1988). An inquest into the deaths of 31 people in the King's Cross Underground station fire in November 1987 suggested that the fire was probably caused by a smoker's discarded match (ash.org.uk). In February of 1989, Mrs J. Swift, Public Affairs Manager of Imperial Tobacco revealing the economic impact of ban on tobacco advertising said that:

> "Foreign low-cost brands would have an additional competitive edge over UK produced brands and adversely influence UK industry jobs" (Tobacco, 1989).

In March of 1989, in a poll survey, 79% of smokers think that 'National No Smoking Day is a good idea and about 5 million smokers indicated they would attempt to give up smoking (Macalister, 1992). In May, the Chairman of the Virgin Group, Richard Branson, banned all forms of tobacco advertising and promotion from his companies, at a cost of £2 million over the subsequent five years (ash.org.uk). By October, the European Council issued Directive 89/552/EEC, which outlawed tobacco advertising across Europe. This would ban cigar and pipe tobacco commercials from British TV (Directive 89/552/EEC, 1988). In November, despite Britain's opposition, the European Council of Health Ministers voted for stricter, larger health warnings on tobacco packs and advertising throughout Europe. Also, tar level in cigarettes was set at 15mg by the end of 1992 and 12mg by the end of 1997 (ash.org.uk). In January of 1990, a coalition of MPs, TV and radio personalities, activists and members of the public launched 'Parents against Tobacco' to press for more effective legislation to protect children from tobacco. Its founder members included Esther Rantzen and Richard Branson (Pollitt et al., 2014). In March, the European Parliament voted in favour of banning tobacco advertising (ash.org.uk). The following month, a Bill drawn up by 'Parents against Tobacco' and presented by MP Joe Ashton proposed to tighten laws against selling cigarettes to children (ash.org.uk). In August, a talk given by a Senior BAT Executive at Chelwood outlined that

> "On the issue of scientific evidence, a statistical association between the habit of smoking and certain diseases has been claimed in epidemiological studies. However, the mechanisms of these diseases are not understood and it has it [not] been established what role, if any, smoking plays in the initiation or development of the diseases. It is the view of BAT that further research is required on this complex subject. A statistical association alone is not proof of causality" (TMDP, 1990).

P. Sheehy, Chairman of BAT, was also of the view that

> "BAT's policy on smoking is very clear. Our view is that smoking has not been established to be the cause of disease" (Simpson, 1990).

In November a bill designed by 'Parents against Tobacco' received a boost as the first MP (Andrew Faulds, Labour MP for Warley East) named in the ballot for Private

Members' Bills took it up (ash.org.uk). In January of 1991, a report published by ASH revealed that around seven million women between the ages of 15 and 24 are exposed to cigarette advertising in the pages of women's magazines (ash.org.uk). This was despite the voluntary agreement aimed at preventing such exposure. In April of 1991, the Government announced a new voluntary agreement to replace the one which ended in 1989 (ash.org.uk). In June of the same year, the Government published a Green Paper, 'The Health of the Nation' which proposed to reduce overall smoking by one third, to 22% in men and 21% in women, as well as a reduction by 30% of deaths from coronary heart disease and stroke in under-65's by the year 2000 (Akehurst and Hutton, 1991). That same month, the Children and Young Persons (Protection from Tobacco Act) 1991 was introduced. This increased the penalties for the sale of tobacco to persons under the age of 16 years and banned the sale of unpackaged cigarettes. This protection act also made it a requirement to publish warning statements in retail premises (Children and Young Persons (Protection from Tobacco) Act, 1991).

The following month, a coalition of 29 organisations representing virtually all the UK's 85,000 doctors launched Doctors for Tobacco Law. Their aim was to push for government endorsement of the proposed EC advertisement ban directive in collaboration with existing tobacco control agencies (Moxham and Munro, 1995). Its first activity was to stage a widely reported demonstration outside Rothmans International's AGM. They provided data showing that for every Rothmans smoker who dies during the year from smoking related illness, the company makes a profit of £35,250. The government also announced a series of new, larger health warnings for tobacco packaging, in line with EC requirements. This increase included health warnings from one to two (i.e. "Smoking kills" and "Protect children: don't make them breathe your smoke") on cigarette packs (Feldman and Bayer, 2009). This was the first time that health warnings were brought under legal control rather than covered by voluntary agreements.

By October of 1991, a new voluntary agreement, The Tobacco Products Labelling (Safety) Regulations 1991 came into force in line with legally required new health warnings on advertisements. Other provisions covered tighter control on other forms of promotion, including direct mailing and magazines (Paliamentary.UK, 2000). In November of 1991, the UK tobacco industry sued the UK government, concerned

about the size of the new health warnings on cigarette packs (ash.org.uk). From the strategic point of view, this bought the tobacco industry time but may also have been an exercise of economic power designed to cause delay in policy intervention. That same month, HEA published 'The Smoking Epidemic' and revealed that tobacco-related diseases in the UK claim 111,000 lives every year (ash.org.uk).

In July of 1992, the White Paper - 'The Health of the Nation' was published by the UK government. It received widespread criticism for failing to recommend a ban on tobacco advertising (DoH, 1992). The paper however offered a higher target of prevalence reduction (to 20% in both men and women by 2000) and a 40% reduction in cigarette consumption by the same year. It also promised to introduce legislation to allow licensed taxi drivers to ban smoking in their vehicles (DoH, 1992). The month after, Margaret Thatcher, former Prime Minister, became an advisor to Philip Morris, assisting in the company's strategy in developing countries, including Eastern Europe. Her action was condemned by the public and those she worked with (Watts, 1992). In May of 1997, The Queen's speech at the opening of the new British Parliament included a bill to ban tobacco advertising. Advertising had previously been controlled by a voluntary agreement between the tobacco companies and the government (Queen Speech, 1997). Tessa Jowell, UK Minister of State for Public Health, speaking after the Queen's speech announced that the government intends to ban tobacco advertising, said that

> "The Government is fully committed to banning tobacco advertising. This is an essential first step in building an effective strategy to deal with smoking" (Jowell, 1997).

By December of 1998, a White Paper on Tobacco is presented to Parliament by the Secretary of State for Health and the Secretaries of State for Scotland, Wales and Northern Ireland by Command of Her Majesty. The White paper was the first policy statement on tobacco control published by any UK government. This happened over four decades after the seeming consensus in government in 1957. The report declared that government had a clear role in tackling smoking and a responsibility to protect children from tobacco; and that government intended to ensure that those who do not smoke are protected from those who do, and that the number of people smoking in Britain falls (The UK Government White Paper, 1998).

Table 6.5 (below) summaries the chronology of events that occurred between the periods of 1966 and 1998.

Table 6.5: Chronology of events relating to the smoking risk debate (between the periods of 1966 and 1998)

Year	Event	
1967	i.	Government expresses intention of introducing legislation to control or ban how tobacco products are promoted (ash.org.uk).
1971	ii.	January – The second Royal College of Physicians report "Smoking and Health Now" is published. The report refers to the death toll caused as a result of cigarette smoking as a present day "holocaust. (RCP Report, 1971).
	iii.	The Chief Medical Officer expresses concern that "some 80,000 premature deaths probably occur in England and Wales (Interdepartmental Group of Officials, 1971).
	iv.	Action on Smoking and Health (ASH) is set up to make non-smoking the norm in society and to inform and educate the public about the death and disease caused by smoking (ash.org.uk).
	v.	March – The secretary of state for Health, Sir Keith Joseph, restates government intention to control tobacco use through voluntary agreement with the tobacco industry (ash.org.uk).
	vi.	April – The first voluntary agreement between the government and tobacco industries is proposed (ash.org.uk).
	vii.	May - Health warnings are put on cigarettes in Britain (ash.org.uk).
1972	viii.	January – In the house of commons, 132 MPs vote in favour of a ban on cigarette advertising, 73 against (ash.org.uk).
	ix.	The Health Education Council (HEC) is established for Health Education England, Wales and Scotland (McNair-Wilson, 1972).
	x.	May - Richard Dobson who is to become Chairman of BAT states that "It's hard to argue that filling your lungs with smoke can be actually good for you ... But surely it is a question of moderation …"(ash.org.uk).
	xi.	July - The Chief Medical Officer describes cigarettes as "the most lethal instrument devised by man for peaceful use"(ash.org.uk)
1977	xii.	January - The HEC launches a television campaign focusing on the rights of non-smokers and smoking by women.
	xiii.	April – P. L Short, from BAT writes a paper on "Smoking and Health", commenting about the benefits of Smoking.
	xiv.	June - The Royal College of Physicians issues its third report on "Smoking or Health" (RCP Report, 1977).
1978	xv.	May – A finance bill 'Clause 1' which provides for extra taxation on high tar cigarettes is debated in Parliamentary Committee and adopted despite opposition from the tobacco industry (ash.org.uk).
1980	xvi.	January - Dr. Green from BAT writes a paper on cigarette smoking. He noted how tobacco industry has made "a great issue of cause and effect relationships in response to the many published studies associating smoking with various diseases" (Green, 1980).

	xvii.	April - Patrick Sheehy, former chairperson of BAT writes to BBC Panorama about the continuing controversy in scientific circles regarding causation. He writes that "scientists are [by] no means unanimous regarding smoking and health issues … we would therefore ask you to ensure that the programme disassociates the views of the scientist in question [Dr Green] from those of this company by making an appropriate statement to this effect in the programme (P. Sheehy, Letter to the BBC, 1980).
	xviii.	April - BBC Panorama programme reports on the tobacco industry, revealing that the chairperson of the Tobacco Advisory Council is on the Sports council. It also shows in-depth how the industry refuses to acknowledge that smoking kills. On the programme Dr. Green, now retired from BAT, admits that smoking is a major factor in lung cancer." (BBC TV, 1980).
1981	xix.	November - The fourth report of the Royal College of Physicians "Smoking still kills" is published (Taylor, 1984). The report urges the government to reverse its present attitude of inactivity and tackle what it describes as a 'hidden holocaust'.
1982	xx.	March - The Presidents of the UK's eight Royal Colleges of Medicine write to the UK Government stating that cigarette smoking is the single most important preventable cause of death and disability in the UK. They also highlight concerns in the arena of sports sponsorship calling for a complete ban on tobacco sponsorship of sport" (Smith, 1982).
	xxi.	March – The biggest percentage rise in cigarette tax since 1947 is implemented in the year's main Budget.
	xxii.	October – The government announces a new voluntary agreement with the tobacco industry. Its provisions include display of health warning on cigarette parks and regulation of advertisement at points of sale (ash.org.uk).
1985	xxiii.	April - The HEC's TV campaign tells women that lungs cancer kills many women as breast cancer (Pollitt et al., 2014).
	xxiv.	November – HEC reveals that UK television broadcast over 330 hours of tobacco sponsored programmes a year (HEC, 1985).
	xxv.	December - George Foulkes, Labour MP introduces a Private Member's Bill to urge employers to increase non-smoking places or facilities in the workplace (ash.org.uk).
	xxvi.	December- The BMJ condemns the Health Promotion Research Trust funded by tobacco industry (ash.org.uk).
1986	xvii.	January - HEC to withhold grants from researchers and academics who receive funds from the tobacco industry (ash.org.uk).
	xviii.	March - Clive Turner, Tobacco Advisory Council expresses the opinion that tobacco advertising does not aim at recruiting new smokers (Turner, 1986).
	xxix.	March - Tobacco adverts are banned in UK cinemas (ash.org.uk).
	xxx.	April - Protection of Children (Tobacco) Act is passed making it illegal to sell any tobacco product to anybody under 16 (Pollitt et al., 2014).
1987	xxxi.	February - ITV stops the transmission of all tobacco sponsored sports events on their programmes (BBC, 2009).
	xxii.	September - The European Commission launches "Europe Against Cancer", a three-year awareness campaign of risky behaviour such as smoking and dietary habits.

1988	xxiii.	February - The HEA launches "Smoking and Me", which is aimed at educating 12-13 year old on the dangers of smoking (ash.org.uk)
	xxiv.	February - Government figures comparing smoking trends between 1984 and 1986 reveal a decline in prevalence of smoking. However no significant decline was found in number of women smoking (Pollitt et al., 2014).
1991	xxv.	January – A report published by ASH reveals that around seven million women between the ages of 15 and 24 are exposed to cigarette advertising in the pages of women's magazines, despite the voluntary agreement aimed at preventing such exposure (ash.org.uk).
	xxvi.	March – The Chancellor raises cigarette tax by approximately 16p in the Budget. He says that "There are strong health arguments for a big duty increase in tobacco" (ash.org.uk).
	xvii.	April – the Government announces a new voluntary agreement to replace the one which expired in 1989 (ash.org.uk).
	xviii.	June – The Government publishes a Green Paper, 'The Health of the Nation' to reduce overall smoking by one third, to 22% in men and 21% in women (Akehurst and Hutton, 1991).
	xxix.	June - Children and Young Persons (Protection from Tobacco Act) 1991 is introduced, increasing the penalties for the sale of tobacco to persons under the age of 16 years. (Children and Young Persons (Protection from Tobacco) Act, 1991).
	xl.	July - A coalition of 29 organisations representing virtually all the UK's 85,000 doctors launches Doctors for Tobacco Law (Moxham and Munro, 1995).
	xli.	July - The government announces a series of new, larger health warnings for tobacco packaging, in line with EC requirements (Feldman and Bayer, 2009). This is the first time that health warnings subject to legislation as opposed to covered by voluntary agreements.
	xlii.	October – A new voluntary agreement comes into force in line with the new legally required health warnings on advertisements. (Paliamentary.UK, 2000).
	xliii.	November - The UK tobacco industry sues the UK government about the size of the new health warnings on cigarette packs (ash.org.uk).
1992	xliv.	The White Paper - 'The Health of the Nation' is published by the government. It receives widespread criticism for failing to recommend a ban on tobacco advertising (DoH, 1992).
	xlv.	Royal College of Physicians report on Smoking and the young states that 17,000 hospital admissions in a single year of children under 5 are due to their parents' smoking (RCP Report, 1992).
1994	xlvi.	A forty years study carried out by Doll et al. (1994) concludes that the long term effects of smoking have been undermined, that 50% of regular smokers will eventually die of the habit, and that Smokers are three times more likely to die.
1997	xlvii.	Queen Elizabeth II's speech at the opening of the new British Parliament includes a bill to ban tobacco advertising (ash.org.uk).

	lviii.	The Government announces that UK tobacco advertising will be banned from 1st November 2000 under the European Union's Directive (ash.org.uk).
1998	xlix.	A White Paper on Tobacco is presented to Parliament by the Secretary of State for Health and the Secretaries of State for Scotland, Wales and Northern Ireland by Command of Her Majesty (The UK Government White Paper, 1998).

6.5 Analysis of the Smoking Debate

The result of the evolving events within the UK smoking debate (between 1950 and 1998) shows that the main thrust of the debate centred on: (a) the nature of evidence (which was largely statistical) linking smoking and lung cancer: (b) how the evidence should be framed within the public health context: and, (c) disagreements about precautionary measures put in place to mitigate the dangers of smoking to health. In the UK, the smoking debate emerged following Doll and Hill's (1950) study in which they suggested a statistical link between smoking and lung cancer. This suggestion puts the burden of proof on the shoulders of the tobacco industry, as well as public health institutions or officials charged with the responsibility of communicating and informing the public of the health risks they face. In this study, the smoking debate is examined in three phases. The first period covered between 1950 and 1955, the second period covered the smoking debate between 1956 and 1965; and the third period examined the unfolding events between the period of 1966 and 1998.

In the first phase, analysis of the evolving event suggests that evidence linking smoking and lung cancer was in its embryonic state at this point and the initial debate centred on the nature of evidence. Although public health officials accepted at this point Doll and Hill's publication, they were cautious of the nature of the evidence. This is evidenced in a memo written to the Cabinet Home Affairs Committee, where the then Minister of Health noted that, *"there is no precise evidence of how tobacco smoking causes lung cancer"*. However, he concluded that the statistical evidence does point to a causal relationship between tobacco smoking and lung cancer. Representatives of the tobacco industry at this early stage can be seen to be seeking out public trust when they said, *"if it should ever be proved that there exists something harmful in tobacco… [They] will be the first to act …."* (Chairman of Imperial Tobacco Statement, 1953). In addition, they rejected and challenged the technical case made against smoking (pointing to uncertainties and gaps in knowledge). Within this period, the government took no steps or initiative to mitigate smoking risk. This initial lack of response from the government can be linked to many factors, including the fact that smoking was considered a normal activity, and the statistical nature of the evidence, but it may also be for economic reasons that the government ignored the

dangers of smoking. Other similar studies have also raised other potential reasons, including electoral concerns over interfering in mass public behaviour and the dangers of creating further pressure over the air pollution debate in the 1950's (Berridge, 2006).

With reference to the PERC framework, power, expertise, communication and trust can be seen to shape the smoking debate within this period. In terms of power, both institutional power (Bachrach and Baratz, 1962) and structural power, Barnett and Duvall (2005) seem to be relevant here. Institutional power is seen in the ability of the medical research council and ministry of health to put the smoking risk issue on the health policy agenda in the 1950s. The consideration of lung cancer and its relationship to smoking cigarettes led to the sponsorship of Doll and Hill's research, which raised awareness of and triggered the direction of the debate on the risk to health from smoking in such a way that smoking policy became a public health priority. Structural power as described by Barnett and Duvall (2005) can be observed in the exercise of stakeholders' (social/professional) relationships. In this case, there was a professional relationship between technical experts (such as Doll and Hill) and policy makers, which allowed for contact and exchange of views that brought about the hegemony within government departments as early as the mid-1950s, of a risk discourse in which smoking is linked to lung cancer. Such a stakeholder relationship privileges this kind of technical expertise over other forms of expertise (e.g. experiential expertise) in the policy perspective taken to risk. This stakeholder relationship provided the platform where interaction and exchange of views with policy makers was possible. Stakeholder relationships create power imbalances in the nature of the influence certain stakeholder groups are able to bring to bear in public health risk communication within the policy context.

In terms of expertise, technical 'expertise' was the means by which public health officials made sense of rising incidences of lung cancer, and the role of smoking was made explicit through technical experts' interpretation of evidence (even if it was only statistical in nature). The interpretation of a '*real association'* between smoking and lung cancer would have resonated with policy makers and the manner in which they responded by accepting this association (see events iii, v, viii, x) signifies the importance of technical expertise in policy inquiry and policy development relating to

risk. In addition, the policy perspective of government departments of public health was aided by the advice and recommendation of expert technical committees and advisory bodies. This observation is line with the view that sees science and its experts as a sense making aid to risk issues within the policy domain (Collingridge and Reeve, 1986, Jasanoff, 1996, Fischbacher-Smith, 2012).

It is also important to note how the tobacco industry demanded a causal (biological) proof of a link between smoking and lung cancer. By highlighting this uncertainty and gaps in knowledge, this created doubt in the public consciousness and raised questions about the validity of the technical case against smoking and its relation to lung cancer. It could also have been a way to divert attention from the real health concerns associated with smoking. Trust and credibility also seem to be relevant here as relevant public health authorities such as CHSC and SACCR accepted Doll and Hill interpretations and urged the government to inform the public of the dangers of smoking. This acceptance was an indication of trust in the credibility of Doll and Hill's conclusions. This was also captured in the words of Dr. Green (see Table 6.2, event v) who, after a meeting between a representative of the tobacco companies and Richard Hill, expressed the view that "It was pretty clear to me that Mr Partridge and his colleagues felt that Hill had answered all their queries in a way which left hardly any loophole for doubt…" (ash.org.uk). Representatives of the tobacco industry also understood the importance of trust when they demanded public trust in their corporate social responsibilities.

Table 6.6 (below) links the evolving events relating to the smoking debate (between 1950 and 1955) to the study research theme on how power, expertise, communication and trust shape public health risk communication.

Table 6.6: Linking smoking risk events (between 1950 and 1955) to research theme evidence from Table 6.2

Power (to effect outcome)	Expertise (interpretation and framing)	Communication (language of uncertainty)	Trust
MRC and MoH ability to **put the smoking risk issue on the policy agenda.** **Stakeholder relation** between technical experts (e.g. doll and Hill) and policy makers. Event xiii: Group of leading tobacco manufacturers in the UK offered **£250,000 to aid MRC research** (Statement Issued by the Group of Leading Tobacco Manufacturers, 1954).	Event i: Doll and Hill suggested a **'real association'** between tobacco and lung cancer (Doll and Hill, 1950b). Related events – event iii, vi, ix, xi.	Event xi: UK Health Minister - **There is no precise evidence of how tobacco smoking causes lung cancer or indeed of the extent to which one causes the other"** (Minister of Health, 1954). Event xiii: Group of leading tobacco manufacturers in - **this can only be the case when medical science is able to provide a causal proof to the claim.** (Statement Issued by the Group of Leading Tobacco Manufacturers, 1954).	Event iii: CHSC and SACCR supports Professor Bradford Hill and Dr Doll research findings. (CHSC and SACCR, 1951). Event v: Dr. Green expressed that **"It was pretty clear to me that Mr Partridge and his colleagues felt that Hill had answered all their queries in a way which left hardly any loophole for doubt…"** (Green, 1952) (ash.org.uk). Event vii: The Chairman of Imperial Tobacco states that "If it should ever be proved that there exists something harmful in tobacco, even in the minutest quantities, which could conceivably make smoking one of the causes of this disease [cancer], we should, I hope, be the first to take steps to eliminate it" (Chairman of Imperial Tobacco Statement, 1953).

The second phase of the smoking debate (between 1956 and 1966) analysed in this study saw the state of scientific evidence evolve from an embryonic state. Evidence at this stage (although still largely statistical) continued to link smoking and lung cancer. It was in this period that the industry heightened its demand for a causal link. Using its own technical experts, the industry launched a fierce attack on the technical case made against smoking. The industry aided other research including offering £250,000 to the research of the Medical Research Council (MRC) stating that a link between smoking and lung cancer can only be established "when medical science is able to provide a causal proof to the claim" (Statement Issued by the Group of Leading Tobacco Manufacturers, 1954). The government response within this period was initially aimed at educating and informing the public of the dangers of smoking. This saw the established of the Health Education Council (HEC), later reorganised into the Health Education Authority in Scotland, England and Wales.

Other competing hypotheses also emerged at this point questioning the validity of the case linking smoking and lung cancer *see* (Berkson, 1958, Fisher, 1959, Hueper, 1955, Berkson, Gilliam, 1955). These critics point to environmental factors and factors other than smoking that might predispose an individual to lung cancer, for instance genotype (Fisher, 1958). Fisher (1958) argued that an individual 'gene' may predispose such a person to both 'smoking' and 'cancer'. However, such alternative arguments (e.g. environmental factors and the genetic hypothesis) received little attention in the policy domain. The technical case linking tobacco to lung cancer was boosted following pressure from elite groups, personalities and public health experts for stricter tobacco control by the government.

With reference to the PERC framework, communication (in terms of the language in use) featured very strongly at this point in shaping the smoking debate. Public health authorities can be seen to use negative frames to qualify the dangers of smoking to health, including *"mortality from lung cancer is twenty times greater amongst heavy smokers than amongst non-smokers"*; *"the most reasonable interpretation of scientific evidence is that the relationship is one of direct cause and effect"* and *"the most credible interpretation and explanation for the increase in the death of lung cancer"*. These frames signify that public health authorities accepted the suggestion that smoking was in fact dangerous to public health and safety. Representatives of the

tobacco industry on the other hand, continued to use languages of uncertainty in the technical case they made attempting to refute the suggestion that smoking was linked to lung cancer (see Table 6.4, events ii, iii, viii ix). They called for more research before any causal association can be established.

By using languages of uncertainty, representatives of the industry continually highlighted uncertainties and gaps in scientific knowledge. They used frames such as *"conflicting and incomplete"* (Statement By A Group of Leading Tobacco Manufacturers in the UK, 1956); *"there is no proof"* (Partridge, 1956); *"it has not been established with any certainty"* (Tobacco Manufacturers' Standing Committee, 1957); *"no conclusive proofs"* (McCormick, 1962); and *"the mechanisms of these diseases are not understood"* (TMDP, 1990). The use of languages of uncertainty undermined the validity of the claim that smoking is related to lung cancer for some time, until evidence began to shift the balance of power away from the tobacco industry. This also created doubt in the minds of the public and may also have been a strategic move to divert attention from the real dangers of smoking to health. This discourse of causal proof or causality was corroborated by Dr. Green, the head of BAT research unit, in his paper on *Cigarette Smoking and Causal Relationships.* He noted that

> The industry has retreated behind impossible demands for 'scientific proof' whereas such proof has never been required as a basis for action in the legal and political fields … It may therefore be concluded that for certain groups of people smoking causes the incidence of certain diseases to be higher than it would otherwise be" (Green, 1975).

The discourse of causal proof, or the causality frame used by the tobacco industry, became a lens by which the industry highlighted the uncertainties surrounding the claim that smoking is linked to lung cancer. It also acted as a barrier to timely and appropriate policy interventions; even at this time there had been no concrete policy interventions. In addition, the discourse of causal proof served to protect the principles of corporate social responsibility (CSR) and accountability because until the industry accepted a link between smoking and lung cancer, it would be wrong for it to be acting in that manner that could be seen as socially irresponsible. Besides the discourse of causal proof used by representatives of the tobacco industry, another narrative they

used is the notion of 'moderation'. They used frames such as *"... Neither tobacco, nor alcohol is harmful, in moderation"* (BBC panorama TV, 1962) and *"Anything can be considered harmful. Apple sauce is harmful if you get too much of it"* (Thames Television, 1976).

In terms of power and expertise in this phase, the establishment of the Tobacco Manufacturers' Standing Committee (TMSC) increased the industry's influence and ability to exercise power over the production of scientific evidence and its interpretation. **Error! Not a valid bookmark self-reference.** (above), links the evolving events within the smoking debate (between 1956 and 1965) to the study research theme.

Table 6.7: Linking the risk events (between 1956 to 1965) to the study research theme

Expertise (interpretation and framing)	Power (to effect outcome)	Communication (using language of certainty)	Trust
Event xiv: The first report by the Royal College of Physicians on "Smoking and Health" - Cigarette smoking causes lung cancer and bronchitis and the **most likely cause of the recent worldwide increase in deaths from** lung cancer (RCP Report, 1962).	Event v: August - Tobacco Manufacturers' Standing Committee (TMSC) is formed by the British Tobacco manufacturers (TMSC First Annual Report, 1956). Event xx: Television advertising of tobacco products is banned in the UK in 1965 under the '1964 Television Act' (ash.org.uk).	*Public Health Officials* Event iv: Minister of Health, Mr. R. H. Turton - **"mortality from lung cancer is twenty times greater amongst heavy smokers than amongst non-smokers"** (Turton, 1956). Event vii: MRC report - **"the most reasonable interpretation of scientific evidence is that the relationship is one of direct cause and effect"**. Event viii: The health minister - **the most credible interpretation and explanation for the increase in the death of lung cancer** (MRC Report, 1957). *Tobacco representatives* Event ii: Imperial Tobacco - **"there is no proof at all that smoking causes lung cancer and much to suggest that it cannot be the cause"** (Partridge, 1956). Event iii: The leading UK tobacco companies - **"The evidence on the possible relationship of lung cancer and smoking is conflicting and incomplete"** (Statement By A Group of Leading Tobacco Manufacturers in the UK, 1956). Also see event v, ix	Event xv: the Chairman of Imperial Tobacco Company, R W S Clark, addressing the Annual General Meeting states that "…It is, of course, self-evident that the industry's commercial interests are involved, but the tobacco manufacturers also fully recognise their responsibility to the public …a general condemnation of cigarette smoking is neither justified nor constructive" (Clarke, 1962).

The last phase of the debate (the period between 1966 and 1998) saw a slow but gradual implementation of initiatives to mitigate smoking risk from both the tobacco industry and departments of public health. This was initially through voluntary agreement between the government and the industry on how tobacco should be promoted and sold. This signified a shift in the tobacco industry's power strategy, from one of attacking the technical case made against smoking, to one focusing on efforts towards influencing policy developments relating to mitigating the risk of smoking. This change of strategy perhaps can be linked to the evolved state of evidence linking tobacco to lung cancer and how that is influencing the nature of argument brought to bear on the debate. The governance response was initially aimed at educating the public, leading to organisations such as the Health Education Council (HEC) in England, Wales and Scotland (McNair-Wilson, 1972) and Action on Smoking and Health (ASH) set up to educate the public and deglamourize smoking in society (ash.org.uk). Subsequently, more concrete action was put into place, including the enactment of the Children and Young Persons (Protection from Tobacco) Act that increased the penalties for the sale of tobacco to persons under the age of 16 (Children and Young Persons (Protection from Tobacco) Act, 1991) and the ban on tobacco advertising in the UK and European union under the European Union's Directive (ash.org.uk). There was also a significant shift in the nature of language used by public health authorities in characterising the dangers of smoking. This saw a shift from the use of language of uncertainty to one of certainty.

In terms of the PERC framework, Barnett and Duvall (2005)'s notion of structural power exercised by means of social relationships was particularly significant here. This can be seen in how the industry focused its effort on pursuing a voluntary agreement (see Table 6.5, events vi, xxii, xxxv, xxxvii, xlii) with government officials. Through voluntary agreement, the industry negotiated a television advertisement ban before 9.00pm (Collingridge and Reeve, 1986), negotiated ways of informing the public about the dangers of smoking tobacco cigarettes, including warnings on cigarette packs, developing tobacco substitutes and addictive and, the promotion of coupons (Collingridge and Reeve, 1986). These negotiations strengthened the industry's political positions by enabling it to delay or make unnecessary the establishment of stricter and legally binding rules. For example, the 1971 negotiation

over health warnings on tobacco products (accepted by the government), killed a Private Member's Bill in the House of Commons, which demanded a much stronger warning on cigarette packs (Popham, 1981). Voluntary agreement delayed or made it irrelevant any legally binding and perhaps, stricter policy legislation against it.

Voluntary agreement also gave the industry more insight into the government position on smoking, enabling it to make more strategic argument relating to smoking policy. Because of its economic power the tobacco industry was also able to circumvent the advertising ban in the UK, thereby undermining the message that smoking is a danger to public health, by sharply increasing its sponsorship of sporting and cultural events. In some cases, this involved racing cars bearing the names of cigarettes that could not be advertised, see also (WHO report, 2013). The industry also used loopholes in the law to delay, restrict or influence government policies on tobacco control. For example, in 1991, the UK tobacco industry sued the UK government about the size of the new health warnings that were to be printed on cigarette packs.

Evidence also suggests that the industry attempted to influence policy through its network of advisors. For example, a BBC Panorama programme also found that the chairperson of the Tobacco Advisory Council was on the Sports council. The presence of an ally in the sports council meant that the interest of the tobacco industry was potentially protected in the policy advice given to the government on sporting issues. It also enhanced its ability to gain insight into policy thinking that might advantage its strategic positioning. The change of tobacco industry strategy was adequately captured by the words of Dr. Jim Green, in an interview after his retirement as the head of BAT research unit with which he served for 20 years,

> "At the beginning of the sixties the tobacco companies realized there was serious evidence connecting smoking and ill health. Their first reaction was to spend money on research to see if this was true, in the hope that it wasn't, so they could win the argument. When this failed, the research effort was directed to finding a safe cigarette, through the development of substitutes. When this flopped in the mid-seventies there was a sharp change of direction. New, corporate careerists were now in charge of the companies and they had fewer qualms about the business they were in; research was redirected to serve the interests of marketing. This development coalesced rather well with the attitude that the companies had taken towards the health risk and regulation policy. On the advice of

> their PR man, they pursued a ‘tight-rope’ policy on health … and entered into voluntary agreements because this bought them time.” (Green, 1972, ash.org.uk).

Table 6.8 (below) links the evolving events relating to the smoking debate (between 1966 and 1998) to the study research theme.

Table 6.8: Linking smoking risk events (between 1966 and 1998) to research theme

Expertise (interpretation and framing)	Power (to effect outcome)	Communication (using language of uncertainty)
Event iii: The Chief Medical Officer - **"some 80,000 premature deaths probably occur in England and Wales each year and for the whole of the United Kingdom the number must approach 100,000 as a result of smoking"** (Interdepartmental Group of Officials, 1971). Event ii: The second Royal College of Physicians' report - refers to the death toll caused by cigarette smoking as **a present day "holocaust**". (RCP Report, 1971). Event xi: The Chief Medical Officer describes the cigarette as **"the most lethal instrument devised by man for peaceful use"**(ash.org.uk).	Event vi: **stakeholder's relationship** - Negotiation of voluntary agreement. Other related events that evidenced stakeholder's relationship are – events xxii, xxxv, xxxvii, xlii. Event xxviii: BBC Panorama programme reports on the tobacco industry, revealing that the **chairperson of the Tobacco Advisory Council is on the Sports council**. Event xx: The Presidents of the UK's eight Royal Colleges of Medicine - **tobacco sponsorship of sport is one method of circumventing the legal ban on the advertising of cigarettes in television** (Smith, 1982). Event xxiv: Health Education Council (HEC) reveals that **UK television broadcast over 330 hours of tobacco sponsored programmes a year** (HEC, 1985). Event xliii: The **UK tobacco industry sues the UK government** concerning the size of the new health warnings on cigarette packs (ash.org.uk).	Event xvii: April - Patrick Sheehy, former chairman of BAT writes to BBC Panorama - **"scientists are [by] no means unanimous regarding smoking and health issues …'** (P. Sheehy, Letter to the BBC, 1980).

The analysis of the evolving events also reveals that there are negative and real consequences associated with the excessive exercise of power (as exemplified by the tobacco industry) in public health risk communication and associated policy making. Firstly, excessive exercise of power may lead to a delay in policy interventions, which may result in taking either over precautionary or under precautionary measures. In the smoking debate, the excessive exercise of power by the tobacco industry (made possible by its resources) led to delays in the appropriate policy interventions. This is evidenced by the fact that the first policy White Paper on tobacco control was presented to Parliament in 1998 despite an awareness of the dangers of smoking and a seeming consensus in government departments of this from as early as the mid-1950s (*see* Table 6.2, events v, viii, x, xi, xvi). The absence of any concrete smoking mitigating strategy over this long span of time undermined the smoking/cancer argument, thereby exposing the public to the risk of smoking for much longer than it should have been.

6.6 Findings relating to Social Amplification (or Attenuation) of Smoking Risk within the policy domain

> Study Hypothesis: *Social amplification of risk is the driver behind the negotiation of public health risk arguments between the over critical model and under critical model in a science-policy relationship.*

The analysis of the smoking debate carried out in this chapter suggests that there is a strong relation between the ability of stakeholder groups to exercise power (amplified by economic resources) and social amplification (or attenuation) in public health risk communication and its associated policymaking. The conclusion that can be drawn from the evolving events is that **powerful interest groups (such as tobacco companies) are able to use the economic resources within their means to (a) purchase the necessary technical expertise to shape risk debates; (b) enhance trust through scientific credibility; (c) control communication by means of language used; and, (d) influence policy processes by means of stakeholder**

relationships. Any or a combination of these factors will shift the transition of risk arguments between the over critical and under critical models in the policy domain.

What is also interesting is how other stakeholder groups exercised 'hidden' power to shape the debate around smoking risk. Such power have been expressed by either defining policy priorities, determining whose expertise are called upon and whose questions are asked in the technical analysis of risk. There was also legitimate power expressed through laws that prohibit the sale of tobacco to the under aged and restrictions to tobacco sale and advertisement. In addition is resistive power that was expressed through boycotts and bans on smoking in public and office spaces.

The next chapter examines the electronic cigarette debate. This involves not only contested science and evidence and multiple legitimate worldviews, but also the delivery of drugs (nicotine) into the human body.

7 Vaping Health Risk Debate

7.1 Introduction

This chapter is the second result chapter of the thesis. It examines the vaping (electronic cigarette) debate (between 2008 and 2016) and provides further empirical evidence on how power and expertise, including communication and trust, shape public health risk communication in a policy context. This case study particularly exemplifies how *technical expertise* shapes public health communication and its associated policymaking in the midst of awareness of (and caution towards) powerful stakeholders' influence on risk debates. The assessment of this debate is divided into two periods. The first period examined the vaping risk debate between 2008 and 2012; the second period covered 2012 to 2016. The analysis of the debate is carried out within the UK context, focusing on the emergence of the vaping risk debate until the first policy consideration. This chapter begins by presenting the evolving events in in the two different phases. The result is then analysed within the context of the PERC framework and those findings are highlighted that relate to social amplification (or attenuation) of smoking risk within the policy domain.

7.2 The Vaping Debate (between 2008 and 2012)

The smoking debate resurfaced once again following the introduction of electronic cigarettes (EC) into the European market around the year 2006. The use of ECs, popularly known as vaping, involves smoking like behaviour and was introduced by retailers as a safer alternative to cigarettes. In 2008, WHO raised concerns that ECs were being marketed as a safer alternative to tobacco cigarettes despite a lack of, or insufficient, scientific understanding of the safety and efficacy of ECs at the time (WHO, 2008) since ECs were newly developed products. Unlike the smoking risk debate that emerged in the 1950s, the vaping debate occurred in a different societal and political context, which has implications for the manner in which the public health risk was communicated. There have been significant advances in information and communication technology (ICT) that have changed the ways in which the public communicates about the risk. Interested members of the public are increasingly able

to seek knowledge and engage (where they are more informed) in the debates relating to risk using the Internet and other mediated sources and with a much broader audience. Within the policy context, there have been significant cultural shifts in policy making since the 1950s. Recent times have seen more emphasis on citizens' participation and deliberative policy making. In addition to these, there was the initial absence of economically powerful stakeholders who were able to engage their resources (as seen in the smoking case study) to shape the public health risk communication process. At the time when the vaping risk debate emerged in 2008, ECs had been newly introduced into European and UK markets and many of the EC companies were still new in comparison to well established and financially resourced tobacco companies in the 1950s.

Before the concern was raised by WHO, initial anecdotal reports pointed to issues around safety. For example, EC devices can explode with consequences such as facial burns and fire outbreaks. The concern raised by WHO put the burden of proof on the shoulders of the EC manufacturers who had to show that their product was safe for public consumption, and a safer alternative to tobacco cigarettes, as was claimed. The burden of proof also lay with institutions charged with responsibility for managing public health and safety. Jason Cropper, managing director of an Electronic Cigarette company was of the view that

> "They [ECs] are certainly healthier than smoking cigarettes. Tests have been done on mice and in the lab and they have shown they are not harmful … it had not been possible to carry out human trials as they were too expensive. Most of these companies selling these are small companies" (BBC, 2008a).

The evolving debate events suggests that the immediate period following the safety and efficacy concern raised by WHO saw the emergence of few scientific studies into the safety and efficacy of ECs that led to further calls from WHO in 2009. For example, a month following this, an industry safety report commissioned by Ruyan, found ECs to be a safer alternative when compared to conventional cigarettes with only trace toxicants found to be contained in them (Laugesen, 2008). In July 2009, WHO raised further concerns that ECs are being targeted at young people and that EC packages lack appropriate health warnings (CASSA, 2014). In December of 2009,

Ruyan brand in a trial study revealed that ECs containing nicotine reduced the desire to smoke, similar to conventional Nicorette nicotine inhalators (Bullen et al., 2010). In addition, the study revealed that ECs were rated as more pleasant to use than the inhalator and performed significantly better than a placebo EC (Bullen et al., 2010).

By January of 2010, a British Medical Journal (BMJ) publication reviewed three reports on EC which largely presented the major available knowledge on the quality of ECs (Flouris and Oikonomou, 2010b). Flouris and Oikonomou (2010b) evaluated reports of the US Food and Drugs Administration (FDA), Health New Zealand (HNZ), a private enterprise and Demokritos, a publicly funded Greek research institute. In contrast to HNZ's findings, that the labelling of different ECs reflected their actual nicotine content, the FDA's report showed variation on the amount of nicotine labelled from the nicotine with each puff (between 26.8 and 43.2 micrograms of nicotine per 100 ml puff). The FDA analysis also found that nicotine was detected in all cartridges, including those labelled as containing no nicotine. The FDA report further detected diethylene glycol, a highly toxic liquid involved in a number of prominent mass poisonings, in one cartridge at a content of about 1%. Furthermore, the FDA detected tobacco specific impurities suspected of being harmful to humans, including anabasine, myosmine, and β nicotyrine. The three reports revealed similar findings in that they identified different harmful constituents of EC liquid content, however, they differed in their interpretations. The US FDA raised caution on the potential harm of EC liquid content to human health. HNZ recommendation was based on comparing the health risk of tobacco with that posed by the EC. The Demokritos report focused mainly on the delivery of results, maintaining a neutral position of the safety or efficacy of ECs. It must be stressed at this point that while FDA and Demokritos are government institutions, HNZ is a private enterprise whose research was funded by an EC manufacturer.

In February, the desire to understand the public position on the regulation of the EC, led MHRA to open a public consultation on whether to bring nicotine containing products (NCPs) including ECs within the medicines licensing regime (MHRA, 2010, Bryan). This was a different policy approach when compared to the tobacco debate, which was initially focused on informing and educating the public. This signifies a shift of power over decision-making by policy makers to the domain of the public.

This shift may be linked to lessons learnt from the previous smoking debate that was fiercely contested by stakeholder groups and which saw a very slow policy intervention over a long span of time.

In March, Eissenberg (2010) report that ECs were less effective in suppressing cravings than conventional cigarettes. The study concluded that unlike other nicotine products (e.g. gum, patches), EC delivery systems did not deliver nicotine effectively after acute administration. This touches upon on a significant issue that leads to the conclusion that ECs may not be an efficient replacement for, or alternative to, tobacco smoke as was previously claimed by retailers. Slightly different from the above study, another study carried out in April 2010 on the short term effect of an electronic nicotine delivery device (EC) on desire to smoke and withdrawal found that the 16 mg[3] Ruyan V8 ENDD[4], a model of EC, enabled smokers to tolerate alleviated desire to smoke after overnight abstinence (Bullen et al., 2010). The study suggested that ECs could be used as an aid to stopping smoking and had potential for long term use (Bullen et al., 2010). The emerging evidence up until this point presented different and conflicting interpretations of the safety and efficacy of EC.

In a two day conference held in Geneva in May 2010, WHO made a further call for research into assessing the safety and efficacy of ECs (World Health Organisation, 2010). In September of 2010, a study published by Trtchounian et al. (2010) found that "EC required stronger vacuums (suction) to smoke than conventional brands, and the effects of this on human health could be adverse" (Trtchounian et al., 2010). This calls into question the usefulness of the EC as a nicotine delivery device over time (Trtchounian et al., 2010). In October of 2010, the first VapeFest was held in UK - an event bringing together all stakeholders in ECs for the purpose of informing, researching and social networking.

[3]16mg is the amount (strength) of nicotine in milligrams for each millilitre of E-Liquid in the sampled Ruyan V8 ENDD brand.

[4] Ruyan V8 ENDD is a brand of Electronic Cigarette.

In September of 2011, the British Cabinet Office's Behavioural Insights Team (BIT - popularly known as the 'Nudge Unit') endorsed tobacco harm reduction in its first annual report, with ECs cited as potentially effective substitutes for tobacco (Stratton, 2011). In the report, it was stated that

> "It will be important to get the regulatory framework for these products right, to encourage new products. A canon of behaviour change is that it is much easier to substitute a similar behaviour than to extinguish an entrenched habit (an example was the rapid switch from leaded to unleaded fuel). If alternative and safe nicotine products can be developed which are attractive enough to substitute people away from traditional cigarettes, they could have the potential to save 10,000s of lives a year." (Stratton, 2011).

In February of 2012, according to The Scotsman newspaper (Smith, 2012), Standard life, one of Scotland biggest insurance companies, banned EC use on its office premises. The corporation said that it had no smoking policy for two decades and would not make any exception for ECs. The corporation came under criticism by groups who supported the use of ECs. For instance, Forest, a pro-tobacco group states that

> "It is utterly crazy. A lot of smokers use them to help them to cut down on smoking, or to try to quit … If companies don't want them to go outside for extended periods then allowing them to smoke an electronic cigarette at their desk seems logical … It is completely ridiculous to ban them. If it's because they look from a distance like cigarettes then they are basically treating workers like children." (Smith, 2012).

Sheila Duffy, chief executive of ASH Scotland contrary to Forest welcomed Standard Life's decision, saying that

> "If a company wants to ban EC in their offices that could help avoid [giving the] impression that smoking is normal, [it] is a desirable thing." (Smith, 2012)

> "Tobacco is not a normal product - it kills half of its customers if used as intended. EC are much less harmful than normal cigarettes. However, there is still a lot of research to be done on both their safety and on their effectiveness." (Smith, 2012).

In March of 2012, consumer groups such as the Consumer Associate for Smoke Free Alternative Association (CASAA), Electronic Cigarette Consumer Association UK (ECCA UK), Stelda NL (Netherlands), and other European companies organized the first World Vaping Day, calling for their right to vape (CASSA, 2014). CASSA stated that,

> "Electronic cigarettes are not intended to be used as a nicotine cessation product. They are intended to replace tobacco cigarettes by providing an alternate source of nicotine and mimicking the familiar behaviours associated with smoking, thereby eliminating the user's exposure to smoke and significantly reducing the health concerns related to smoking. By eliminating the cigarette smoke but not requiring the user to give up familiar habits and nicotine, electronic cigarettes are showing significant promise as a highly successful tobacco harm reduction product" (CASSA, 2012).

In July of 2012, a study carried out by Schripp et al raised the significance of passive vaping in the debate. Schripp et al. (2013), concluded that ECs do not produce a similar second-hand smoke to conventional cigarettes. Bystanders are exposed to a mist of exhaled vapour, which has undergone changes in the human lungs similar to deposition and evaporation (Schripp et al., 2013). With consumer groups clamouring for the rights of vapers, this study is of serious significance as the right of non-vaping bystanders also becomes relevant in the debate. By December of 2012, BAT had acquired UK-based Company CN Creative, which specialised in the development of EC technologies (BAT, 2014). A tobacco company acquiring a EC company raised a lot of suspicion and further fuelled the debate due to historical controversies surrounding tobacco smoking. ECs at this stage were still marketed as a consumer product and could be purchased in most retail shops in the UK.

By the end of 2012, the evolving events suggest there was also a gradual evolution of the state of scientific evidence (but still insufficient to draw any conclusion) in the suggestion that ECs were a safer alternative to smoking or an aid to stopping smoking. The main issue during this phase of the debate (between 2008 and 2012) was whether available ECs were a safer alternative to tobacco cigarettes in terms of quality, or an effective aid to stopping smoking. While some studies concluded that ECs are safer when compared to tobacco smoking, and an effective smoking cessation aid, other

studies raised caution, pointing to passive vaping, inconsistency with labelling and actual context, and questioning the long term benefit of vaping, amplified by large residual uncertainty. Some of the studies which can be used to support favourable arguments towards the use of EC are (Laugesen, 2008, Bullen et al., 2010, Etter, 2010, Etter and Bullen, 2011, Dawkins et al., 2012, Wagener et al., 2012, Flouris and Oikonomou, 2010a, Polosa et al., 2011, Vardavas et al., 2012, Flouris et al., 2012). On the other hand, studies such as (Bahl et al., 2012a, Kim and Shin, 2013, Schripp et al., 2013, Trtchounian et al., 2010, Eissenberg, 2010) can be used to counter arguments in favour of the safety and efficacy claims made on behalf of ECs. This unfolding scenario illustrates Collingridge and Reeve (1986)'s over critical model, where the science is contested and where multiple interpretations exist about available evidence. This period ended with the entry of big tobacco companies into the electronic cigarette market.

Table 7.1 (below) provides the chronology of events that unfolded relating to the vaping risk debate (between 2008 and 2012) following the concern initially raised by WHO.

Table 7.1: Chronology of events relating to the vaping risk between the periods of 2008 and 2012

Year	EC Debate
2008	i. Electronic cigarettes were initially introduced and claimed as a better alternative to smoking. However, in September of 2008, World Health Organization (WHO) released a report debunking any of claim (Nebehay, 2008). They called for further scientific research in this arena before any such claim could be made. ii. October - A safety report commissioned by Ruyan (an e-cigarette company) found ECs to be safe when compared to conventional cigarettes with only trace toxicant found to be contained in them (Laugesen, 2008).
2009	iii. July - WHO raised concerns that electronic cigarettes, may be marketed to young people and lack appropriate health warnings (CASSA, 2014). iv. December - A trial study reveals that Ruyan brand EC containing nicotine reduced the desire to smoke, similar to conventional Nicorette nicotine inhalator (Bullen et al., 2010).
2010	v. January - Research conducted in Greece by institute Demokritos analysing toxicants in electronic cigarettes found no trace of polycyclic aromatic hydrocarbons (Flouris and Oikonomou, 2010b). vi. February - MHRA opened a public consultation on whether to bring nicotine-containing products (NCPs) including ECs within the medicines licensing regime (MHRA, 2010, Bryan). vii. March - A clinical laboratory study carried out by (Eissenberg, 2010) shows that ECs were less effective in suppressing cravings than conventional cigarettes. viii. April - A study published by Bullen et al. (2010) on the short term effect of an electronic nicotine delivery device (EC) on desire to smoke concluded that the 16 mg Ruyan V8 ENDD enabled smokers to tolerate alleviated desire to smoke after overnight abstinence. ix. May - In a two day conference held in Geneva, WHO made a further call to the scientific community to conduct further research into assessing the safety and efficacy of ECs (World Health Organisation, 2010). x. September - A study published by Trtchounian et al (2010) found that stronger puffing is needed to smoke most brands of EC than conventional cigarettes, and that smoking characteristics like vacuum and density vary considerably between brands (Trtchounian et al., 2010). xi. October - the first VapeFest is held in UK. VapeFest is an event that brings together all stakeholders in ECs for the purpose of informing, researching and social networking.
2011	xii. March - the Medicines and Healthcare Products Regulatory Agency (MHRA) published the outcome of a public consultation on whether to bring nicotine containing products (NCPs) including ECs within the medicines

		licensing regime. Responses indicated a strong support from the medical and public health communities for the application of the medicines regulatory framework.
	xiii.	March - Department of Health Tobacco launched the plan to "develop new approaches to encourage tobacco users who cannot quit switching to safer sources of nicotine." (Department of Health, 2011).
	xiv.	May - Expert working group was set up under the statutory committee of the Commission on Human Medicines (CHM) to advise the UK government on medicines on the nature, quality and safety of unlicensed NCPs (MHRA, 2013).
	xv.	August – Etter and Bullen (2011) show that an electronic cigarettes is a device used successfully by many smokers to quit smoking or substantially cut down the number of cigarettes consumed (Etter and Bullen, 2011).
	xvi.	October - Polosa et al (2011) concluded that ECs substantially decreased cigarette consumption without causing significant side effects in smokers not intending to quit.
	xvii.	October - The British Cabinet Office's Behavioural Insights Team (BIT) endorses tobacco harm reduction in its first annual report with ECs cited as potentially effective substitutes to tobacco.
2012	xviii.	February –Standard life, one of Scotland biggest companies bans EC use on its office premises (Smith, 2012).
	xix.	March - Consumer groups such as the CASAA, ECCA UK, Stelda NL (Netherlands), IGED (Germany) and ATACA (Australia) organize the first World Vaping Day, calling for their right to vape (CASSA, 2014).
	xx.	April - A study published in 'Chest' by MacCauley et al suggested a link between EC use and exogenous lipoid pneumonia due to glycerin-based ECs (McCauley et al., 2012).
	xxi.	June - A study investigating the short term pulmonary effect of ECs found that there were immediate adverse physiological effects similar to that of tobacco cigarettes (Vardavas et al., 2012).
	xxii.	July - A study carried out by Schripp et al concluded that ECs do not produce second-hand smoke, like tobacco cigarettes. However, bystanders are exposed to mist exhaled by the vaper which undergoes changes in the human lungs similar to deposition and evaporation (Schripp et al., 2013).
	xxiii.	October - Flouris et al found that complete blood count (CBC) indices remained unchanged during the control session of active and passive EC smoking sessions, unlike the tobacco smoke which increased the secondary proteins of acute inflammatory load for at least one hour (Flouris et al., 2012).
	xxiv.	December - Bahl et al raised concern about pregnant women who use ECs or who are exposed to second hand EC mist (Bahl et al., 2012a).
	xxv.	December – BAT acquires UK-based company CN Creative, who specialise in the development of EC technologies (BAT, 2014).

7.3 The Vaping Debate (between 2013 and 2016)

The unfolding of events suggests that within the period between 2013 and 2016, there was more emphasis placed on how ECs should be regulated. The involvement of the tobacco industry at this stage also heightened tension and brought about fierce scrutiny of evidence and arguments between stakeholder groups around the risk acceptability debate, horning the divisions and disagreements between them. The unfolding of events shows that in January of 2013, the first television advert for ECs on a national, mainstream British channel was launched by the brand E-Lites (Sweney, 2013). Adverts for ECs were at that time subject to the general rules of the advertising code. In February of 2013, Vype launched a £3.6 million EC promotional campaign in the UK. Prof John Britton, Chair, Tobacco Advisory Group, Royal College of Physicians who supports ECs says that

> "If all the smokers in Britain stopped smoking cigarettes and started smoking ECs we would save 5 million deaths in people who are alive today. It's a massive potential public health prize" (Satchell, 2014).

In March of 2013, the Medicines and Healthcare Products Regulatory Agency (MHRA) published the outcome of a public consultation on whether or not to bring nicotine-containing products (NCPs), including ECs within the medicines licensing regime. According to MHRA report, they received a total of 1,217 responses, including consumers of NCPs and patient groups, medical professionals, including Royal Colleges, pharmacists, public Health and NHS bodies, Local and Trading Standards Authorities, manufacturers/importers of NCPs and the pharmaceutical industry (MHRA, 2013). According to MHRA, responses indicated a strong support from the medical and public health communities for the application of the medicines regulatory framework. Some other public health organisations also thought that an immediate medicine regulation would see the disappearance of potentially useful products from the market, or that it may lead to the suppression of beneficial innovation (MHRA, 2013). Those mainly against the MHRA medical framework regulation were importers and users of unlicensed electronic cigarettes (MHRA,

2013). They feared it could lead to a ban on available products, which would force EC users back into smoking tobacco. This indicates a public perception that ECs may be beneficial to public health and safety and would therefore require appropriate regulation.

In May of 2013, an expert working group was set up under the authority of the statutory committee of the Commission on Human Medicines (CHM) which advises the UK government on medicines (MHRA, 2013). The scope of the group's remit included advising on the nature, quality and safety of unlicensed NCPs, the actual use of unlicensed NCPs in the marketplace, the effectiveness of unlicensed NCPs in smoking cessation, modelling of the potential impact on bringing these products under medicines regulation on public health outcomes (MHRA, 2013). In June of 2013, MHRA announced that the UK Government had decided that it would regulate all NCPs, including EC, as medicines in order to ensure the safety of the product and also address the issue of distrust about the quality of some EC devices and their content. Jeremy Mean, the MHRA's Group Manager of Vigilance and Risk Management of Medicines, states that

> "Reducing the harms of smoking to smokers and those around them is a key Government health priority. Our research has shown that existing electronic cigarettes and other nicotine containing products on the market are not good enough to meet this public health priority".

This announcement came three months after the publication of the public consultation report on how ECs should be regulated, in which there was wide support for EC regulation within the existing medicines framework. The decision to regulate under medical regimes, according to Jeremy, was to ensure both that high quality products were made widely available and that smokers had an effective alternative they could rely on. This indicates that the regulation and marketing of ECs changed from a consumer product not subject to test before being put on sale to the public, to one which is regulated under the medicines regulatory framework, requiring manufacturers to apply for a medicinal licence from the Medicines and Healthcare products Regulatory Agency (MHRA).

In July, BAT and China National Tobacco Corporation jointly invested in a subsidiary (CTBAT International Limited) launch their first EC product, Vype, in the UK (BAT, 2014). In February of 2014, the European Parliament approved a revised European Union Tobacco Product Directive that regulates as tobacco products ECs with nicotine concentrations up to 20 mg/mL, an amount equal to that in a pack of cigarettes (Gallagher, 2014). According to the directives, ECs with higher nicotine concentrations or intended therapeutic use would be regulated as medical devices. The directive stipulated that ECs had to be childproof and that packaging had to include information about ingredients, adverse effects, and health warnings. Refillable cartridges were allowed as long as their volume did not exceed 2 mL (but could be banned by the European Commission if at least 3 member states prohibited them on the basis of risk to human health). Marketing and advertising restrictions would mirror those of tobacco products (EC, 2014). The European Commission said the new rules would "deter young people from experimenting with, and becoming addicted to, tobacco" and should lead to a 2% drop in the amount smoked over the subsequent five years.

Simon Clark, the director of the pro smoking campaign group Forest, criticised the EU ban as a ban on consumer choice that "will do little" to prevent young children from smoking (Gallagher, 2014). He also criticised the requirement for plain packaging legislation that was being considered in some EU countries, including the UK. Cancer Research UK's head of tobacco policy, Alison Cox, supported the new EU directive stating that

> "The Tobacco Products Directive sets standards on tobacco which will bring real benefits for people's health in the UK and across Europe." (Gallagher, 2014).

The Committee of Advertising Practice (CAP) opened an eight-week consultation to look at introducing new rules to clear up 'concern' and 'confusion' in EC advertising. The consultation followed criticism of an EC advert broadcast during ITV's *I'm a Celebrity ... Get Me Out Of Here* which prompted more than 1,100 complaints to the advertising watchdog (Reynolds, 2014). In March, the European Parliament and Council adopted the revised Tobacco Products Directive (EC, 2014)**.** Under this

directive, advertising of nicotine-containing devices not licensed as medicines were to be prohibited, products would be required to carry health warnings, meet as yet to be defined purity and emissions standards, provide data on nicotine uptake, and be subject to restrictions on total nicotine content, while suppliers would be required to take full responsibility for quality and safety when used under normal conditions (EC, 2014). This meant that any EC that was not regulated by MHRA would be governed by the revised European Union Tobacco Products Directive (TPD) (EC, 2014).

Another interesting event (within the unfolding event) that signifies a clear scientific divide and contradiction in both the scientific and public health communities was when, in 2014, 53 specialists in nicotine science and public health policy experts wrote to Dr. Margaret Chan, of the World Health Organization (WHO) saying that regulating EC in the same way as tobacco products would cost lives by reducing the number of people relying on ECs to quit smoking. The letter expressed the opinion that tobacco harm reduction strategy is part of the solution to the burden of smoking related disease that requires a careful, evidence based approach to its regulation (Dreaper, 2014a). They viewed ECs as one of "the most significant health innovations of the 21st century – perhaps saving hundreds of millions of lives" asking WHO to "resist the urge to control and suppress ECs" (Dreaper, 2014a, Nicotinepolicy.net, 2014). In response to this, one hundred and twenty nine (129) public health and medical experts from 31 countries, representing every WHO region, signed a letter to Margaret Chan, calling for new controls on EC and warning of tobacco industry tactics (Aktan et al., 2014). The letter expressed the view that "the statement [initial letter signed by 53 experts] makes several assertions about ENDS' marketing, emissions, harms, and use that are either contradicted by available evidence or for which no evidence is currently available." They ask WHO to be mindful of tobacco industry tactics in shaping arguments around EC regulation.

By 2015, a number of scientific studies providing evidence about the safety and efficacy of ECs had emerged. Table 7.2 (below) summarises some of scientific evidence for or against the use of EC and the associated safety and efficacy arguments.

Table 7.2 Summary of scientific evidence for or against electronic cigarette

Arguments for		Arguments against	
Author	Findings and conclusion	Author	Findings and conclusion
Laugesen (2008)	Found ECs to be safe when compared to conventional cigarettes and only trace toxicant was found to be contained in it.	Eissenberg (2010)	ECs do not deliver nicotine effectively after acute administration unlike gums and patches.
Bullen et al. (2010)	ECs are rated more pleasant to use than the inhalator and reduce the desire to smoke, similar to conventional Nicorette nicotine inhalator.	Trtchounian et al. (2010)	Efficiency of vapour production was found to decline during vaping calling into question EC's usefulness as a nicotine delivery devices.
Etter (2010)	EC found to aid smoking cessation.	Trehy et al. (2011)	Found the nicotine related impurities to be present in the EC sample tested and inconsistencies with content labelling found.
Etter and Bullen (2011)	EC aided smokers in quitting or reducing smoking.	Bahl et al. (2012b)	Embryonic cells found to be more sensitive to refill fluid than adult lung cells. Flavourings linked to toxicity and refill products vary in terms of cytotoxicity.
Dawkins et al. (2012)	ECs reduced desire to smoke and abstain over a 20 minute period	Schripp et al. (2013)	ECs are a new source for chemical and vapour exposure in an enclosed environment.
Wagener et al. (2012)	ECs offer more benefit than cost, e.g. in terms of toxic exposure to smokers and bystanders, aids smoking cessation.	Schober et al. (2014)	ECs are not emission free and their pollutants have health implication for both users and bystanders.
Vansickel and Eissenberg (2013)	ECs deliver nicotine effectively, increase heart rate and reduces urge to smoke.	Kim and Shin (2013)	Tobacco-specific nitrosamines in refill liquids for ECs were found to be 10 times more than those published by Ruyan EC Company.
Goniewicz et al. (2013)	ECs used mostly to quit smoking and have lesser harm effect.	Meo and Al Asiri (2014)	ECs can lead to several health implications such as nausea, headache, dizziness, upper

			respiratory tract irritation and risk of lung cancer.
Etter et al. (2013)	Finds nicotine content in refill liquids to be similar to those stated on the label. Although toxicants were found, these were within a safe level.	Pisinger (2014)	ECs although less harmful than tobacco cigarettes can have negative consequences for public health if used by a large sections of the population.
Dawkins and Corcoran (2014)	ECs reduce urge to smoke.	Norton et al. (2014)	ECs found to require more puffing than conventional cigarettes, to delivere less nicotine and to be less satisfying.
McNeill et al. (2015)	ECs are 95% less harmful than conventional cigarettes.	Johnson and Pennington (2015)	ECs contain harmful substances and do not result in decreased use of tobacco cigarettes.

The point here is to shed light on the divisions, contradictions and disagreements that existed within the scientific community and how such disagreement polarised the vaping health risk debate. The reasons for this scientific division and disagreement may be due to (a) the absence of economically resourced stakeholder groups and; (b) the lack of willingness by stakeholders to use available resources to protect their interests and shape the technical debate relating to vaping risk in the same way as was seen in the tobacco debate; (c) the fact that there are no obvious deaths relating to vaping (indeed it is seen as less of a hazard than smoking) which might also shape the discourse; and, (d) the fact that political power was less obvious earlier on in the technical debate relating to vaping. ECs are new products, and the benefits (including potential tax yields for the government) or possible dangers to public health and safety were unclear in their initial embryonic stage. These may have led to differences in timeframes between smoking and vaping risk debates, where in the smoking debate, powerful stakeholder groups were seen to exercise power with the interest of shaping the debate. Such scientific division has already been described in literature by Collingridge and Reeve (1986) as “over critical model” where those with power cannot supress or constrain the perspectives brought to bear on risk debate, or in this case, where those with economic power are unable to shape the technical debate brought to bear on the risk.

The evolving events presented in this study also show that similar divisions and disagreement existed amongst UK public health institutions. Institutions such as Public Health England (PHE), Royal College of Physicians of London and ASH UK, and the British cabinet office were optimistic about the potential benefits of ECs, focusing their arguments on existing smokers and the fact that ECs reduce exposure to carcinogenic substances found in tobacco cigarettes. Indeed, the issue here is how the relative risks are judged, either from the perspective of smokers or non-smokers. There is also an assumption that all those who vape are trying to quit, which begs the question of patches and nicotine and how effective these are as smoking cessation aids. These groups of public health institutions see ECs as an effective aid to smoking cessation, offering a safer alternative to those who do not want to quit smoking. For example, the British Cabinet Office's Behavioural Insights Team (BIT - the 'Nudge Unit') as early as 2011 endorsed tobacco harm reduction in its first annual report, with ECs cited as potentially effective substitutes to tobacco (Stratton, 2011). In the report, it was stated that:

> "It will be important to get the regulatory framework for these products right, to encourage new products. A canon of behaviour change is that it is much easier to substitute a similar behaviour than to extinguish an entrenched habit (an example was the rapid switch from leaded to unleaded fuel). If alternative and safe nicotine products can be developed which are attractive enough to substitute people away from traditional cigarettes, they could have the potential to save 10,000s of lives a year" (Stratton, 2011).

Other public institutions such as the British Medical Association, the UK Faculty of Public Health, and the European Commission took a precautionary stance and called for strict control and regulation of EC devices. These groups expressed concern that ECs may be a potential gateway to re-normalizing smoking (Rigotti, 2015) and might be exploited by the tobacco industry to recruit non-smokers and children (Kremer, 2013). For example, the British Medical Association raised concerns that ECs may 're-normalise' smoking, thereby undermining the smoking bans which have helped de-glamorise cigarettes in United Kingdom (Kremer, 2013). The UK Faculty of Public Health also expressed concern that there was the potential for the tobacco industry to use ECs to promote tobacco cigarettes while gaining access to policy makers (UKFPH, 2014). There were those who claimed that the red-glowing tips and various fruity

flavours might prove enticing to children and that ECs may become a gateway for recruiting new tobacco smokers, especially young children and others who have never smoked. Other areas of contention included: adequate safety controls to prevent accidental injury, monitoring of trends in 'dual use' of EC in combination with continued tobacco smoking, regulation of marketing activity, and the involvement of the tobacco industry in the EC market.

Table 7.3 (below), summarises the chronology of events relating to the vaping debate (between the periods of 2013 and 2016).

Table 7.3: Chronology of events relating to the vaping risk between the periods of 2013 and 2016

Year	Evolving events
2013	i. January - EC advertising is allowed on TV and made subject to the general rules of the advertising code. ii. February – Prof John Britton, Chair, Tobacco Advisory Group, Royal College of Physicians said:" If all the smokers in Britain stopped smoking cigarettes and started smoking ECs we would save 5 million deaths in people who are alive today. It's a massive potential public health prize." iii. February - Vype launches £3.6 million plus EC campaign in the UK iv. June - Medicines and Healthcare Products Regulatory Agency (MHRA) announced a plan to regulate ECs as medicines on the basis of the assumption that ECs function like NRTs for smokers wishing to cut down or quit (Grana et al., 2014a). v. June - Jeremy Mean, the MHRA's Group Manager of Vigilance and Risk Management of Medicines, says that "our research has shown that existing electronic cigarettes and other nicotine containing products on the market are not good enough to meet this public health priority" (MHRA, 2013). vi. June - ASH announced that it "does not consider it appropriate to include ECs under smoke free regulations". vii. June - MHRA announces that UK government has accepted the advice of the CHM expert group which concluded that the NCPs on the market did not meet required standards of safety, quality and efficacy (MHRA, 2013). MHRA recommended that all NCP products including ECs should be regulated as medicines. viii. June - The Council of European union reached political agreement on a revised EU tobacco directive draft (EC, 2014).
2014	ix. A study found EC use to be more prevalent among youths than adults, despite a law prohibiting EC sales to minors (Grana et al., 2014b). x. February - the European Parliament approved a revised European Union Tobacco Product Directive that regulates ECs with nicotine concentrations up to 20 mg/mL (an amount equal to that in a pack of cigarettes) as tobacco products (Gallagher, 2014). The directive stipulates that ECs must be childproof and that packaging must include information about ingredients, adverse effects, and health warnings (EC, 2014). xi. The European Commission says the new rules will "deter young people from experimenting with, and becoming addicted to, tobacco" and should lead to a 2% drop in the amount smoked over the next five years. xii. Simon Clark, the director of the pro-smoking campaign group - Forest, criticised the ban as a ban on consumer choice, which would do little to deter children from smoking.

	xiii.	Cancer Research UK's head of tobacco policy, Alison Cox, supported the new EU directive stating that "The Tobacco Products Directive sets standards on tobacco which will bring real benefits for people's health in the UK and across Europe." (Gallagher, 2014).
	xiv.	February - England's Public Health Minister, Jane Ellison, reacting to the EU directive said: "I am very pleased that we have made a significant step towards further tough action on tobacco in the UK and across Europe." (Gallagher, 2014)
	xv.	February - North East Conservative MEP Martin Callanan, said he was disappointed that most of his colleagues had voted for the EU proposals (Moss, 2014).
	xvi.	February - The Committee of Advertising Practice (CAP) opened an eight-week consultation to look at introducing new rules to clear up "concern" and "confusion" in EC advertising (Reynolds, 2014).
	xvii.	February - Etter and Bullen concluded that population-based studies indicate that, across countries, ECs are most commonly being used concurrently with conventional tobacco cigarettes (dual use) (Etter and Bullen, 2011).
	xviii.	March - The European Parliament and Council adopts the revised Tobacco Products Directive (EC, 2014)**.** Under this directive, advertising of nicotine-containing devices not licensed as medicines would be prohibited, products would be required to carry health warnings, meet yet to be defined purity and emissions standards, provide data on nicotine uptake and be subject to restrictions on total nicotine content, while suppliers will be required to bear full responsibility for quality and safety when used under reasonably foreseeable or normal conditions (EC, 2014).
	xix.	March - The Advertising Standards Authority launched an investigation into EC Vype advertising that calls Vype experience "pure satisfaction" and calls on smokers to "experience the breakthrough" (Sweney, 2014).
	xx.	April - ASH reported that the number of people who use electronic cigarettes in the UK had tripled over the past two years to 2.1 million (BBC, 2014a).
	xxi.	Ash conducted a separate study and found that most EC users were using them to reduce smoking (ASH, 2014).
	xxii.	May - EU Tobacco Products Directive (TPD) enters into force (Gallagher, 2014).
	xxiii.	May - 53 scientists write to Dr Chan, World Health Organization (WHO) saying that regulating ECs in the same way as tobacco products would cost lives by reducing the number of people using them to quit smoking. They asked WHO to "resist the urge to control and suppress ECs" (Nicotinepolicy.net, 2014).
	xxiv.	May - Prof West, of University College London told the BBC that ECs should be "regulated appropriate to what they are" and that they are "orders of magnitude safer" than tobacco cigarettes (Dreaper, 2014b).
	xxv.	May - Dr. Vivienne Nathanson of the British Medical Association (BMA) calls for stronger regulation of ECs in the UK. In a BBC Breakfast show, she explained that evidence suggests that children who had never smoked were starting to use ECs, having been influenced by marketing campaigns. Prof John Ashton, president of the Faculty of Public Health, also raised concerns about children using ECs stating that the benefits of fewer people smoking must

		be weighed against the risk of electronic cigarettes leading to more people starting to smoke, particularly children (Satchell, 2014).
	xxvi.	June - A press campaign promoting ECs as "pure satisfaction" for smokers was banned (Sweney, 2014).
	xxvii.	June - One hundred and twenty nine (129) public health and medical experts from 31 countries, representing every WHO region, signed a letter to Dr. Margaret Chan, the Director General of WHO, calling for new controls on ECs and warning of tobacco industry tactics (Aktan et al., 2014). The letter is a direct response to the previous letter signed by 53 experts. The letter warns WHO of tobacco tactics.
	xviii.	July - Ash Scotland calls for a legal ban on sales of electronic smoking devices to anyone under 18, with tighter controls on their marketing (BBC, 2014b).
	xxix.	July - BBC bans the use of ECs in its offices. According to the corporation, the ban comes after advice from British Medical Association (Glanfield, 2014).
	xxx.	August 8 - A 62 year old man dies as a result of an EC explosion in Penkett Road, Wallasey (Guardian News, 2014).
	xxxi.	August 15 - An EC advert saying 'love your lungs' is banned for implying that they were of health benefit. An investigation was launched by watchdogs into LeoLite's poster, after receiving complaints of safety and health benefit claims. The manufacturers however, argued there were no health claims (Evans, 2014).
	xxii.	August 26 – WHO announces that there should be a ban on the use of ECs indoors and that sale to children, should stop (Mundasad, 2014).
	xxiii.	August - Public Health England's expert evidence review concluded that ECs are around 95% less harmful than smoking (McNeill et al., 2015).
	xxiv.	December - UK government announced that EC will be prescribed by NHS doctors (Tonkin, 2015).
2016	xxv.	Electronic cigarettes are to be regulated by the EU Tobacco Products Directive in the UK from 20 May 2016 unless licensed by the medicines regulator, the MHRA (Consumer Protection, 2016).

7.4 Analysis of the Vaping Debate

This chapter examined the development and evolution of the vaping debate into policy development. The main thrust of the vaping risk debate centred on the safety and efficacy of EC and whether it is a potential replacement for tobacco cigarettes or a means of stopping smoking. The central actors involved in the initial phase of the debate are - WHO that raised the concern on the lack of evidence around the safety and efficacy of EC; the scientific community who are called upon to conduct more research in this arena and; EC companies and retailers who claim that EC is a safer alternative to tobacco but enjoy economic benefit from the sale of the product. Unlike the smoking debate, the EC debate occurred in a different social-political context including significant advances in information and communication technology (ICT) that has shifted the ways in which the public communicates about the risk to a more interactive way. There were also significant cultural shifts in policy making when compared to the 1950s when the tobacco debate emerged. In addition, recent times have seen more emphasis on citizens' participation and deliberative policy making. Furthermore, there was the initial absence of economically powerful stakeholders who were able to engage their resources (as seen in the smoking case study) to shape the public health risk communication process.

Within the first phase of the analysed debate (between 2008 and 2012), there was very little or no scientific understanding of vaping risk, there was a gradual evolution of scientific evidence and there was a MHRA led public consultation on how electronic cigarettes should be regulated. The unfolding of events suggested a sharp divide within the scientific and public health communities in their interpretation of available evidence that mirrored a divide in the public at large (see Table 7.2). The scenario here illustrates Collingridge and Reeve (1986)'s over critical model, where the science is contested and where multiple interpretations exist around available evidence. The core argument at this point concerns the need to *"get the regulatory framework right"* for a device that could potentially save thousands of lives (Stratton, 2011); the need for more research to be done before any conclusions can be drawn (Smith, 2012); and the need to retain familiar habits and nicotine intake, to encourage cessation (CASSA,

2012). This period ended by the end of 2012 with the entry of big tobacco companies into the electronic cigarette market that created tension and heightened scrutiny in the risk acceptability debate thereon.

With reference to the PERC framework, the evolving events suggest that the *institutional* power of WHO was significant in pointing out that the lack of knowledge about the safety and efficacy of ECs was important within the context of their declared public health benefit. The call for research made by WHO into the safety and efficacy of ECs seems to have driven scientific research around the safety and efficacy frame. The MHRA led public consultation on how to regulate ECs also influenced the direction of the vaping debate. This shifted the decision making power from the policy to the public domain, although this may have been a reflection of a more general shift towards democratic policy making in contemporary political life. In terms of expertise, technical expertise was the means by which the public made sense of the benefits or risk of electronic cigarette. This suggests that while the public were involved in decision-making relating to regulation, public engagement in the development of accepted knowledge around the safety and efficacy of ECs was limited to the acceptability debate with scientist playing leading role in the technical debate. The vaping debate also highlights the importance of (mis)trust in public health risk communication, and how the presence or absence of trust could influence the nature of tension, and scrutiny of the debate around risk acceptability. For example, the entry of powerful tobacco companies in the EC industry fuelled tension and suspicion, and further heightened scrutiny of evidence and arguments brought by stakeholders in the vaping risk debate.

In the second examined phase of the vaping debate (the period between 2013 and 2016), the entry of tobacco companies in the EC market saw more heightened tension and scrutiny of scientific evidence and interpretation. This created greater visibility for divisions and disagreements between the various stakeholder groups engaged in the debate. Some of the situational factors that may have contributed to this scientific division and disagreement are (a) the absence of economically resourced stakeholder groups before late 2012 (b) caution towards the use of delay tactics by EC companies in the same way as was seen in the tobacco debate and (c) the fact that political power was less obvious earlier on in the technical debate relating to vaping. The results of

the MHRA led consultation were also published in this period. There was a strong support from medical and public health communities for the application of the medicines regulatory framework on ECs (MHRA, 2013). However, marketers and users of unlicensed ECs feared inappropriate regulation could lead to a ban on available products, which would force EC users back towards smoking tobacco. Three months following the publication of the public consultation, the UK Government announced that all NCPs including ECs would be regulated as medicines. Following this, the EU directive was also adopted.

With reference to the PERC framework, *structural* power can be seen to be expressed for instance in the stakeholder relation between expert committees and policy makers. For example, in 2015, shortly after the public health England's expert conclusion that ECs are around 95% less harmful than smoking (McNeill et al., 2015), following that, the UK government made the decision that EC could be prescribed by NHS doctors to help smokers who wanted to quit smoking (Tonkin, 2015). This decision was based on the advice of the expert committee of public health England, which pointed to the importance of the 'stakeholder's relationship' in the policy perspective taken to vaping risk. What was also important was how technical experts' interpretations and frames of argument shaped the discourse around vaping risk. There were scientists and public health expert groups who viewed EC as an effective aid to smoking cessation, offering a safer alternative to those who do not want to quit smoking. On the other hand, there were those who called for a precautionary stance and for stricter control and regulation of EC devices. The latter group of experts expressed concern that ECs may be a potential gateway to renormalizing smoking, undermining several years of effort in deglamourizing smoking, and that ECs may be exploited by the tobacco industry to recruit non-smokers and children who may then go on to smoke cigarettes. The nature of interpretation is dependent on how the relative risks are judged, from the perspective of either the smokers or non-smokers (see Table 7.2).

In terms of communication, one unique feature of this debate was how MHRA led a public consultation allowed a two-way communication within policy makers and the public, and how that has allowed different group of stakeholders to exchange views and opinions with policy makers. This perhaps, may have eased public acceptability of EC regulation under the medical regime, as the public felt trusted and included in

the decision as seen in the report of the consultation that shows a strong public support for medical consultation of ECs. The vaping debate also highlights the importance of (mis)trust in public health risk communication, around how the presence or absence of trust could influence the nature of tensions in, and scrutiny of the debate around risk acceptability. An important issue within this latter stage of the debate was how the entrenched mistrust inherited from the smoking debate shaped the vaping debate. This was evidenced in a letter signed by 129 public health and medical experts from 31 countries, representing every WHO region, to Margaret Chan, of World Health Organisation. This group of experts in the letter called for new regulation and control of ECs, warning of tobacco industry tactics (Aktan et al., 2014) and the need to be cautious of the favourable argument brought to bear on the vaping health risk debate.

Table 7.4 (below) summarises the link between events within the vaping debate and the study research theme.

Table 7.4: Linking smoking and vaping risk events (the period between 2008 and 2016) to the study research theme

Power (to effect outcome)	Expertise (interpretation and framing)	Communication	(mis)trust/credibility
The ability of WHO to raise vaping risk as an issue worthy to on the health policy agenda. Public perception been shaped by expertise **Public consultation** **Stakeholder relation** between scientific committees and public health authorities.	Event i: The World Health Organization (WHO) - debunked claims that ECs are a safer and more effective option (Nebehay, 2008). Event ii: According to Prof John Britton, Chair, Tobacco Advisory Group, Royal College of Physicians: "**If all the smokers in Britain stopped smoking cigarettes and started smoking ECs we would save 5 million deaths in people who are alive today. It's a massive potential public health prize "** (Satchell, 2014). Event xxiii: 53 specialist writes to Dr Chan, (WHO) saying that **regulating ECs in the same way as tobacco products would cost lives by reducing the number of people using them to quit smoking** (Dreaper, 2014a, Nicotinepolicy.net, 2014). Event xxiv: Prof West, of University College London told the BBC ECs should "**be regulated appropriate to what they are" and that they are "orders of magnitude safer" than tobacco cigarettes.** (Dreaper, 2014b). Event xxv: Dr. Vivienne Nathanson of the British Medical Association (BMA) - **children who had never smoked were starting to use ECs, having been influenced by marketing campaigns**. (Satchell, 2014). Event xxxiii: Public health England expert evidence review concludes that **ECs are around 95% less harmful than smoking** (McNeill et al., 2015).	Event iv: MHRA opened a public consultation on whether to bring nicotine-containing products (NCPs) including ECs within the medicines licensing regime (MHRA, 2010, Bryan). **Public consultation** – two way communication	Event xxvii: 129 public health and medical experts, signed a letter to Dr Margaret Chan of WHO calling for new controls on ECs and **warning of tobacco industry tactics** (Aktan et al., 2014).

7.5 Findings relating to Social Amplification (or Attenuation) of Smoking Risk within the policy domain

Study Hypothesis: *Social amplification of risk is the driver behind the negotiation of public health risk arguments between the over critical model and under critical model in a science-policy relationship.*

Unlike the smoking debate, which spanned several decades between policy consensus and policy interventions, the vaping debate spanned only a few years. The awareness of the risk of vaping to public health and safety was raised in 2008 by the World Health Organization, and by 2014, the regulation of electronic cigarettes under a medical framework was already established, following a decision made in 2012 by MHRA. The analysis of unfolding events within the two debates suggests that **the time scale between scientific consensus and policy decision depends on the ability of interest groups to muster their power to shape the debate.** This aligns with the views of Collingridge and Reeve (1986), who argued that the effect of science within policy making is determined by the absence and presence of 'power to' influence the outcome of risk assessment. This therefore suggest that **there is a strong relationship between the exercise of power, the nature of scrutiny and the expertise brought to bear on risk, which may lead to either social amplification (or attenuation) of risk and determine the nature of policy interventions.**

The next chapter examines the measles, mumps and rubella (MMR) vaccine safety debate to investigate the role of power and expertise, in public health risk communication. As mentioned in (chapter five – methodology), the MMR vaccine debate was chosen because it involves debates around contested science and evidence and where multiple legitimate worldviews and values are brought to bear on the debate within the policy context. MMR vaccine also involved the delivery of drugs into the human body.

8 Measles Mumps and Rubella Risk Debate

8.1 Introduction

This chapter is the third results chapter of this thesis. It examines the measles mumps and rubella (MMR) debate (between 1998 and 2003) and assesses evidence on how power and expertise, as well as communication and trust might shape public health risk communication in a policy context. This case study particularly evidences how *technical expertise and experiential expertise* shape public health communication and associated policymaking. It also highlights the bias against experiential expertise, which is undervalued in contested fields of knowledge. The events that unfolded within these debates are presented in chronological order (as justified in chapter five) and analysed within the context of the research themes. The first period of analysis covered the MMR vaccine debate between 1998 and 2000 in order to analyse policy inquiry following suggestions that MMR vaccine may be linked to autism. The second period examined the debate between 2001 and 2003. The first period analysed the initial stakeholders' responses to the claim that MMR was linked to autism. The second period examined the consequences of and subsequent responses to the aforementioned claim. Together, these two phases cover the period from the emergence of the MMR vaccine debate in the UK to the introduction of policy and precautionary measures.

The chapter begins by presenting the evolution of events in the aforementioned two phases. The result is then analysed within the context of the PERC framework and those findings are highlighted that relate to social amplification (or attenuation) of MMR vaccination within the policy domain.

8.2 The MMR Vaccine Debate (1998 - 2000)

The technical debate relating to the MMR vaccination in United Kingdom originated from a study led by Dr. Andrew Wakefield of London's Royal Free Hospital, published in The Lancet in February of 1998. The study suggested the possibility of a link between the MMR vaccine and regressive behavioural disorders (Wakefield et al., 1998). The paper described twelve children aged

between three and ten, suffering from developmental regression and gastrointestinal problems. According to the publication, nine of the twelve children had become autistic, one had disintegrative psychosis and two had possible post viral or vaccinal encephalitis. In addition, the paper pointed to a possible environmental trigger and explained that the parents of eight of the twelve children associated the onset of these problems with MMR vaccination (Wakefield et al., 1998). On the eve of the publication, a press conference was called at the Royal Free Hospital. In the press release, it is stated that

> "Researchers at the Royal Free Hospital School of Medicine may have discovered a new syndrome in children involving a new inflammatory bowel disease and autism" … "The study identified a possible link between gut disorder in children and autism. In the majority of cases the onset of symptoms occurred after the MMR vaccination. We clearly need further research to examine this new syndrome, and to look into [any] possible relation to the MMR vaccine" (Royal Free Hospital Press Release, 1992).

As a precautionary measure, Wakefield called for the suspension of the triple injection in favour of single vaccines until the combination MMR vaccine was ruled out as a possible environmental trigger. He said that

> "It's a moral issue for me. .... and I can't support the continued use of these three vaccines given in combination until this issue has been resolved" (Deer, 2004).

There are a number of ethical and honesty issues that should be mentioned from the outset. Firstly, did Andrew Wakefield use children who were already showing signs of autism, and then subject this group of vulnerable children to invasive and unpleasant procedures they did not need (Novella, 2009) in order to prove his theory? Some have even alleged that he may have faked his data (Novella, 2009) and may have taken blood from children at a birthday party, paying them £5.00 a time (Boseley, 2010). In addition, Andrew Wakefield did not disclose any conflict of interest to the research ethics committee. An investigative journalist, Brian Deer found that Wakefield had taken a large consulting fee from an solicitor in order to prepare evidence for solicitors representing clients who claimed that the MMR vaccine had damaged their children and who hoped to bring cases against vaccine

manufacturers (Deer, 2008). In fact, eleven of the twelve children in his 1998 Lancet publication were found to be part of the litigation. It was also discovered that he had logged a patent for a new vaccine against measles known as the Transfer Factor, which he claimed was safer (Novella, 2009) and could also be used as a treatment for inflammatory bowel disease (Boseley, 2010). Ten of the co-authors of the original paper in The Lancet in 1998 withdrew their names from the publication. The paper was also retracted by The Lancet editors on the basis of undisclosed conflict of interest (Horton, 2004).

Technical verification of Andrew Wakefield's claims began a month after The Lancet 1998 publication, and following a request from the Chief Medical officer (CMO), Sir Kenneth Calman and the Medical Research council. The Medical Research Council (MRC) supports research across the entire spectrum of medical sciences and other related fields in order to improve human health, both in the UK and in MRC units in Africa (see website). Thirty seven (37) experts formed an ad hoc committee, combining current expertise in virology, gastroenterology, epidemiology, immunology, paediatrics and child psychiatry (Edwards, 2001), and convened to review Wakefield's evidence and claims. The expert committee reviewed the associations between the measles virus and MMR, and between inflammatory bowel disease and autism (MRC 1998). Professor Sir John Pattison chaired the committee. After considering the laboratory evidence used for the hypothesis that measles virus caused inflammatory bowel disease, the committee found no correlation between measles or mumps infection and Crohn's disease and ulcerative colitis. The meeting concluded that there was no current evidence to support a link between MMR vaccine and autism and bowel disorders like Crohn's disease and ulcerative colitis (MRC 1998: 3) cited in (Fitzpatrick, 2004). In addition, they suggested 'further research on an international basis would settle this matter'. Following the verification, the Chief Medical Officer, Department of Health in a press release on the MMR vaccine stated that

> "No evidence was presented to suggest that MMR vaccination gives rise to autism . . . The age at which MMR is usually given coincides with the age at which autism is often recognised; this does not mean that one causes the other . . . A better understanding is needed of the causes of . . . autism" (Thrower, 1997) item 323.

The conclusion was sent to every doctor in the country in a letter signed by the Chief Medical Officer, Sir Kenneth Calman on the 27 March (Calman, 1998). In the letter, Sir Kenneth Calman stated that he had

> ".... concluded that there is no link between measles, measles vaccine or MMR immunisation, Crohn's Disease and ASD. Together with others at the meeting, I was not convinced that any of the studies support suggestions that measles or MMR vaccine is implicated in Crohn's Disease and in autism. I therefore recommend children be given MMR at [the] appropriate time, and should not be given the separate component vaccines, since there is no evidence that doing this has any benefit and it may even be harmful. I believe that more research is needed to identify the causes of Crohn's disease and ASD, but I do not think that MMR vaccine is in any way implicated in the cause of these conditions" (Calman, 1998).

> "I strongly advise parents to continue to have their children immunised with the MMR vaccine." (BBC, 1998b).

However, the director of Justice, Awareness & Basic Support (JABS) group expressed concern that the issue was not given sufficient time for debate (Casiday, 2005). JABS is a group for parents who believe their children were damaged following childhood vaccination. The group was launched in 1994 and aims to achieve justice for the children and their families. In May of 1998, a 14-year Finnish study on adverse effect of vaccines revealed no association between MMR and autism. The study published in July 2000 examined a historical vaccination project report maintained by the national board of health investigation (Peltola et al., 1998). The researchers performed a two prospective cohort study, examining the histories of the vaccines and charting 1.8 million individuals from the start of the MMR vaccination programme in 1982. Out of an estimated three million vaccine doses given by the end of 1996, 173 potentially serious reactions had been recorded as having possibly been caused by the vaccine and 31 gastrointestinal symptoms identified, none of the children according to the study had developed autism (Peltola et al., 1998). The findings from this Finnish study were of vital significance, considering the large scope of the study. David Walker, department of public health medicine at Durham health authority described Wakefield's association between the vaccine and the diseases as

> "Anecdotal reporting of a biased sample … it is poor science which has no place in a peer-reviewed journal" (Laurance, 1998).

In June of 1998, the Public Health Laboratory Service announced that MMR vaccine uptake was on the decline in Wales, after a study by Thomas (Thomas et al., 1998) found a general decline in the uptake of the MMR vaccine. Thomas and his colleagues assessed the impact of adverse publicity on the uptake of MMR immunisation by obtaining data from the Child Health System on children resident in Wales in April 23, 1998. This study evidenced mistrust or suspicion in the MMR immunisation programme and of government reassurances that the vaccine was safe. Parents' suspicions about the MMR vaccine may also have been linked to other previous events or controversies. For example, in 1992, the department of health withdrew two out of the three brands of vaccines used in Britain. The withdrawal was due to the suggestion that the mumps component of the MMR vaccine caused mild transient meningitis (Sugiura and Yamada, 1991). The two brands that were withdrawn are *Immravax* and *Pluserix*, made by Merieux UK and SmithKline Beecham respectively. According to the department, these brands contained a strain of a mumps virus that was linked with a 1 in 11,000 risk of meningitis. The third brand, MMR-II, which was manufactured by Merck Sharp and Dohme, used a strain that carried a lower risk (Dyer, 1994). Merck Sharp and Dohme in response to the growing anxiety was of the view that:

> "more than 150 million doses of MMR-II have been administered, establishing an unsurpassed record of safety and effectiveness" (Dyer, 1994).

There was also the anti-vaccination movement in the Britain in the 1800s that may have further entrenched parents' suspicion of the claim that there is no link between MMR and autism (Blume, 2006). This distrust or suspicion was accentuated by already existing negative attitudes to government authorities, resulting from previous public controversies, such as the BSE epidemic, in which government scientific advisors lost credibility by reversing their assurances to the public that BSE posed no health threat to humans (Caplan, 2000, Bellaby, 2003, Murphy-Lawless, 2003). In July 1998, the government in an effort to reassure parents sent two and a half million leaflets to parents, distributed through 9,000 GP surgeries and 156 health promotion units (BBC, 1998a). The leaflet, MMR - The Facts, published by the Department of Health and the Health Education Authority (HEA), states that there is no evidence of a link between MMR vaccines and inflammatory bowel disease or autism, and that children could die

from the diseases if they fail to take the MMR vaccination (BBC, 1998a). In the leaflet, the government argue that

> "The risk from the three diseases [is] greater than the risk of developing autism, which has not been proven".

By October of 1998, a pharmacist in Croydon, Surrey, Andrew McCoig, was reported to be supplying parents who are opting for the single injections. Pharmacist McCoig believed that parents should be given alternative options and should be able to exercise a choice about their child's immunisation (BBC, 1998b). In June 1999, a study funded by the Medicines Control Agency carried out an epidemiological study to investigate whether MMR vaccine may be causally linked with autism (Taylor et al., 1999). The study reviewed 498 cases of autism (261 of core autism, 166 of atypical autism, and 71 of Asperger's syndrome). The children were identified through relevant registers and schools records in eight North Thames health districts, UK. The study did not find evidence for any causal association between MMR vaccine and autism.

In August 1999, another study vindicating the use of MMR vaccine was published in the British Medical Journal (BMJ). The study found that single mumps vaccine (previously imported into the UK) offers no protection to children (Schlegel et al., 1999). The significance of this study is that it went beyond only verifying Wakefield's hypothesis, and also investigated his suggested alternative to the triple injection. In September, the Journal of the Royal Society of Medicine accused doctors of dropping patients, including children who had not received MMR vaccination, from their registers in order to increase profits (Norton, 1999). This was linked to the introduction of vaccination target payments by which GPs earned £2865 if their practice achieved ninety per cent vaccination uptake, and £955 for a seventy per cent vaccination uptake.

By November of 1999, eight families who were represented by solicitor Richard Barr lodged an injunction in the High Court against MMR vaccine manufacturers. A further 350 families were granted legal aid for similar cases (Buncombe, 1998) in (Casiday, 2005). In December 1999, an outbreak of measles occurred in North Dublin, Ireland and lasted until July 2000 (Mcbrien et al., 2003). During the outbreak, 844 suspected cases were recorded. This number is significant compared with 152 notifications between the periods of 1995-1999. Two (2) out of a hundred and one (101) children

hospitalised died (Mcbrien et al., 2003). By the end of 1999, no other scientific study or evidence was yet able to verify Dr Wakefield's claims. In February 2000, a study by (Kaye et al., 2001) in the British Medical Journal finds that autism has continued to rise despite MMR administration being static. The time trend analysis study of the UK general practice research database concluded that there was no correlation between the prevalence of MMR vaccination and the rapid increase in the risk of autism over time. The study noted further that "the explanation for the marked increase in risk of the diagnosis of autism in the past decade remains uncertain" (Kaye et al., 2001).

That same month in another publication and co-authored by two other researchers, Dr. Wakefield suggested that their study found "an endoscopically and histologically consistent pattern of ileo-colonic pathology" in "a cohort of children with developmental disorders" (Wakefield et al., 2000) P.2294. The study compared 60 cases of 'autistic enterocolitis' including 12 of the cases in the 1998 Lancet publication. This included a control group of 37 developmentally normal children undergoing ileo-colonscopy. The authors describe a 'new variant' inflammatory bowel disease, different from either Crohn's disease or ulcerative colitis. They concluded that "this syndrome [autistic enterocolitis] may reflect a subset of children with developmental disorders with distinct etiological and clinical features" (Wakefield et al., 2000) P.2294.

In response to this latest publication, the MRC commissioned another expert subgroup in April of 2000 to monitor research in inflammatory bowel disease and autism, and to examine further evidence from an expert team of the Royal Free Hospital in relation to 'a classic pan-colitis associated with severe constipation and immune dysregulation in a group of children with developmental disorders' (Wakefield et al., 2000). The MRC criticised the study for cherry-picking evidence describing it as a "self-selected group of patients" adding that "the histological finding of ileal lymphoid-nodular hyperplasia may have been secondary to severe constipation" (MRC 2000: 4) cited in (Fitzpatrick, 2004) and concluded that "the case for 'autistic enterocolitis' had not been proven" (MRC 2000: 4) cited in (Fitzpatrick, 2004). They stated that "there had been no new evidence to suggest a causal link between MMR and inflammatory bowel

disease/autism" (MRC 2000: 5) cited in (Fitzpatrick, 2004). They however, called for more research on inflammatory bowel disease.

That same month, Dr. Wakefield and Professor John O'Leary, director of pathology at Coombe Women's Hospital in Dublin, presented their research to the US Congress showing that tests on 25 children with autism revealed 24 had traces of the measles virus in their gut (O'Leary et al., 2000). Professor O'Leary said there was now "compelling evidence" of a link between autism and MMR (BBC, 2008b). They however, did not confirm that the virus causes autism, or even that the source of the virus found is the MMR vaccination, which contains "dead" versions of the measles and mumps viruses (O'Leary et al., 2000). Wakefield suggested that the mumps component of the vaccine allows the measles virus from the vaccine into the intestine of susceptible individuals; the measles virus then renders the intestine permeable to certain peptides (becoming a 'leaky gut'), which then enter the bloodstream and interfere with the central-nervous system opioids, and causing the autistic behaviour.

In October of 2000, the Joint Committee on Vaccination and Immunisation (JCVI) reviewed a paper (supplied by the authors - Wakefield and Montgomery) that was due to be published by the end of the year. JCVI concluded that the yet unpublished paper gave no new insights or evidence that changed its views on the safety of MMR vaccines (Medicines Control Agency and Department of Health, 2001). Two months later, the Medicine Control Agency (MCA) and the Department of Health (DoH) which also reviewed the pre-published copy of the Wakefield and Montgomery paper rejected any suggestion that combined measles, mumps and rubella (MMR) vaccines were licensed prematurely (Medicines Control Agency and Department of Health, 2001). The study due to be published during the following weeks suggested that MMR vaccine had never undergone a safety test. The MCA and DoH accused the report of cherry-picking evidence arguing that the triple MMR vaccine is safer for children than single injections, which would expose them and others to a far greater risk of measles, mumps and rubella through slow or non-existent take-up (Medicines Control Agency and Department of Health, 2001).

The following week, Dr. Wakefield published the pre-reviewed paper entitled 'MMR vaccine: through a glass, darkly', saying the vaccine has never undergone proper safety

tests (Wakefield and Montgomery, 2000). Dr. Wakefield reported that original safety checks on the vaccine were poorly conducted and only lasted for four weeks. He explained that he identified nearly 170 cases of a new syndrome and his team was testing the hypothesis that the measles virus from the vaccine can lodge in the gut of susceptible children. He noted that in almost every case of testing the vaccine, observation periods were too short to include the time of onset of delayed neurological or other adverse events, and that too few patients were followed up. In December of 2000, a part-funded study by Merck Sharp Dohme reported of a follow-up study aimed at identifying serious adverse events relating to MMR vaccination (Patja et al., 2000). Data were obtained from a countrywide surveillance system set up in Finland to detect serious adverse events associated with MMR. The study examined 1.8 million immunization records of individuals' consumption of almost 3 million vaccine doses by the end of 1996. The study similar to the 1998 publication could not prove a link between MMR vaccine and autism (Patja et al., 2000). By the end of 2000, other scientific studies were not able to replicate Andrew Wakefield's claims that MMR vaccine was linked to autism. Table 8.1 below provides a summary of events that unfolded in the MMR Vaccine debate following the 1998 publication and 2000.

Table 8.1: Summary of events that unfolded in the MMR Vaccine debate (1998-2000)

Year	Event
1998	i. February of 1998, a study led by Dr. Andrew Wakefield, London's Royal Free Hospital published in The Lancet suggested the possibility of a link between the MMR vaccine and regressive behavioural disorders (Wakefield et al., 1998). ii. At a press conference coinciding with the publication, Wakefield called for the suspension of the triple injection in favour of the single vaccines until the MMR vaccine was ruled out as a possible environmental trigger. "I can't support the continued use of these three vaccines given in combination until this issue has been resolved" iii. The following month, the Chief Medical officer (CMO) called for independent scientific seminars to verify the work of the Royal Free Hospital group on MMR (Medicines Control Agency and Department of Health, 2001). Thirty seven (37) experts were convened, including leading experts in virology, epidemiology, immunology, paediatrics, child psychiatry and gastroenterology (Edwards, 2001). The meeting concluded that evidence does not support a link between the MMR injection and autism and bowel disorders like Crohn's disease and ulcerative colitis. Therefore, it recommend that there was no reason for a policy change in the current MMR vaccine programme (Medicines Control Agency and Department of Health, 2001). iv. The director of Justice, Awareness & Basic Support (JABS) group expressed concern that the issue was not given sufficient time for debate (Casiday, 2005). v. A 14-year study by Finnish scientists published in May 1998 on adverse effect of vaccines revealed no association between MMR and autism (Peltola et al., 1998). vi. June, the Public Health Laboratory Service reported that MMR vaccine uptake was on the decline in Wales (Thomas et al., 1998). vii. July, the Department of Health and the Health Education Authority (HEA) issued an independent review of information about children's what and sent two and a half million leaflets to parents and health workers in an effort to calm fears over the triple vaccination for measles, mumps and rubella. The leaflet, MMR - The Facts, states that there is no evidence of a link between MMR vaccines and inflammatory bowel disease or autism. The government argued that the risk from the three diseases was greater than the risk of developing autism, which had not been proven.
1999	viii. June – An independent expert group working for the Committee on Safety of Medicines (CSM) was asked to assess reports from parents who believed that their children had been damaged by measles vaccine. They reported that evidence did not constitute proof that vaccination caused the symptoms and suggested temporal coincidence, since

		the age at which children receive their first MMR jab coincides with the age at which most autism cases are first diagnosed.
	ix.	A study blamed decline of MMR vaccine uptake on media scares (Anderson, 1999).
	x.	A study by Taylor et al, commissioned by the UK Medicines Control Agency (MCA) concluded that causal association between MMR vaccine and autism could not be found (Taylor et al., 1999).
	xi.	A study published in British Medical Journal (BMJ) says that single mumps vaccine offers no protection (Schlegel et al. 1999). The Government banned the import of single vaccine substitutes (Casiday, 2005).
	xii.	September, the Journal of the Royal Society of Medicine accused doctors of dropping patients, including children who had not received MMR vaccination, from their registers in order to increase profits (Norton, 1999).
	xiii.	November, eight families, who were represented by solicitor Richard Barr, lodged an injunction in the High Court against MMR vaccine manufacturers. A further 350 families were granted legal aid for similar cases (Buncombe, 1998) in (Casiday, 2005).
	xiv.	December, an outbreak of measles occurred in North of Dublin, Ireland and lasted until July 2000 (Mcbrien et al., 2003) with a record high of 844 suspected cases.
2000	xv.	In April, the working expert group of MCA issued a statement confirming the conclusions of an earlier expert seminar in 1998, reporting that there was “no new evidence of a link between autism and MMR”
	xvi.	Five days later, Dr. Wakefield and Professor John O'Leary, director of pathology at Coombe Women's Hospital in Dublin, present research to the US Congress showing that tests on 25 children with autism revealed 24 had traces of the measles virus in their gut (O'Leary et al., 2000).
	xvii.	In October, the Joint Committee on Vaccination and Immunisation (JCVI) reviewed a pre-publication copy (supplied by the authors) of the Wakefield and Montgomery paper in October 2000 and concluded the paper gave no new insights or evidence that changed its views on the safety of MMR vaccines (Medicines Control Agency and Department of Health, 2001).
	xviii.	In December, the MCA and DoH also reviewed a pre-publication copy of the Wakefield and Montgomery paper in October 2000. They rejected the suggestion that combined measles, mumps and rubella (MMR) vaccines were licensed prematurely (Medicines Control Agency and Department of Health, 2001).
	xix.	Dr Wakefield published a paper entitled ‘MMR vaccine: through a glass, darkly’, claiming that original safety checks on the vaccine were poorly conducted and only lasted for four weeks (Wakefield and Montgomery, 2000).

The burden of proof within this period lay largely with Andrew Wakefield and his team who had to demonstrate the credibility of their research and the claims they made on its basis. This highlights the importance of credibility in the nature of expertise and the manner of interpretation brought to bear on public health risk communication in a policy domain. Public health authorities also shared the burden of proof of reassuring parents that the MMR vaccine was indeed safe for their young infants. Public health institutions responsible for advising the UK government on immunization (including MMR and autism) include the department of health (DoH), the Medicines Control Agency (MCA), the Committee on Safety of Medicines (CSM) and the Joint Committee on Vaccination and Immunisation (JCVI).

8.3 The MMR Vaccine Debate (2001-2003)

This phase of the debate saw an evolved state of knowledge, information and evidence about the safety of the MMR vaccine, which included fierce and conflicting arguments between Andrew Wakefield and public health authorities on the opposing side of the debate. The period also recorded a decline in the uptake of MMR vaccination and an increase in measles outbreaks in some parts of the country (with associated deaths). What was also interesting was how Tony Blair, the then Prime Minister and his son Leo were in the middle of the political debate relating to MMR vaccine.

At the start of 2001, the Government launched a £3 million advertisement campaign in order to cope with a growing concern about the use of the MMR vaccine (Boseley, 2001). The campaign was directed at parents and health professionals, a move which was criticised by National Autistic Society, saying that the government focus should be on research rather than advertising (Boseley, 2001). The same month, the MRC announced it would fund Professor Andrew Hall of the London School of Hygiene and Tropical Medicine to conduct a computerised database study on risk factors for autism, including immunisation. The Committee on Safety of Medicines (CSM), which also considered the pre-publication copy of the Wakefield and Montgomery paper, together with the available evidence on MMR safety, in a press release, concluded that vaccination with MMR was very effective at preventing serious and occasionally fatal diseases. The expert group expressed the view that the policy of

giving MMR vaccine in two doses was safer than giving the three component vaccines sequentially with six injections, and as such, the balance of benefit to risk was therefore highly favourable (DoH, 2001).

Also in January, Wakefield revealed to the Daily Telegraph that he had evidence of 170 new cases of 'autistic syndrome', with the majority of cases backed by documentary evidence of regression following vaccination. According to him, authorities failed adequately to address the safety of the MMR vaccine (Fraser, 2001c). The Daily Mail and other news media launched campaigns to back Dr Wakefield (Deer, 2011), who was at this point viewed as a genuine expert standing alone against powerful corporations and the government. At this time, newspaper reports revealed that 500 parents planned to sue the DoH, claiming that the vaccine had damaged their children. 850 families were given legal aid (Hall, 2001).

Shedding Light on Areas of Uncertainty

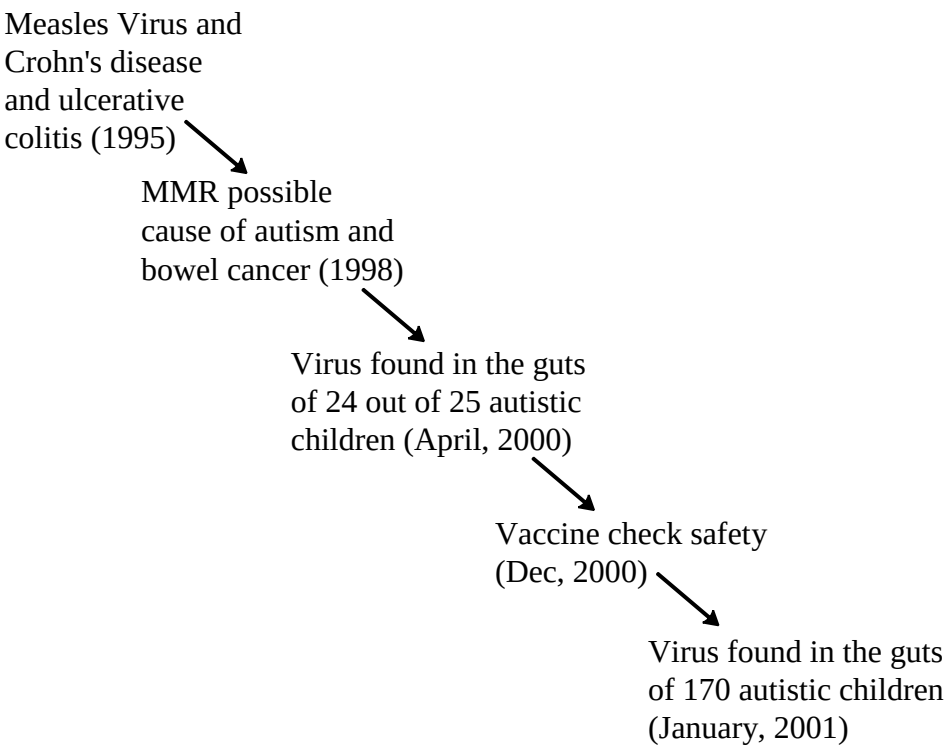
One feature of the MMR debate is the evolving nature of Wakefield's claims. Wakefield was keen to prove that he had found a link between MMR and autism. From the assertion that MMR may be linked to Chrohn's disease and ulcerative colitis, to the hypothesis that it may be linked to autism and bowel cancer, to a virus found in the guts of autistic children. He then went further to claim that the MMR vaccine safety may be unduly conducted. In February of 2001 he also revealed to the Telegraph that he had evidence of 170 new cases of 'autistic syndrome' (Fraser, 2001c) (see In June 2001, further study (Farrington et al., 2001) provided further evidence against a causal association between MMR vaccination and autism. The study reanalysed the data from the previous study commissioned by the MRC (Taylor et al, 1999) and concluded that the results did not support a link between MMR and autism. However, that same month, the Lothian division of the British Medical Association (BMA) requested that the BMA back single vaccines as an alternative for parents who refuse the MMR vaccine. In August, a doctor offering separate vaccines in his clinic was reported to the General Medical Council (GMC) (Fraser, 2001b) in (Casiday, 2005), and two months later was cleared of any misconduct. He was allowed to continue to offer single injections on the condition that he provide up to date information of the safety of MMR (Boseley, 2001). In September, a study by

(Elliman and Bedford, 2001) warned parents of the risk of vaccination with unlicensed products, which may be ineffective and carry a slightly higher risk of meningitis. The study reviewed the evidence on separate MMR vaccines. In October, (Fombonne and Chakrabarti, 2001) performed a cross-sectional study of 262 autistic children and the study demonstrated no difference in age of first parental concern or rate of developmental regression by exposure to MMR vaccines. No association between developmental regression and gastrointestinal symptoms was observed.

Figure 8.1).

In June 2001, further study (Farrington et al., 2001) provided further evidence against a causal association between MMR vaccination and autism. The study reanalysed the data from the previous study commissioned by the MRC (Taylor et al, 1999) and concluded that the results did not support a link between MMR and autism. However, that same month, the Lothian division of the British Medical Association (BMA) requested that the BMA back single vaccines as an alternative for parents who refuse the MMR vaccine. In August, a doctor offering separate vaccines in his clinic was reported to the General Medical Council (GMC) (Fraser, 2001b) in (Casiday, 2005), and two months later was cleared of any misconduct. He was allowed to continue to offer single injections on the condition that he provide up to date information of the safety of MMR (Boseley, 2001). In September, a study by (Elliman and Bedford, 2001) warned parents of the risk of vaccination with unlicensed products, which may be ineffective and carry a slightly higher risk of meningitis. The study reviewed the evidence on separate MMR vaccines. In October, (Fombonne and Chakrabarti, 2001) performed a cross-sectional study of 262 autistic children and the study demonstrated no difference in age of first parental concern or rate of developmental regression by exposure to MMR vaccines. No association between developmental regression and gastrointestinal symptoms was observed.

Figure 8.1: Wakefield MMR-Autism claims



In December of 2001, Dr. Wakefield resigned from the Royal Free stating that "I have been asked to go because my research results are unpopular … I did not wish to leave but I have agreed to stand down in the hope that my going will take the political pressure off my colleagues and allow them to get on with the job of looking after the many sick children we have seen … They have not sacked me. They cannot; I have not done anything wrong. I have no intention of stopping my investigations." (Fraser, 2001a). Also in December, the MRC published a report that reviewed available research into autism and found that the number of autistic cases had increased to (6 in 1000 children) (MRC, 2001a). However, this rise was attributed to increased recognition and changing definitions of autism. The report found no evidence of a link with MMR, and suggested that autism was the result of a range of causes, with the strongest evidence to date being genetic. The report expressed the view that several genes interact to create susceptibility to the disorder and suggested that the interplay between genetic and environmental factors is likely to play a key role, noting that the nature of the disease still remains unknown.

There were other key events that led to the public amplification of the MMR vaccine risk. These included: Tony Blair and Neo Leo Saga; Family Conflict - Love and Law,

Measles Outbreaks and Media Report, other scientific reports and Brian Deer's Investigation and the General Medical Council (GMC) professional misconduct investigation.

Tony Blair and Neo Leo Saga

The government decision not to offer a single vaccination programme put the then Prime Minister, Tony Blair into the spotlight. In December of 2001, during Prime Minister's Questions, MP Julie Kirkbride, a mother of a 14-month-old boy asked Mr Blair whether his son Leo had been immunised with MMR. Mr Blair declined to answer insisting on the family privacy on medical matters. Some groups within the public began to speculate that Blair was publicly (and hypocritically) supporting a dangerous vaccine that he would not give to his own child (Riddell, 2001). The prime minister's insistence on not saying whether Leo was given the triple injection further heightened suspicion about the vaccine's safety. This seemly trivial event became the centre of attention in 2001 with 32% of media featuring this story (Speers and Lewis, 2004). The Tony Blair saga was brought to an end in February 2002, when The Independent newspaper revealed that Leo Blair had been given MMR vaccine (Dillon, 2002). The Prime Minister however, refused to confirm this report on the grounds of privacy in personal medical matters. Other factors were also blamed for amplifying the risk of MMR vaccine. Wakefield for instance blamed the MMR crisis on the removal of choice by the government, stating that:

> "What precipitated this [MMR] crisis was the removal of the single vaccine, the removal of choice, and that is what has caused the furore—because the doctors, the gurus, are treating the public as though they are some kind of moronic mass who cannot make an informed decision for themselves." (Wakefield, 2002).

Parents were to give voluntarily consent to their children to be vaccinated. However, one parent, frustrated about the fact that she was not given an option, said:

> "We were angry that we were not given a choice, that it had to be the combined three together, why they couldn't split it ... We were told no you couldn't ... we were never given that choice, we were just told this is how

> it is ... why are we not allowed to have it, why is there not the option to have any of those three separate vaccines?" (Evans et al., 2001b).

In February of 2002, the Government launched its own campaign, featuring an open letter to GP surgeries and televised appeals on the BBC from Chief Medical Officer Liam Donaldson. The aim was to reassure parents, presenting them with information so they could make informed decisions. In April of 2002, another study co-authored by Wakefield and O'Leary suggested a link between the measles virus and bowel disease in children with developmental disorders (Uhlmann et al., 2002). The study investigated whether children with developmental disorders, such as autism, as well as a bowel disorder also had the measles virus in their gut. The study found traces of the virus in the guts of 75 children out of 91 with bowel disease, but in only five out of 70 healthy children. The researchers theorised that the virus may act as a trigger, leading to problems with the immune system. Dr. Wakefield said that most of the children in the study had had MMR, though a few had the single vaccine. He and his colleagues emphasised that it would be wrong to jump to any hasty conclusions about MMR causing either bowel disease or developmental disorders such as autism. In the same month, the Royal Free Hospital where Dr. Wakefield carried out his initial research - published a study on the British Medical Journal website stating that there is no link between MMR and autism. The team analysed 473 children with autism born between 1979 and 1998. It found the proportion of children with developmental regression (autism) or bowel disorders did not change significantly over that time. The study concluded that the incidence of developmental regression did not differ between cohorts, and the authors observed no differences in the prevalence of gastrointestinal symptoms between vaccinated and unvaccinated autistic children (Taylor et al., 2002).

The politics of the MMR debate continued nevertheless to be important. In April MP Julie Kirkbride announced plans to introduce a bill in Parliament allowing parents to choose single vaccines without charge under the NHS (Dillon, 2002). The following month, Lord May called on Government to access the MMR vaccine since parents were not persuaded by blanket government assurances that MMR poses no risk of autism (Highfield, 2002). In June, the then Mayor of London, Ken Livingstone, announced that he would opt for single vaccines for his yet unborn child (BBC, 2002). In a statement to BBC Radio Five Live he said he would be giving his unborn child

separate injections, when the time came, to guard against mumps, measles and rubella. The chairman of the British Medical Association, Dr. Ian Bogle, however criticised him, urging him to apologise and retract the statement. Dr Wakefield again in June of 2002 presented evidence to a US congressional committee claiming that the measles virus identified in the guts of autistic children had been identified by a team led by John O'Leary as originating from the vaccine (Deer, 2011).

Family Conflict - Love and Law

Family conflicts were also brought to bear on the debate when, in July of 2002, two mothers were brought to court by their estranged husbands for refusing to give their children the MMR vaccine (Payne, 2002). The fathers, who did not have custody over the children, wanted them to receive the MMR. One year later the court ruled in favour of the fathers, mandating that MMR vaccine be given to the children, who may not have been able to make informed decisions, given that they could have been exposed to wrong or false information by their mothers (Payne, 2002). In July of 2002, the government decision to order wholesale suppliers of the single rubella vaccine to decrease the amount supplied to private clinics (Vallely, 2002) further aggravated parents' fears and anxiety, as options for choice were further curtailed. This left them with little or no choice to give consent to their children being given the MMR vaccine. Out of the three, Rubella was the only single vaccine licensed for use in the UK because it is given to women planning pregnancy who do not already have rubella antibodies. That same month, GPs voted to abandon the 'cash for jabs' system (Hall, 2002) as an earlier study revealed that many doctors had previously admitted using 'scare tactics' (Morrison, 2001) to persuade parents to vaccinate their children in order to profit under the scheme. Parents who came to know about vaccination targets questioned the objectivity of their doctors' advice on MMR vaccine.

In August, a US study giving weight to Wakefield's argument found an unusual MMR antibody in 75% of autistic children, but not in children without autism (Singh et al., 2002). The study expressed the view that "autoimmunity to the central nervous system (CNS), especially to myelin basic protein (MBP) may play a causal role in autism, a neurodevelopmental disorder" thereby suggesting a strong association between MMR and CNS autoimmunity in autism. This study was widely shared amongst anti-MMR

campaigners. In September, DoH launched a new website, 'MMR: The facts' to give parents information about the vaccine and the scientific studies supporting its safety, and also news about the controversy. This was to give parents access to the relevant information with ease and also to enable them to ask questions directly of members of the DoH.

In November, another study revealed that increase in autism rates was due to environmental factors rather than to improved diagnoses or increased awareness as was earlier claimed (Byrd, 2002) in (Casiday, 2005). That same month, NHS GP, Dr Peter Smith of Kingston, Surrey invited a private-owned company - Direct Health 2000, to provide single vaccines to parents who had refused the MMR vaccine (Fraser, 2002). Dr Smith who supported MMR vaccination, wanted to provide options for parents who were not convinced of the safety of MMR in order to ensure children did not go unvaccinated (Casiday, 2005). By the end of November, using a national registry, Danish researchers determined the vaccination status and autism diagnosis in 537,303 children born during 1991 (Madsen et al., 2002). The authors observed no differences in the relative risk of autism between those who did and those who did not receive MMR vaccine. Among autistic children, no relationship between date of vaccination and development of autism was observed. The controversy continued in the face of preparation of legal cases, parliamentary debates, further Department of Health promotional materials and scientific publications, while demand for separate measles, mumps, and rubella vaccines rose dramatically.

At the beginning of 2003, The London Assembly warned of lower rates of vaccination uptake when compared to the nationwide rate (73% vs. 85%). The assembly urged the Government to boost immunisation levels and issue a review, reporting on possible side-effects (Wright, 2003). The Health Protection Authority (HPA) also announced that mumps cases in Wales had doubled from 65 cases in 2001 to 143 in 2002 (de Bruxelles, 2003). At the same time, demands for separate measles and mumps vaccines had increased dramatically. The single measles demand rose from 11,818 requests in 2001 to 71,859 in 2002 and demand for mumps vaccine rose from 17,800 to 39,089 (Laurance, 2003). By March, Desumo Information and Health Care (Worcester) were ordered to stop offering single vaccines until the company was registered with the National Care Standards Commission, leaving 5,000 families uncertain about how

their children's vaccination courses would be completed (Fraser, 2003). The following month, the DoH wrote to doctors warning that up to 40,000 children vaccinated at the Elstree Aerodrome in Hertfordshire and Hillsborough Arena in Sheffield were at risk of the diseases, and that they should be re-immunised with MMM (Casiday, 2005).

In August of 2003, Dr David Pugh, of Elstree Aeromedical centre, is taken to court to faces charges of forging blood test results relating to single measles, mumps and rubella vaccines (Payne, 2002). Dr Pugh was believed to have fudged the results to allay parents' worries over the effectiveness of single injections. Dr. Pugh ran a private clinic and at the heart of the scare about the relation of autism to the triple MMR injection was treating about 250 children and earning more than £17,000 a week. Dr Pugh was eventually arrested in December 2004 (Sapsted, 2004). Also in August of 2003, a study revealed that measles cases in Britain had risen with decline in MMR vaccination (Jansen et al., 2003). The study revealed that there was an indication that the chance of an epidemic increased from 0.47 (1995-1998) to 0.82 (1999-2002). In September, the annual immunization uptake report showed MMR uptake to have been at a record low (79%) since the vaccine was introduced (Boseley, 2003). This study reiterated the existence of mistrust in public health institutions and their experts.

In October, parents (by now, more than 1500) who were suing MMR vaccine manufacturers over alleged damage to their children, lost their legal aid funding for the case (Martin, 2003). The parents' appeal was turned down. Simon Murch, a co-author on the paper that triggered the MMR debate (Wakefield et al., 1998) warned The Lancet in a letter of the heightened likelihood of measles outbreak in the winter if MMR uptake did not increase (Murch, 2003). Murch claimed he had never believed there was firm evidence linking the vaccine with the behavioural and bowel disorders described in the paper. Andrew Wakefield in response to Murch claimed that he had been pressured into publicly changing his view on MMR. Wakefield made his claim on Radio 4's Today programme. In December, Channel Five aired a drama - 'Hear the Silence' which portrayed a mother's struggle, assisted by Dr Wakefield, to find recognition and treatment for her autistic son, whom she believed had been damaged by the MMR vaccine. The programme was aired, despite protests from doctors and the DoH that it misrepresented the controversy and could further undermine the Department of Health's immunisation programme (Wells and Boseley, 2003). Also in

December, an outbreak of mumps at some UK universities sparked a campaign to give the MMR vaccine to students (Longrigg, 2003). Such anomalies brought the costs and benefits of the MMR vaccine to bear on the debate; whether there are alternatives to the MMR vaccine or if the risk of MMR vaccine should be accepted. A study which lent support to the safety of the MMR vaccine was published and revealed that the rise in childhood autism could be explained by changing diagnoses of behavioural disorders (Jick and Kaye, 2003). At this stage of the debate, there was an evolved state of scientific evidence relating to the safety and efficacy of MMR Vaccination.

Table 8.2 (below) provides some of the narratives of technical experts relating to the safety and efficacy of MMR vaccination.

Table 8.2: Narratives of technical expert around the safety and efficacy of MMR vaccination

Studies supporting claim linking MMR to autism		Studies refuting claim linking MMR to autism	
Author	Findings and conclusion	Author	Findings and conclusion
Wakefield et al. (1998)	Suggest a link between MMR and Autism.	Peltola et al. (1998).	A 14-year study by Finnish scientists on adverse effect of vaccines revealed no association between MMR and autism.
Wakefield et al. (2000)	Found a new variant inflammatory bowel disease, different from Crohn's disease or ulcerative colitis in children with developmental disorder.	Taylor et al. (1999).	Found a steady increase in cases of autism and no 'step-up' was found after the introduction of MMR in 1988.
Kawashima et al. (2000)	Measles virus found in peripheral mononuclear cells in some patients with chronic intestinal inflammation. Virus consistent with vaccine strains.	Kaye et al. (2001)	Finds that autism has continued to rise despite MMR administration being static.
Wakefield and Montgomery (2000)	Concludes that vaccine has never undergone proper safety tests	Farrington et al. (2001)	Results do not support a link between MMR and autism.
Uhlmann et al. (2002)	Finds possible link between the measles virus and bowel disease in children with developmental disorders.	Fombonne and Chakrabarti (2001)	No observed association between developmental regression and gastrointestinal symptoms.
		Halsey (2001)	Found no evidence of combined vaccination increasing the burden on the immune system.
		DeStefano and Chen (2001)	Available evidence does not support a causal association between MMR or other vaccines.

One observation that can be made from

Table 8.2 is that the expert narratives potentially linking MMR vaccine to autism and other diseases were either authored or co-authored by Andrew Wakefield (Wakefield et al., 1998, Wakefield and Montgomery, 2000, Wakefield et al., 2000, Kawashima et al., 2000, Uhlmann et al., 2002). Wakefield and Montgomery (2000) also raised concern that safety testing of the MMR vaccine may have been incomplete. In their paper entitled 'MMR vaccine: through a glass, darkly', the authors argue that the vaccine has never undergone proper safety tests, arguing that original safety checks on the vaccine were poorly conducted and only lasted for four weeks. In the same paper, the authors also claimed that they identified nearly 170 cases of a new syndrome and are testing the hypothesis that the measles virus from the vaccine can lodge in the gut of susceptible children. He notes that in almost every case of testing the vaccine, observation periods were too short to include the time of onset of delayed neurological or other adverse events, and that too few patients were followed up.

However, public health institutions responsible for advising the UK government on immunization (including MMR and autism) such as the department of health (DoH), the Medicines Control Agency (MCA), the Committee on Safety of Medicines (CSM) and the Joint Committee on Vaccination and Immunisation (JCVI) were quick to dismiss Andrew Wakefield's claims. The government realised it needed to do more than reassure parents and also had to provide information about what is known scientifically to both health practitioners and the public. The initial government reassuring response and one-way risk communication model was seen to be ineffective, since MMR uptake was for the first time on the decline in some parts of the country. Perhaps, where effective feedback processes were initiated, the outcome may have been different. This raises questions about whether the media scare alone can be held responsible for the decline in MMR vaccine uptake, or whether the one-way and ineffective risk communication approach of policy makers and health practitioners, who were keen to offer reassurances to concerned parents, are also significant. Other factors that may also have partly influenced the debate were the fact the MMR vaccine debate came after the BSE inquiry, which occupied the attention of two chief medical officers in England and Wales, and occurred at the start of the Labour Government. These are all possible factors that could have influenced and shaped the social amplification (or attenuation) of the MMR vaccine debate. **Error!**

Not a valid bookmark self-reference. (below) provides a summary of unfolding events in the MMR Vaccine debate between 2001 and 2003.

Table 8.3: Summary of events that unfolded in the MMR Vaccine debate between 2001 and 2003

Year	Event	
2001	i.	By the start of 2001, the UK government launched a £3 million advertising campaign in order to cope with growing concerns about the use of the MMR vaccine (Boseley, 2001).
	ii.	The MRC announced it will fund Professor Andrew Hall of the London School of Hygiene and Tropical Medicine to conduct a computerised database study on risk factors for autism, including immunisation.
	iii.	The Committee on Safety of Medicines (CSM) considered a pre-publication copy (supplied by the authors) of the Wakefield and Montgomery paper, together with the available evidence on MMR safety, in January 2001. They concluded that The Wakefield and Montgomery paper provided no new scientific data and criticised the article for being selective and flawed in its analysis (MRC Report, 2001).
	iv.	Wakefield reveals to the Telegraph that he has evidence of 170 new cases of 'autistic syndrome', with the majority of cases backed by documentary evidence of regression following vaccination (Fraser, 2001c).
	v.	Newspapers reports revealed that 500 parents plan to sue the DoH with claims that the vaccine had damaged their children. 850 families had been given legal aid (Hall, 2001).
	vi.	A study by (Kaye et al., 2001) in the British Medical Journal found that autism has continued to rise despite MMR administration being static.
	vii.	A study carried out by (Farrington et al., 2001) provides further evidence against a causal association between MMR vaccination and autism.
	viii.	June, the Lothian division of the British Medical Association (BMA) requests that the BMA back single vaccines as an alternative for parents who refuse the MMR.
	ix.	August, a doctor offering separate vaccines in his clinic was reported to the General Medical Council (GMC) (Fraser, 2001b) in (Casiday, 2005). Two months later, the doctor was cleared of any misconduct and allowed to continue to offer single injections on the condition that he provided up to date information of the safety of MMR (Boseley, 2001).
	x.	September, study by Elliman and Bedford (2001) warned parents of the risk of vaccinating with unlicensed products, which may be ineffective and carry a slightly higher risk of meningitis. They reviewed the evidence on separate MMR vaccines.
	xi.	October, in their paper Fombonne and Chakrabarti (2001) reported a cross-sectional study of 262 autistic children, demonstrating no difference in age of first parental concern or rate of developmental regression by

		exposure to MMR vaccines. No association between developmental regression and gastrointestinal symptoms was observed.
	xii.	December, Dr. Wakefield resigns from the Royal Free Hospital (Fraser, 2001a).
	xiii.	During Prime Minister's Questions, MP Julie Kirkbride, mother of a 14-month-old boy, asked Mr Blair, the then prime minister whether his son Leo had been immunised with MMR. Mr Blair declined to reply (BBC, 2001).
	xiv.	The MRC published its report on the review of autism research and found that the number of autistic cases has increased to (6 in 1000 children) due to increased recognition and changing definitions of autism (MRC report, 2001).
2002	xv.	January - A study reveals that babies' immune systems are capable of handling up to 10,000 different infections at a time (Offit et al., 2002). The report exonerated the practice of combining Vaccines.
	xvi.	In February, the Independent newspaper revealed that Leo Blair had been given MMR (Dillon, 2002). The Prime Minister however, refuses to confirm this report on the grounds of privacy in personal medical matters.
	xvii.	The Committee on Safety of Medicines (CSM), which examined the most recent publications into the safety of the MMR vaccine, concluded that current scientific evidence does not support a causal link between MMR vaccination and autism or bowel disease.
	xviii.	February - Wakefield linked the decline in MMR vaccine to removal of the single vaccine and of choice (Wakefield, 2002).
	xix.	In April, a study co-authored by Wakefield and O'Leary suggests a link between the measles virus and bowel disease in children with developmental disorders (Uhlmann et al., 2002).
	xx.	Conservative MP Julie Kirkbride announced plans to introduce a bill in Parliament allowing parents to choose single vaccines for free under the NHS (Dillon, 2002).
	xxi.	The Royal Free Hospital where Dr. Wakefield carried out his initial research - published a study on the British Medical Journal website saying there is no link between MMR and autism.
	xxii.	In May, Lord May called on Government to access the MMR vaccine as parents were not persuaded by government blanket assurances that MMR possess no risk of autism (Highfield, 2002).
	xxiii.	June, Wakefield presented evidence to a US congressional committee claiming that the measles virus identified in the guts of autistic children had been identified by a team led by John O'Leary as originating from the vaccine (Deer, 2011).
	xxiv.	In September, DoH launched a new website, 'MMR: The facts' to give parents information about the vaccine and the scientific studies supporting its safety and news on the controversy. The website also has frequently asked questions sections and a forum for parents to ask questions directly to members of the DoH.

	xxv.	November – A study links increase in autism to environmental factors (such as vaccination) rather than to better diagnosis or increased awareness as was earlier claimed (Byrd, 2002) in (Casiday, 2005).
	xxvi.	Using a national registry, Danish researchers observed no differences in the relative risk of autism between those who did and those who did not receive MMR vaccine (Madsen et al., 2002).
2003	xxvii.	At the beginning of 2003, The London Assembly warned of lower rate of vaccination uptake when compared to the nationwide record (73% vs. 85%). The assembly urged the Government to boost immunisation levels and issue a review report of possible side-effects (Wright, 2003).
	xxviii.	The Health Protection Authority (HPA) also announced that mumps cases in Wales had doubled from 65 cases in 2001 to 143 in 2002, up from (de Bruxelles, 2003). At the same time, demands for separate measles and mumps vaccines had increased dramatically (Laurance, 2003).
	xxix.	March - Desumo Information and Health Care (Worcester) ordered to stop the offer of single vaccines until the company was registered with the National Care Standards Commission, leaving 5,000 families uncertain about how their children's vaccination courses would be completed (Fraser, 2003).
	xxx.	June - High Court rules in favour of the fathers of the children of two divorced couples, mandating MMR vaccine be given to the children. Their fathers demanded their children be given immunisation (Payne, 2002).
	xxxi.	July - DoH wrote to doctors warning that up to 40,000 children vaccinated at the Elstree Aerodrome in Hertfordshire and Hillsborough Arena in Sheffield were at risk of the diseases and that they should be re-immunised with MMM (Casiday, 2005).
	xxxii.	August - Dr David Pugh, of Elstree Aeromedical centre, was taken to court to face charges of forgery of blood test results relating to single measles, mumps and rubella vaccines (Payne, 2002). Dr Pugh was eventually arrested in December 2004 (Sapsted, 2004).
	xxxiii.	A study revealed that measles cases in Britain had risen with decline in MMR vaccination (Jansen et al., 2003).
	xxxiv.	September - Annual immunization uptake report showed MMR uptake at a record low (79%) since the vaccine was introduced (Boseley, 2003).
	xxxv.	October - Parents (by now, more than 1500) suing MMR vaccine manufacturers over alleged damage to their children lost their legal aid funding for their cases (Martin, 2003). The parents appeal was turned down.

8.4 Analysis of MMR Vaccine Debate

This chapter examined the emergence and the evolution of the MMR vaccine safety debate in the United Kingdom and the associated policy responses to the claim that MMR vaccine was a risk factor to young infants. The main thrust of the MMR vaccine safety debate centred on whether the institutionalised MMR vaccine immunisation routine was safe for young infants given its suggested link to autism. Andrew Wakefield and his team in the 1998 suggested a link between MMR vaccine and autism and called for a precautionary approach to use a single injection until any risk from the MMR vaccine was ruled out. However, this suggestion was meet with stiff opposition by public health authorities who are charged with the responsibility of managing public health. While some of the co-authors retracted their support for the 1998 paper, Andrew Wakefield insisted for many years that the MMR vaccine was unsafe for some young infants. He claimed in several studies that that the vaccine has never undergone proper safety tests. Within the first phase of the debate, public health institutions responsible for advising the UK government on routine immunization, such as the department of health (DoH), the Medicines Control Agency (MCA), the Committee on Safety of Medicines (CSM) and the Joint Committee on Vaccination and Immunisation (JCVI) were quick to dismiss Andrew Wakefield's claims, accusing him of cherry-picking evidence, unethical conduct and committing fraudulent acts. These authorities argued that the triple MMR vaccine was safe and preferable to single component injections (Bosley, 2001). No policy changes were recommended or made in the first analysed phase of the debate.

In the second phase of the debate (the period between 2001 and 2003), Andrew Wakefield continued to insist that the MMR vaccine was unsafe for young infants. He claimed that he had found a virus in the guts of 170 autistic children (Fraser, 2001c). This period also saw a rise in measles outbreaks in the UK. At this point, the government, realizing the importance of communication and trust between public and health authorities launched a £3 million advertising campaign in order to cope with a growing concern about the use of the triple MMR vaccine (Boseley, 2001). This move was criticised by National Autistic Society, saying that the government focus should be on research rather than advertising (Boseley, 2001). Subsequently, the MRC announced it would fund Professor Andrew Hall of the London School of Hygiene

and Tropical Medicine to conduct a computerised database study on risk factors for autism, including immunisation. Public health authorities continued to criticise Wakefield's conduct but also argued that the policy of giving MMR vaccine in two doses was safer than administering the three component vaccines sequentially with six injections (DoH, 2001). In addition, an investigation by journalist Brian Deer of The Sunday Times revealed that Wakefield had been paid £55,000 for his research by a legal team preparing a case against the vaccine manufacturers (Deer, 2004). Wakefield earlier disclosed a link with the Legal Aid Board in a letter to The Lancet three months before his 1998 publication (Booth, 2004), but failed to mention the money he was paid for the study. He was struck off the British medical register by General Medical Council for serious professional misconduct in 2010 (Meikle and Boseley, 2010).

In terms of the PERC framework, Barnett and Duvall (2005)'s notion of structural power seem to be significant here in shaping the policy perspective taken to risk. This was manifest in the stakeholder relationship between policy makers and technical experts (the 37 expert committee) whose expertise was called upon to make sense of the risk to public health. The recommendation of the committee, that there was no reason for a policy change in the current MMR vaccine programme, led to the policy perspective that the MMR vaccine was indeed safe and in the best interest of infants and public health. Andrew Wakefield's membership of the medical profession gave him the authority and mandate to speak to this domain of risk, which, combined within his interpretation in the press conference following the first publication of his findings, may have also sparked the public controversy over whether MMR vaccine is linked to autism.

In regard to the role of expertise, technical experts can be seen to play a significant role in shaping the MMR vaccine safety discourse (in this case from under critical model to over critical mode and vice versa). Wakefield raised concern that MMR vaccine may be linked to autism, despite the fact that his 1998 study did not constitute a causal proof of a link. Certainly, it was his suggestion of a possible link in a press statement on the eve of the publication and subsequent media presentation that raised parents' concerns while looking to make the safest choices for their children. Technical experts can also be seen to act as policy advisers advising the government on the policy action in the interest of public health. For example, the 37 expert

committee after its investigation recommended that there was no reason for a policy change in the current MMR vaccine programme (Medicines Control Agency and Department of Health, 2001). The experts agreed however that there is a need for more research generally into the causes of Crohn's disease, ulcerative colitis and autism. Therefore, government officials were quick to refute Wakefield's claims and reassure concerned parents that MMR vaccine policy was indeed safe and in the best interest of both their infants and public health. The first examined phase of the MMR vaccine debate also illustrates the bias against experiential expertise, which is undervalued in fields of contested knowledge. This can be seen in parents' observations linking the onset of their children's behavioural responses to the MMR vaccination. Nevertheless, the fear-mongering discourse of Andrew Wakefield that MMR vaccine may be linked to autism combined with some of the parents' accounts of their children's behavioural changes may have amplified risk (erroneously) in the face of scientific evidence.

With reference to communication and trust, what seems apparent is how the government's initial response was focused on reassuring parents that the claim that MMR was linked to autism was unsubstantiated. However, these reassurances were carried out in a one-way communication fashion that is now recognised as a deficient model for public health risk communication. This perhaps, may be one reason why MMR vaccine uptake was found to have declined in some parts of the country, despite quick government reassurances. For example, as early as June 1998, the Public Health Laboratory Service reported that MMR vaccine uptake was on the decline. The study was conducted by Thomas et al., (1998) who assessed the impact of adverse publicity on uptake of MMR immunisation by obtaining data from the Child Health System on children resident in Wales in April of 1998. This suggested that government official's reassurances that MMR vaccine was safe failed to convince some concerned parents in some parts of the UK. However, there was another study that blamed the decline of MMR vaccine uptake on media scares (Anderson, 1999). Subsequently, the launching of the website enabled a forum for parents to ask questions directly to members of the DoH; a move towards a two-way communication.

The analysis of the unfolding events further suggests that social amplification (or attenuation) of public health risk has real health consequences. For example, Wakefield's incorrect assertion

linking MMR and autism led to a decline in vaccination rates in the United Kingdom for the first time since its introduction in 1988. The decline in the uptake of MMR vaccine in some parts of the UK saw a parallel rise in measles and mumps outbreaks that led to serious illness and death. Besides, his continuing cautions against the MMR vaccine maintained a climate of distrust of both MMR and other vaccines. Studies such as (Poland and Jacobson, 2011, Deer, 2009) has reached similar conclusions.

Table 8.4 summarises the link between the two analysed phases of the MMR vaccine to the study research themes.

Table 8.4: Linking unfolding events in MMR vaccine debate to the stud research theme between 1998 to 2000

Power (to effect outcome)	Expertise (interpretation and framing)	Communication (nature of communication	Trust/credibility
Risk perception being shaped by means of 'technical expertise'. Table 8.1, Event iii: **Stakeholders relation** between technical experts (e.g. 37 expert committees) and policy makers. See also event viii, vix	Table 8.1, event ii: Wakefield calls for suspension of the triple injection. Event iii: The CSM concludes **the policy of giving MMR vaccine in two doses is safer than giving the three component vaccines sequentially with six injections,** as such, the balance of benefit to risk is therefore highly favourable. Table 8.2, event iv,: Wakefield reveals to the Telegraph that he has evidence of 170 new cases of 'autistic syndrome', with the majority of cases backed by documentary evidence of regression following vaccination. According to him, authorities have failed to adequately address safety of the MMR vaccine (Fraser, 2001c). Other related events vi, vii, x, xi, xiv etc Table 8.2, event xxi: The Royal Free Hospital where Dr. Wakefield carried out his initial research - publishes a study on the British Medical Journal website saying **there is no link between MMR and autism.**	Table 8.2, Event i: The British government launches £3 million advertising in other to address the growing concern around the use of MMR. Table 8.2, event xxiv: DoH launches a new website, 'MMR: The facts' to give parents information about the vaccine and the scientific studies supporting its safety and news on the controversy. The website also has frequently asked questions sections and a forum for parents to ask questions directly to members of the DoH.	Event xii: Andrew Wakefield resigns from Royal Free Hospital. Table 8.1, event iii: The 37 expert committee conclude that evidence does not support a link between MMR injections and autism and bowel disorders like Crohn's disease and ulcerative colitis. See also events v, viii, and x. Table 8.2, event xvi: Tony Blair declines to answer if his son Leo has taken the MMR vaccine.

8.5 Findings relating to Social Amplification (or Attenuation) of MMR Vaccine Risk within the Policy Domain

Study Hypothesis: Social amplification of risk is the driver behind the negotiation of public health risk arguments between the over critical model and under critical model in a science-policy relationship.

The analysis of the evolving events carried out in this chapter suggests that **there is strong relationship between over use of power of experts by stakeholder groups and social amplification (or attenuation) of risk in a policy domain.** This is evidenced by Wakefield's research (shrouded by unethical behaviour) and his incorrect suggestion that MMR vaccine is linked to autism despite the fact that his study did not constitute a proof. When this is combined with vested interest (as those seen in the case of Andrew Wakefield), this could present a dangerous and salient avenue of power in public health risk communication that may go unnoticed or unscrutinised because of a perceived credibility of technical expertise that may allow social amplification (or attenuation) of risk to thrive.

The next chapter (nine) carry out a cross case analysis of the smoking, vaping and MMR vaccine debates and provides interpretive insights through the theoretical lens of the policy evaluation risk communication (PERC) framework and other extant literature. This will enable the study to consolidate the findings from the three chapters and also to check for the usefulness of the PERC framework.

9 Public Health Risk Debate and the Policy Evaluation Risk Communication Framework

9.1 Introduction

This chapter discusses the cross-case empirical findings of the smoking, vaping and MMR vaccine safety debates through the lens of the policy evaluation risk communication (PERC) framework described in chapter four. The chapter begins by briefly summarizing the elements of the PERC framework using this as a lens to discuss the empirical findings from the smoking, vaping and MMR vaccine safety debates (presented in Chapters six, seven and eight). The implications of the empirical findings for public health risk communication and its associated policymaking are then set out, consolidating findings from the three examined case study debates.

9.2 The Policy Evaluation Risk Communication framework

On the basis of gaps and weaknesses identified in the Collingridge and Reeve (1986) under critical and over critical models (see chapter two) and Kasperson et al. (1988), social amplification of risk framework (see chapter three), a policy evaluation risk communication (PERC) framework was developed (see chapter four). Chapter one of the thesis set out to examine the roles of power and expertise in public health risk communication as it relates to policy. Using debates about smoking, vaping and the MMR vaccine (see chapter six, seven and eight), the PERC framework was tested to understand how power and expertise shape public health risk discussion in the policy domain. The PERC framework is based on the assumption that *social amplification of risk is the driver of the negotiation of public health risk argument between the over critical model and the under critical model in a science-policy relationship.* Within this, social amplification is viewed as a multi-dimensional and multi-channel process, a view already held by (Fischbacher-Smith, 2012), and developed by this study in chapter ten to provide a modified account of SARF. The PERC framework further describes how individual or group behavioural responses and their emergent problems may influence the transition of risk argument between over critical and under critical

models. However, due to the resource (time and word limit) constraints of this PhD, emphasis will be placed on the empirical testing of how power, expertise, communication and trust shape the social amplification (or attenuation) of public health risk communication within their policy contexts. Future research will require an empirical validation of how behavioural responses and their emergent problems shape this transition of risk argument between the over critical and under critical models.

The core argument of the PERC framework is that policy debates relating to risk encounter multiple interactions between power and expertise that can enhance or inhibit risk communication, create or destroy trust and credibility, and privilege certain social and professional relationships over others. The consequence of this is that a degree of bias can arise from the asymmetries of power underpinning these interactions and processes that, in turn, perpetuate the domination of certain risk perspectives and/or shape the prioritisation of issues and debates in the policy domain.

The following section therefore, discusses the cross-case empirical findings within the elements of the PERC framework and then critically analyses these within the context of extant literature. The key elements are power, expertise, communication and trust.

9.2.1 Power and Expertise

The constructs of power and expertise are jointly discussed here because the two are intertwined and in some cases overlap. For example, the analysis of the smoking, vaping and MMR vaccine debates showed that 'power' was expressed through 'expertise'. However, expertise may be an outcome of power or even produce power. Having said this, considering the roles of power and expertise in public health risk communication as it relates to policy making, it would appear that institutional (Bachrach and Baratz, 1962), productive (Lukes, 2005) and structural (Barnett and Duvall, 2005) powers provide the best (although still inadequate) explanation of how power shaped the smoking, vaping risk and the MMR vaccine safety debates and associated policy making. This argument is elaborated below.

Institutional Power in Risk Debate

The smoking, vaping and MMR vaccine debate showed that institutional power (Bachrach and Baratz, 1962) was able to explain how certain stakeholder groups can exercise the 'non-decision making' (p.952) power and how that shaped public health risk communication. For example, the evolving events in the smoking risk debate suggest that the medical research council and ministry of health exercised non-decision making power by prioritizing inquiry into the relationship between smoking and lung cancer in the 1950's. This consideration led to the sponsorship of Doll and Hill's research and that triggered the emergence of the smoking debate, making smoking risk a health priority in the UK. Institutional power was also expressed by the World Health Organisation, which raised concerns about inadequacies in the understanding of the safety and efficacy of electronic cigarettes (EC) as a smoking cessation aid. Marketers had initially claimed ECs were a safer alternative to tobacco cigarettes in 2008 when they were initially introduced into the European market. The same exercise of institutional power applies to public health authorities that determined what questions were essential in assessing the incorrect suggestion that MMR vaccine was linked to autism. There were those who were interested in understanding the causes of autism. Instead, initial emphasis of the 37 expert committee conveyed by the Minister of Health focused on examining (validating or refuting) Andrew Wakefield's evidence.

Such non-decision making power as exercised by public health authorities (seen in the smoking, vaping and MMR vaccine case studies) influenced the initial direction and scope of the discussion, which prevented any overt conflicts or initial challenges from other stakeholder groups. This finding is similar to Birkland (2007) who suggested that setting the risk or policy agenda determines which risk issue or solution gains public and policy attention, which ultimately, will drive the issue and conversely, reduce the significance of those issues or problems relating to the risk that fail to make it to the agenda. Bachrach and Baratz (1962) raised caution about the ways policy makers define 'critical' or 'key' issues that make an issue a policy priority. They argue for a "restrictive face of power" that considers non-decision making, and which can be used to: (a) uncover procedural, institutional or social bias and the extent to which powerful

persons and groups are able to influence those values and institutions that are brought to bear in risk communication and that may profit or disadvantage certain groups; (b) as a foundation for analysing those directly or indirectly involved in decision making; and, (c) a standard for distinguishing between 'key' and 'routine' policy decisions" (p.952). Bachrach and Baratz (1962) reject any suggestion that undermines this as a useful means of deconstructing institutional power in risk discussion, despite recognising that identifying these restrictive or enabling forces is a subjective act.

Productive power

Productive power - the capacity to influence others in a covert way - can also be seen to be manifest in the analysis of the evolving events relating to smoking, vaping and the MMR vaccine debates. Productive power was expressed through technical expertise and media sources which are the means by which interested stakeholders and the public made sense of the risks they face. For example, the expert interpretation that states that there is a 'real association' between smoking and lung cancer expressed by Doll and Hill was accepted by key government advisory bodies, and this interpretation shaped the policy perspective taken to smoking risk. Similarly, in the vaping debate, technical experts can be seen to play a central role in helping the public make sense of the safety and efficacy of electronic cigarettes, including its social consequences. This can be observed from the initial identification of the uncertainty or gaps in scientific knowledge about the safety and efficacy of ECs by World Health Organisation, to the development of knowledge and framing of EC risk within the public health context.

Technical experts were also the means by which other experts are held accountable to their interpretations. For example, the scenario in the EC debate suggests that the science (around the safety and efficacy of ECs and their associated social values) was contested within both the scientific and public health communities. On the one hand, there are expert groups that viewed ECs as an effective aid to smoking cessation, offering a safer alternative to those who do not want to quit smoking. On the other hand, are those who called for a precautionary stance for strict control and regulation

of EC devices. The two groups of experts on the opposing sides of the debate fiercely scrutinized the evidence and arguments of the other group in a way that continually shaped the understanding of the vaping risk and the risk acceptability debate. Productive power can also be observed in the MMR vaccine safety debate where Andrew Wakefield suggested a link between MMR vaccine and autism. His assertion created a lot of tension and distress in relation to public health and safety, despite the fact that his research did not constitute any kind of proof of a link between the MMR vaccine and autism. Surely, it was his interpretation in the press conference before the publication of his findings, where he called for the suspension of the triple injection in favour of the single vaccines, until such time as the MMR vaccine is ruled out as a possible environmental trigger for autism and the subsequent presentation of this in the media that fuelled the concern amongst parents.

The centrality of science and its experts in helping the public and policy makers make sense of smoking vaping and MMR vaccine risks suggests that technical experts have the capacity to influence the perception of others in both overt and covert ways. This view is in line with the assertion made in several studies, such as (Collingridge and Reeve, 1986, Jasanoff, 1996, Fischbacher-Smith, 2012), that expertise is seen as a sense making aid to other stakeholders engaged in dialogue. The centrality of science and its experts suggests that technical experts are key influential amplification agents during unfolding public health controversies, especially in the policy context. Lukes (2005) recognises that this form of power does not have to be negative but also "productive, transformative, authoritative and compatible with dignity" (p.109). Technical expertise has allowed us better to understand the nature of the risk we face and enabled us to build capacity by carefully and critical reflecting upon evidence around us (Muscatelli, 2016). However, where there are gaps in knowledge and where vested interest cannot be ruled out, we must pay attention to the manner in which technical experts may become prominent, and perhaps dangerous, amplification or attenuation agents.

It can be seen from the analysis of the evolving events within the three debates that the media are another source for the exercise of productive power. For example, in the

press conference before and after The Lancet 1998 publication of his work, and in subsequent presentations in the media, Andrew Wakefield's interpretation fuelled concerns amongst parents of a link between autism and MMR. This assertion is in line with other studies, such as Anderson (1999) who held 'media scares' to be responsible for the decline of MMR vaccine uptake. Luke, (2005) has highlighted the importance of media sources and how they shape the "perception, conception and preferences" of risk in ways that may even shape public perception away from what would be in its own best interest. Indeed, expert interpretation and media sources are critical in public health risk communication since members of the public are sometimes unwilling or unable accurately to assess or decode the science or evidence for themselves.

Structural power

Structural power can be seen also to be manifest in the analysis of the evolving events within the examined case studies. Barnett and Duval (2005) talk of how power exists or may be exercised in a direct and specific relationship. For example, representatives of the tobacco industry sought to shape policy developments by pursuing an informal health policy arrangement by voluntary agreement with the Government on how to regulate tobacco sales and advertising. This enabled them to develop social and professional relationships by which they were able to exchange views and express opinions with policy makers. These negotiations, according to Collingridge and Reeve (1986), strengthened the industry political positions by enabling them to delay or make unnecessary the establishment of stricter and legally binding rules. For example, the 1971 negotiation over the health warnings on tobacco products (accepted by the government), killed a Private Member's Bill in the house of common which threatened a much stronger warning on cigarette packs (Popham, 1981).

Stakeholder relationships (between expert committees and policy makers) were also prominent within the three case study debates. For example, in the evolution of events, shortly after the Public Health England expert review reported that ECs are approximately 95% less harmful than smoking (McNeill et al., 2015), the UK government decided that ECs could be prescribed by NHS doctors to help smokers who wanted to quit smoking (Tonkin, 2015). This decision was based on the advice of

the expert committee of Public Health England, hence pointing to the importance of a 'stakeholder relationship' in the policy perspective taken towards the use of electronic cigarettes. Stakeholder relationship can also be observed in the MMR vaccine safety debate. For example, event iii, on table 8.1 suggests that policy makers convened a committee of 37 experts to verify Andrew Wakefield's claims that the MMR vaccine may be linked to autism. The 37 expert committee recommended that there was no reason for a policy change in the current MMR vaccine programme (Medicines Control Agency and Department of Health, 2001), and this recommendation shaped the policy perspective taken to the MMR vaccine. As a result of this recommendation, the government decided not to take any action. This was against the suggestion by Andrew Wakefield who had called for the withdrawal of the triple dose in favour of a separate single vaccine for each disease.

Other approaches have highlighted the importance of indirect and socially diffuse relationships whereby power is not exercised through direct relationships but formed by them (Foucault, 1980). This includes the form of power that arises from being a member of a social group (Barnett and Duvall, 2005). This type of structural power can be observed in how being a member of a professional discipline enhances the ability of technical experts to speak authoritatively in certain domains of risk. A good example of this is how a group of public health and medical experts who, by virtue of their membership of a public health and medical community, jointly signed several letters to Margaret Chan, of the World Health Organisation, advising on the best course of action in regulating ECs and proposing measures that would avoid corporate pitfalls (similar to those seen during the tobacco debate).

Resistance

Foucault's notion of resistive power is also relevant here. This can be observed within the MMR vaccine debate in terms of some parents' refusal to give consent to their infants being given the MMR vaccine, and opting instead for the single immunisation components, see also (Evans et al., 2001a). This led to a drop in the uptake of the MMR vaccine to below the threshold of herd immunity for the first

time since the introduction of the vaccine. This exercise of power led the government to change its strategy towards communicating its position on the MMR vaccine risk. There was also a change from a one-way communication strategy focused on reassurance, to a two-way and interactive communication strategy. The UK government later launched a new website - 'MMR: The facts', to give parents information about the vaccine and the scientific studies supporting its safety, as well as updated news on the continuing controversy. This gave parents access to the relevant information and also enabled them to address any concerns they may have had by putting direct questions to members of the Department of Health.

The above analysis of power suggests that institutional power (Bachrach and Baratz, 1962), productive power (Lukes, 2005) and structural power (Barnett and Duvall, 2005), as well as Foucault's resistive power (Foucault, 1978) operating through the earlier mentioned three dimensions, were together able to explain how power shaped public health risk communication as it relates to policy making. This validates the argument (made in section 3.3.1) that risk communication is a process embedded within institutional, productive and structural powers that may allow social amplification (or attenuation) of risk to thrive. However, neither of this theory of power alone is sufficient to explain how power functions in public health risk communication. Future research in risk communication should look at consolidating insight form these forms of power to theorise and empirically validate how power functions in situations of risk and policy making.

Economic resource, power and social amplification of risk

It is also important how wider economic factors significantly made it possible for economically resourced stakeholder groups (e.g. tobacco companies) to act in way that protected their interests, at least for some time, until evidence began to tilt the balance of power. Aside from forging relevant stakeholder relationships, the analysis of the evolving events in the smoking debate shows that the tobacco industry was able to use its resources (e.g. economic means) to purchase the relevant scientific expertise, and to exert influence on the perception of smoking risk while also engaging in policy

development relating to tobacco cigarettes. The analysis also points to how the industry circumvented the ban on advertising in the UK through sponsorship of sporting and cultural events. It was also able to delay policy interventions with legal battles against UK government policy decisions, and by working with allies in key government positions. The knock-on effect was that despite the seeming consensus in government departments about the dangers of smoking as earlier as the mid-50's (*see* Table 6.2, events v, viii, x, xi, xvi), and pressures from advisory committees, including some members of parliament and the MRC, no immediate action was taken by the government to inform the public of the dangers of smoking. This perhaps, can be linked to the tobacco industry's ability to use its economic power to its advantage in the smoking risk discussion within the public and policy domain.

Voluntary agreement was used as a means to control the sale and marketing of tobacco products, which bought the industry time and strengthened its political positions in delaying, or making unnecessary the establishment of stricter and legally binding rules. Most of the stricter and legally binding policy interventions were legitimised in the 1990's. Also, its ability to attack the technical case made against smoking by means of technical expertise could also explain the delay in policy intervention. At least, this created doubt in the minds of the public, as there was little or no causal proof of a link between smoking and lung cancer. These findings correspond with the conclusion of other studies such as (Saloojee and Dagli, 2000, Trochim et al., 2003, World Health, 2000, Fischbacher-Smith, 2012). This suggests that there is a seeming relationship between economic power, technical expertise and policy interventions. The relationship between economic power and policy making has also been suggested by previous studies *see* (Smith, 1988). Smith (1988) has previously argued that "corporate bodies are able to exert considerable influence on the decision-making process due to their economic power and technical expertise" (p1).

Another line of argument that can be drawn from the analysis of the evolving events of the three examined case studies is that those with economic and political power (agenda control and decision making power) demonstrated higher ability to influence the technical expertise brought to bear on risk because they often have the means or

authority to acquire necessary scientific expertise in risk discussion. This can be seen in how the tobacco industry was able to engage and attack the technical case linking smoking to lung cancer via its own technical expertise. It is also evident in how policy makers through scientific committees come to make sense of a potential or actual risk. Political and economic power also enhances the ability of stakeholder groups to influence other forms of power, such as productive and structural powers. For example, in 1991, the UK tobacco industry sued the UK government over the size of the new compulsory health warnings on cigarette packs, using legislation and loopholes in the law to delay, restrict or influence government policies on tobacco control. In this way, tobacco companies were able to use their economic resources to buy legal expertise in the court of law to further their aim. In addition, by means of voluntary agreements, they were able to use their economic resources to strengthen their structural power position. This finding aligns with the views of Kasperson et al., (1988) who suggested that the understanding of risk is a reflection of 'intuitive biases and economic interests' (p.178).

Economic resource, expertise and social amplification of risk

The analysis of the smoking and vaping risk debate suggest that the short lived timeline between the transition of policy argument from over critical to under critical models and policy action (or inaction) debate, may be linked to the absence of powerful economically resourced stakeholders groups, unlike those seen in this tobacco debate. For example, the vaping risk debate witnessed an almost absence of economically powerful stakeholder groups who were able to use their resources to shape the public health risk debate in the manner seen in the tobacco debate. As at the time the vaping risk debate emerged in 2008, ECs had been newly introduced into the European and UK markets and many of the electronic cigarette companies were still new and financially less resourced, especially when compared to the big tobacco companies. From this, it is logical to suggest that EC companies were not in a position to mount an effective challenge on the technical case made against ECs in the same way that the tobacco companies did in the smoking debate. Instead, any arguments that would advantage EC companies economically were received with caution so as to avoid

similar deceit and delay tactics that was used successfully by the tobacco companies for many years. The inference that can therefore be drawn from this (and as previously noted in chapters four and seven) is that time scale between scientific consensus and policy action depends on the ability of interest groups to muster their power to influence the nature of the debate brought to bear on the risk.

This raises another issue; that where there is power, the influence of trust and credibility is reduced. However, the relevance of trust and credibility becomes heightened where power is absent from shaping the policy perspective taken to risk. For example, Wakefield's incorrect suggestion and the inability of other scientists around the world to replicate his claim put the burden on him and his colleagues to prove their credibility (his colleagues later retracted their support for the paper). While he had the technical expertise, he was not financially resourced to mount an effective challenge against the public health authorities that refuted his claims of a link between MMR vaccine and autism. This paradoxical relationship between power and trust has been suggested in previous studies. For example, Buchmann (2001) argues that where power increases, the effect of trust decreases, and where power decreases the effect of trust increases. The absence of economically resourced stakeholder groups may be one reason why trust and credibility was a central factor in shaping the arguments brought to bear on both the vaping debate and the MMR vaccine safety debate.

9.2.2 Power, expertise and the negotiation of risk argument between over critical and under critical model

Within the first phase of the smoking debate (as analysed in chapter six), the evolving events suggest that there was some sense of scientific consensus that smoking was linked to lung cancer (*see* Table 6.2, events i, ii, ix, xiii and xiv). However, as the debate evolved, the analysis of the smoking debate indicates that the tobacco companies were able to engage the resources at their disposal to acquire or access the necessary technical expertise effectively to refute and attack the technical case made against smoking. The industry provided scientific evidence to contradict research,

especially around the technical details linking advertising (e.g. sports sponsorship) and recruiting new smokers (see Table 6.5, event xxiii). However, since subsequent studies continued strongly to point to a link between tobacco and lung cancer, there was a shift in the balance of power to the point where it was generally accepted that smoking is linked to lung cancer; a shift towards the under critical model. This suggests that those with resources (such as knowledge, expertise or capital) and political power (decision and non-decision making power) demonstrate a greater ability to influence the technical expertise brought to bear in risk debates. The evidence seen in the tobacco case suggests that powerful elite groups are able to acquire the scientific expertise that supports their interest in the negotiation of risk. Furthermore, those in charge of managing public health may influence technical expertise through the selection of expert committees, which act as advisors to policy makers.

While the influence of economic and political power was less salient in the initial stages of the vaping risk debate, productive power exercised through technical expertise was largely dominant in shaping the risk discussion. This can be seen in the arguments presented by both sides of the debate and where evidence presented is subjected to intense scrutiny by the either side. This suggests that powerful individuals or groups with requisite knowledge or expertise are able to use their knowledge or technical expertise to shape public health risk communication. Interestingly, this 'productive' power can also be exercised as a means of resistance in the sense used by Foucault, suggesting that power is fluid and exists everywhere. When technical expertise is combined with a vested interest (e.g. in the MMR vaccine debate Dr. Andrew Wakefield fraudulently claimed there is a link between MMR vaccine and autism), this productive kind of power (that is, technical expertise) could present a salient and perhaps dangerous avenue of power in risk communication, which could go unnoticed or unscrutinised in such a way that may disadvantage other risk perspectives or worldviews in a policy domain.

9.2.3 Communication and Trust

The influence of communication (or language) featured strongly in the analysis of the three cases in chapters six, seven and eight, especially in the use of languages of uncertainty. For example, in the smoking debate, representatives of tobacco companies can be seen to frequently point to gaps in knowledge, and a lack of any available causal proof (see table text 1, in section 6.3). By using this language of uncertainty, the tobacco industry was able to attack (and attenuate) the technical case made against smoking. According to Simmerling and Janich (2016), who argue that languages of (un)certainty are 'highly context sensitive' and may affect how a risk argument is received and believed. The knock-on effect as seen in the smoking debate is that it delayed the transition of the smoking risk argument towards the under critical model, and the development of any concrete policy intervention that would otherwise have improved human health and living conditions. Similarly, experts on opposing sides of the argument in the vaping risk debate were quick to point to lack of evidence in claims put forward by opposing sides of the argument, bringing about endless technical debates about the safety and efficacy of ECs. The importance of this has been noted by Fischbacher-Smith (2011) who highlights how uncertainty "creates problems of interpretation and speculation, but also occasionally served to heighten the uncertainty surrounding the event". In such situations, those at risk may become confused about what action to take or to avoid or from which to disengage having been alerted to a risk issue. In other words, the public may ignore the science and associated scientific advice.

Furthermore, the analysis of the vaping debate suggests that the MHRA-led public consultation (a two-way communication between stakeholders) may have eased public acceptability of EC regulation under the medical regime. The report of the consultation showed strong public support for regulation of EC devices under a medical regime. Besides, it has been suggested by Fischbacher-Smith et al. (2010) that people's willingness to consult with each another reduces the likelihood of risk intensification and tension during risk acceptability debates. The 'two-way communication model' as rightly suggested by Shannon and Weaver (2015) is shown to be essential in public

health risk communication because it allows risk regulators and policy makers to understand and learn about public concerns. At the same it, it empowers the public in the discussions of the risk issue, enabling them to make valuable input to decision making. This two-way model of communication has moreover been suggested to foster trust (Renn, 1991a).

Trust and credibility were also critical in the debates under examination. For example, public health authorities such as CHSC and SACCR were observed to have believed in the credibility of Doll and Hill's research linking smoking and lung cancer. As such, they accepted their interpretations, urging the government to inform the public of the dangers of smoking. This was also captured in the words of Dr. Green who, after the meeting between representatives of the tobacco companies and Richard Hill, expressed the view that **"**it was pretty clear to me that Mr Partridge and his colleagues felt that Hill had answered all their queries in a way which left hardly any loophole for doubt…" (ash.org.uk). (Mis)trust and credibility also featured strongly in how stakeholders responded to the arguments brought to bear on the debate around the regulation of electronic cigarettes. This can be linked to many years of lies, deceit and cover-ups during which the tobacco industry attempted to refute claims that smoking was linked to lung cancer and other diseases. As a result, there was a lot of suspicion around any argument seen to be of economic interest to stakeholder groups (e.g. corporate organizations) in risk discussions. Evidence of this can be seen in a letter signed by 129 public health and medical experts from 31 countries to Margaret Chan, of the World Health Organisation. This group of experts called on WHO to establish new controls on ECs and warned of tobacco industry tactics (Aktan et al., 2014) and the need to be cautious of how vested economic interests bring the various arguments to bear in the debate (see Table 7.3, event xvii). Further suspicion was raised when tobacco companies entered into EC manufacture. There was concern about conspiracies, which may have even led to the fierce nature of the scrutiny seen in the risk acceptability debate about how ECs should be framed within the public health context. The lack of trust coupled with concerns about conspiracies created tension

around the risk acceptability debate, and this was a driving force shifting the vaping risk argument more towards the over critical model.

The analysis of the evolving events in the MMR vaccine debate also highlights the importance of trust and credibility in amplifying public and policy makers' perception of MMR vaccine safety. For instance, the credibility of Andrew Wakefield and his claims was called into question especially within the policy context when his evidence could not be verified by a 37 expert committee and subsequent technical research work. His credibility was further dented when he was found to have falsified evidence to support his argument *see* (Deer, 2011) which lead to his dismissal by the General Medical Council (GMC) in 2010. Other factors that had implications for trust can be linked to other similar public health debates that have occurred in the past. An example was the withdrawal of two out of the three brands of vaccines used in Britain by the department of health due to links with mild transient meningitis (Sugiura and Yamada, 1991). In addition, the anti-vaccination movement that has endured since the 1900's in Britain may have entrenched further suspicion of the MMR vaccine among concerned parents Blume (2006).

The controversies around Tony Blair and his son (Leo) further highlight the importance of public trust in policy makers or those in charge of managing risk (see Table 8.3, event xiii). This is important from the perspective that public behavioural responses may exert influence upon the success or failure of any policy strategies adopted. The analysis of the MMR debate suggests that the reluctance of the Prime Minister to reveal his son's MMR status is believed to have steered public anxiety amongst parents who were about to immunise their infants in the face of Andrew Wakefield's suggested link of the MMR vaccine to autism.

9.2.4 The state of evidence, information and knowledge

The state of evidence, information and knowledge also played a role in shifting arguments between over critical and under critical models. A typical example is how the tobacco industry was seen to change its power strategy from one of attacking the

technical case made against smoking and lung cancer by means of technical expertise, to focusing effort on influencing policy development relating to smoking health risk using professional lobbyists and government allies. The analysis of the smoking debate suggests that this was due to the evolved state of evidence, information and knowledge that tilted the balance of power against the tobacco industry. As such, the state of evidence, information and knowledge impacted on the nature of power and expertise, including communication and trust, brought to bear on the risk of smoking, which in turn shaped the manner in which these factors determined the negotiation of risk arguments between over critical and under critical models.

Table 9.1 below provides a descriptive summary of how power, expertise, communication and trust/credibility shaped the social amplification (or attenuation) processes in public health risk communication within the policy domain.

Table 9.1: Summary of factors shaping social amplification processes in policy evaluation risk communication in three case studies

Factors shaping social amplification and attenuation processes in public health risk communication within the policy domain		
Smoking and Vaping Risk Debate		**MMR Vaccine safety debate**
Smoking Risk Debate	**Vaping Risk Debate**	
Power ○ Institutional ○ Productive ○ Structural and ○	**Power** ○ Institutional ○ Productive and ○ Structural	**Power** ○ Institutional ○ Productive ○ Structural and
Technical expertise ○ Interpretation ○ Policy advisory ○ frames	**Expertise (Technical/local)** ○ Interpretation ○ Policy advisory ○ frames	**Expertise (Technical)** ○ Interpretation ○ Policy advisory ○ frames
Communication ○ Using language of uncertainty	**Communication** ○ Public consultation	**Communication** ○ Government reassurance ○ Multichannel communication
Trust and credibility ○ Reduced confidence in tobacco industry argument due to evolved state of evidence.	**Trust and credibility** ○ Lies, deceit and cover up from previous smoking controversy	**Trust and credibility** ○ Lack of credibility ○ Anti-immunisation movement in the 1800's). ○ Previous failed reassurances e.g. BSE event).

Having analysed the three case studies (smoking, vaping and MMR vaccine debates), it can be seen that the PERC framework is relevant and able to explain how certain perspectives of risk in a policy domain become amplified and how risk arguments transition between over critical and under critical models. Nevertheless, further empirical research is needed to validate how behavioural response to policy interventions may shape the transition between over critical and under critical models.

Table 9.2 (below) provides an overall summary of the empirical findings of this study that are relevant to the role of power and expertise in public health risk communication as it relates to policy making.

Table 9.2: Cross case empirical findings relating to power and expertise in public health risk communication as it relates to policy making.

Key Research Question *How does an argument within a set of risk argument become amplified in a policy context*	
Case study	Empirical findings relating to power and expertise in public health risk communication as it relates to policy making
Cross-Case Analysis	➢ Risk communication is embedded within institutional, productive and structural dimensions of power. There is also power in the form of resistance that is available to everyone willing to exercise it. ➢ 'Power' in risk communication may be expressed through technical expertise, control of communication and creation of trust (through scientific credibility). ➢ The centrality of science and its experts in making sense of the risk faced suggest that technical experts are key influential amplification agents during unfolding public health controversies especially in the policy context. ➢ Social amplification of risk is the driver behind the transition of policy arguments between over critical and under critical models. ➢ Policy debates relating to risk arise from, and are conducted within a public space in which there are multiple interactions between power and expertise that enhance or inhibit risk communication, create or destroy trust and credibility, and privilege certain social and professional relationships over others. As such, a degree of bias can arise from the asymmetries of power underpinning these interactions and processes that in turn, perpetuate the domination of certain risk perspectives and/or shape the prioritisation of issues and debates in the policy domain.
Smoking	➢ Economic resources are likely to enhance the ability of stakeholder groups to exercise institutional, productive and structural forms of power in public health risk communication within the policy context. ➢ Economic resources are likely to condition the nature of technical expertise brought to bear on risk, to control communication and to create trust (through perceived scientific credibility).

	➢ Language use (e.g. language of (un)certainty) enhances or attenuates the ability of stakeholder groups to undermine or amplify the magnitude of risk.
Vaping	➢ The time scale between scientific consensus and policy decision depends on the ability of interested groups to muster their power to shape the risk debate. ➢ There is a strong relationship between the exercise of power, the nature of scrutiny and expertise brought to bear on risk that may either lead to social amplification (or attenuation) of risk and concrete policy interventions. ➢ There is a bias against experiential expertise, which is undervalued in fields of contested knowledge.
MMR vaccine	➢ There is a strong relationship between over use of power of experts by stakeholder groups and social amplification (or attenuation) in risk communication.

9.2.5 Consequences of power in public health risk communication

The analysis of the evolving events in the smoking debate further suggests that there are distributive inequalities associated with errors or inadequacies in the understanding of risk and government action or inaction (see Table 6.5, event iii). For example, the second Royal College of Physicians Report *Smoking and Health Now* published in January of 1971 refers to cigarette smoking as a present day "holocaust" and suggests a clear socio-economic divide in smoking behaviours. For example, those in professional classes (e.g. doctors) were giving up smoking, while people in manual and unwaged groups maintained their smoking behaviour (RCP Report, 1971). While the analysis did not reveal why such a divide occurs, this supports the argument (made in chapter one of this thesis) that the powerless (typically the poor) suffer the consequences of inadequacies or errors in public understanding of smoking risk. Further research will require empirical validation to elaborate how errors or inadequacies in the understanding of risk bring about distributive inequalities, and the impact this has for public health and safety.

Having considered the empirical findings of this study through the theoretical lens of the PREC framework, the thesis draws the conclusion that *'power' in public health risk communication within its policy context may be expressed through technical expertise, control of communication and creation of trust (through scientific credibility).* The following section discusses the implication of the empirical findings on power and expertise for public health risk communication and its associated policy making.

9.3 The Implication of the Study Findings on Power and Expertise for Public Health Risk Communication

The ability of powerful stakeholders (individuals or groups) to muster their power to exert influence upon risk communication processes would appear to be an issue of concern to public health and safety, particularly when risk communication is used as an effective means to understand the nature of public health risk faced and improve on public health and safety standards in the United Kingdom. The manner in which public health risk is communicated is important because it shapes public understanding (or perception) of the risk and the policy perspective taken to it, which influences subsequent individual or group behavioural responses, which may in turn have positive or negative consequences for public health and safety, and also potentially other as yet unknown economic or socio-political effects. The analysis of the evolving events in the smoking, vaping and MMR vaccine debates (in chapters six, seven and eight) has led to the conclusion that powerful elite individuals or groups are able to express power in risk communication by means of technical expertise, control of communication and creation of trust (through perceived scientific credibility). 'Expertise' *see* (Collingridge and Reeve, 1986, Jasanoff, 1996, Fischbacher-Smith, 2012); 'communication' *see* (Bernstein, 2003, Foucault, 1971, Smith, 1990, Fischer, 2003, Kasperson, 2012b) and 'trust and credibility' (Kasperson, 1992, Löfstedt and Horlick-

Jones, 1999, Frewer, 2003) have received greater levels of attention in the extant literature and are now recognised as the critical elements of effective risk communication that shapes public understanding and perception of risk and associated mitigation advice. However, at this time, understanding of the role of power in risk communication remains weak and under developed.

Understanding the role of power in public health risk communication is important because it reveals salient factors that enable or constrain certain stakeholder groups in risk communication in such way that may benefit or disadvantage certain perspectives or worldviews in the policy perspective taken to risk. Moreover, the issue of vested interest (individual or group) cannot be ignored, especially where something of human value is a stake and even more so where there is unequal distribution of the costs and benefits associated with a risk. When power (expressed through expertise, communication or trust) is combined with vested interests, the problem that may arise as it relates to public health risk communication is in the manner in which distortion, or bias may come to shape the expert interpretation brought to bear on risk signals (see section 2.5). The danger here is that this may go unnoticed and unscrutinised by the public and policy makers, and thus not affect the way they make sense of the risk faced or subsequent decisions relating to it.

The analysis of the smoking, vaping and the MMR vaccine debate has highlighted the significance of power (especially when combined with vested interests) in public health risk communication. The analysis of the smoking debate shows that representatives of tobacco companies were able to use the resources within their means (e.g. economic resources, expertise and political allies) to influence the smoking risk debate. They acquired relevant technical expertise to advance their worldview, refuting any damaging arguments and even disrupting existing knowledge (as it relates to the technical details of addiction). Representatives of the industry also used professional lobbyists and allies to exert influence on the smoking risk debate, especially within the policy domain. For example, through voluntary agreements, representatives of the industry were able to develop the necessary social and professional relationships with policy makers, which afforded them the opportunity to exchange views and opinions

and provided a platform upon which to make the economic case for their existence. It also gave them opportunity to gain insight into policy and ideas about smoking risk, which placed them in a strategic position of power when compared to other stakeholder groups.

The outcome of this privileged exchange or *power informed* relationship led to a situation where voluntary agreements were largely relied upon by the UK government as a means to control cigarette sales and distribution for a long period until the 1990s. By means of voluntary agreement, the industry was able to delay concrete, strict and legally binding policies. In other instances, tobacco companies used loopholes in the law to shape the debate by taking the UK government court over the size of the new health warnings on cigarette packs. This way, they were able to delay, restrict or influence government policies on tobacco control. In addition, evidence also suggests that the industry attempted to influence smoking policy through its network of advisors. It was further revealed that the chairman of the Tobacco Advisory Council was on the UK government sports council. This meant that the interests of the tobacco industry were protected in policy advice given to the government on sporting issues. This multi-dimensional exercise of power by the tobacco industry can be seen to have shaped and influenced the timeline of the tobacco debate from its emergence in the 1950s, and spanning several decades thereafter.

The MMR vaccine debate also presents another dimension where the impact of powerful elite persons or groups (combined with vested interests) can be examined and lessons learnt for risk communication. Because of personal, undisclosed (e.g. economic and reputational) interests, Andrew Wakefield fraudulently suggested that MMR vaccine was linked to autism, even when his research did not constitute proof. Certainly, it was his interpretation in the press conference before the publication and subsequent presentation in the media that fuelled the concern amongst parents of a link between autism and MMR. Anderson (1999), for instance, blamed the decline of MMR vaccine uptake on media scares. Indeed, expert interpretation is important because members of the public are sometimes unwilling or unable accurately to assess or decode the science or evidence themselves. This leaves them ‘dangerously trusting’

the judgement and interpretation of experts despite the possibility of there being a margin of error (or intentional bias) in expert judgement, especially in unfamiliar risk circumstances where there is large residual uncertainty. Such errors in expert interpretation even when corrected (as in the case of the MMR vaccine), may have had adverse consequences for public health and safety, and even the risk communication process itself.

The consequences are far reaching and may result in situations where there are inadequacies or errors in public understanding of the nature of a risk to health and safety or its effects within some segment of the society. In the smoking debate, this led to a delay in concrete policy intervention until the 1990's, which may in fact have also sent the wrong message in terms of attenuating the significance of the smoking risk to the public. There is also the possibility that lives may have been saved and incidences of lung cancer reduced if the appropriate policy interventions or information had been communicated to the public as soon as evidence was established in the 1950/60s of a link between smoking cigarettes and lung cancer. Delays in policy intervention can also be dangerous or damaging to public trust as this may bring about loss of public confidence in government officials' ability to protect public health from powerful vested interests at the expense of public health and safety. For example, there was a lot of suspicion in the policy debate relating to the vaping risk that vaping involves a smoking like behaviour. This suspicion is linked to many years of lies and cover up by the tobacco companies (Bero, 2003), where their representatives concealed evidence of a link between tobacco and lung cancer while knowing that cigarettes are in fact dangerous to health. Perhaps, the loss of public confidence in public officials and corporations (from the previous smoking debate) may be one reason why the vaping risk debate was so fiercely contested by scientists, suspicious of vested interests and keen to ensure minimal distortion in the understanding of vaping risk to public health and safety by powerful groups.

Risk communication, expertise and policy makers

What is also important in terms of power is the ability of politicians (or policy makers) to shape the nature of expertise brought to bear on public health risk communication. For example, the analysis of the three case studies carried out in this thesis has highlighted the importance of stakeholder relationships in bringing about hegemony of a risk discourse. This may be a relationship between technical experts who are called upon to provide information (experts committees) and policy makers, or between other resourced groups (as seen in the case of tobacco) and policy makers. Since the vested interests of politicians or the need to promote a policy agenda by policy makers can also not be ruled out when something of human value is put a stake, it is necessary to pay attention to how expert (scientific) committees are constituted. This is essential in order to avoid cherry picking of technical experts who share similar policy ideas in technical verification of risk, which will have implications for the nature of interpretation bought to bear on risk in the policy domain. This is essential in order to avoid situations where policy decisions do not reflect local experiences, increasing the potential for those at risk to reject or undermine associated policy interventions. Such a situation exposes the individuals or the public to a higher level of risk and danger for longer than necessary. This may come with other negative consequences for public confidence in the ability of government and public health officials to protect public health.

In addition, it is necessary to consider how different stakeholder groups are able to access policy makers. The importance of this is that it may privilege some perspectives or worldviews over others by providing a platform where exchanges of views, values and ideologies are possible in a way that might enhance or disadvantage certain perspectives in policy making. For example, the privileged interaction of representatives of tobacco companies with policy makers in their negotiations on voluntary agreements allowed the industry to gain valuable insight into policy perspectives and present its arguments in a favourable manner. This may have

disadvantaged other groups (e.g. children with reference to passive smoking) brought about by the delay in legally binding policy interventions.

Risk communication as a way forward for public health and safety

One of the biggest challenges for public health risk communication in an everyday societal context is how to develop an appropriate public understanding and policy perspective to a risk, where there are multiple perspectives, values and strong power dynamics. This is significant considering the conclusion drawn in this study that 'power' in risk communication within its policy context may be expressed through technical expertise, control of communication and creation of trust (through scientific credibility). 'Expertise' *see* (Collingridge and Reeve, 1986, Jasanoff, 1996, Fischbacher-Smith, 2012); 'communication' *see* (Bernstein, 2003, Foucault, 1971, Smith, 1990, Fischer, 2003, Kasperson, 2012b) and 'trust and credibility' see (Kasperson, 1992, Löfstedt and Horlick-Jones, 1999, Frewer, 2003) have been recognised as key elements of effective public health risk communication. To reduce the chances of, or avoid the exploitation of these factors, attention must be paid to the notion of power, which is another important element that should not be ignored in the field of risk communication.

Therefore, one way of improving public health risk communication would mean opening up risk assessment and its policy debate for public input and scrutiny *(see section 11.4 for practical next steps).* It would entail drawing on the knowledge of multiple experts (including local expertise or those in close proximity to the risk) in risk communication especially in situations of uncertainty, ambiguity and complexity. Moreover, technocratic styles of policy inquiry pose a threat to the advancement of knowledge creation around risk, as interpretations of risk signals are not subject to the wider public scrutiny. Technocratic styles of policy inquiry also ignore the dynamics of bargaining that lie at the heart of democratic politics. Opening up public health risk communication recognises the different forms of expertise and acknowledges these differences as a resource instead of an impediment (Stilgoe et al 2006). It is an

approach similar to that of Irwin (2015)'s third-order thinking, which encourages a 'more critical reflection – and reflection-informed risk practice' (p.10). While, practical next steps are carefully set out in chapter eleven, the advantages of this approach must be clearly articulated here.

There are several advantages to this approach when communicating about public health risk and safety. Firstly, it allows normative concerns to be weighed in on the risk. This allow technical experts in charge of managing the risk to understand and learn about public concerns in a way that could feed into the interpretation brought to bear on risk signals. There is even the possibility that this may reduce the attraction of technical expertise being used or exploited to forge vested interests, and where honest negotiation of risk can occur in situations of risk and where values are a stake. Moreover, this creates an enabling environment for trust and relationship building between stakeholders (e.g. public and public health officials), which in the past has been damaged or tainted by public health risk controversies in the UK. Trust has been suggested to be generated through repetitive interactions (Adekola, 2012) and believed to promote openness, transparency, and honest dialogue. Therefore, it is necessary to pay attention to trust and relationship repair, and to improve on future public health risk acceptability debate and public uptake of scientific advice in the UK.

Secondly, it presents the opportunity to take advantage of advancement in information communication technology (ICT) and social media to engage the public in debates relating to risk. It also enables the public to understand the inevitable compromises and trade-off associated with risk issues and their policy formulation (Adekola et al., 2017) and avoids the pitfall of bringing risk information to the public with a deficient one-way model of risk communication, which is now recognised to be ineffective. This is important from the perspective that members of the public are increasingly able to engage in online research and assess information for themselves. However, it must be stated that sometimes such information may be false or incomplete (as seen in the Brexit debate) but still shape individual or group perception of the risk, and inform critical risk decision-making. In addition, if the public feels disempowered by the manner in which a risk is communicated and framed, it may reduce motivation to take

up any associated advice. Finally, it reduces the burden of dangerously trusting technical experts to make sense of risk in unfamiliar risk territory.

Having stated this, it is clear that any understanding of social amplification of risk, without consideration to the role of power and expertise in risk communication, will fail to provide a robust account of social amplification (or attenuation) processes. This will require a development of a modified version of the social amplification of risk framework that accounts for the role of power and expertise in the amplification (or attenuation) process that shapes risk perception (see chapter ten).

9.4 Summary of key points and conclusions

1. This chapter is a discussion chapter of empirical findings (presented in chapters six, seven and eight) through the lens of the policy evaluation risk communication framework (PERC). The analysis of the smoking, vaping and the MMR vaccine debate shows that the PERC framework was capable of explaining the transition of public health risk arguments between over critical and under critical advisory situations (models). Therefore, the evidence supports the thesis hypothesis that proposes that *social amplification of risk is the driver behind the transition of policy argument between over critical and under critical model.* However, more research is needed to empirically validate how behavioural responses shape the transition of risk argument between over critical and under critical models.

2. From the analysis and discussion carried out in this thesis, it concluded that 'power' in public health risk communication within its policy context might be expressed through technical expertise, control of communication and creation of trust (through scientific credibility). As expertise, communication and trust are critical elements of an effective risk communication, there is a need to pay attention the notion of power to avoid the exploitation of these factors.

3. The centrality of science and its experts in making sense of the risk faced suggested that technical experts are key influential amplification agents during unfolding public health controversies especially in the policy context.

4. The study also found that power in public health risk communication might create errors in the understanding of risk and cause delays in policy interventions, while having negative consequences for public health and safety. Unfortunately, the costs and benefits are unevenly distributed amongst different social groups and typically borne by poorer sections of the society. However, more research is needed to substantiate this argument empirically.

5. The next chapter ten will develop a modified model of the social amplification of risk framework, which accounts for the role of power and expertise in the amplification (or attenuation process). It provides a detailed account of the social amplification of risk as a multi-channel and multi-dimensional process.

10 Power, Expertise and Social amplification of risk framework

10.1 Introduction

This chapter provides a modified account of the social amplification of risk framework (SARF) based on the theoretical and empirical findings and discussion of power and expertise carried out in this thesis. The account of SARF presented in this chapter focuses on 'what' factors shape the social amplification (and attenuation) of risk and how they operate (see figure 9.1), rather than on the 'who' factors used in the existing conceptualisation of SARF, especially in the information mechanism stage. The emphasis on the 'who' factor in the existing conceptualisation of SARF neglects critical underlying and salient factors that shape social amplification (or attenuation) processes in public health risk communication. For example, the SARF was criticised for paying too little attention to the notion of power (Petts et al., 2001) and expertise in risk communication (see chapter three). Therefore, it was unable to explain the role of power and expertise in amplifying an argument within a set of arguments that privileges certain public groups over others in a risk discussion. Addressing these weaknesses in the existing conceptualisation of the SARF is essential, as the SARF is a key theoretical framework in the field of risk communication that shapes the understanding of individual and group perception and behavioural responses, and how risk is communicated. Moreover, the insight provided by the policy evaluation risk communication (PERC) framework, originally designed within the policy context in this study, provides valuable evidence on how power and expertise shapes social amplification or attenuation of risk that is applicable in broader contexts. Therefore, this can be used to address adequately the failing of the SARF.

This current account of SARF is built on the assumption that social amplification of risk is a multi-channel and multi-dimensional process (Fischbacher-Smith et al. 2012). It views risk communication as a field of play and competition (Petts et al., 2001), where each actor responds to the action or (inaction) of the other in an effort to win the risk argument and compete for resources, such as health or profit. Insight from this study's PERC framework suggests that power, expertise, communication and trust/credibility are critical factors driving social amplification (or attenuation)

processes in public health risk communication, so that one argument becomes dominant in relation to policy. This aligns with the views expressed in other studies, such as Petts et al, (2001) that competition in risk communication revolves around four key aspects. These are: (i) institutional and structural factors shaping the risk agenda and debate; (ii) legitimacy of who has the authority to speak; (iii) control of communication, over when and what is made visible or concealed and on what basis; and, (iv) whose perspective is believed and trusted (Petts et al., 2001). Within these, processes involving the nature of power and expertise, and communication and trust shape the arguments brought to bear on risk communication. Together, these factors determine whose interpretation and framing of reality is believed and legitimised within the policy context.

The following sections begin by re-highlighting the weaknesses in existing conceptualisations of the SARF (see section 3.2 for more details) and then provide a detailed account of social amplification of risk from the power and expertise perspectives. The account of SARF provided here is based on insight from the literature (see chapters one to four) and the analysis of the evolving events (see chapters six to nine of this thesis). Four hypothetical scenarios were then created in order to highlight the impact (both positive and negative) of power and expertise for social amplification (or attenuation) processes, and the implication this has for risk communication and public health. From the analysis of the evolving events within the three cases studied, the study drew the conclusion that '*power' in public health risk communication as it relates to policy making may be expressed through technical expertise, control of communication and creation of trust (through scientific credibility).*

10.2 Weakness in the Existing Conceptualisation of SARF

In chapter three of this thesis, a critical review of the SARF framework led to the identification of several weaknesses of the framework see (

Table 3.2). Within this, it was observed that the SARF over-emphasised the 'who' factor (that is, sources, channels and transmitters) especially 'the media' in amplifying (or attenuation) risk signals. While this is valuable, it ignores underlying factors, such as power and expertise that condition the amplification (or attenuation) process of risk, especially in the information mechanism stage of the SARF. It is on this basis, that the alternative perspective of SARF is presented here. This account of SARF is built rather on the assumption that social amplification of risk is a multi-channel and multi-dimensional process (Fischbacher-Smith et al. 2012). This perspective recognises the dynamic representations of the different stakeholder groups (Pidgeon et al., 2003) and makes a radical move away from the view that sees the media as the primary amplifier. The assumption here is that scientific experts and the science they know, understand and communicate are powerful influences that may thereafter form the basis of debate, mediated by the other groups (including the media). This suggests that social amplification of risk may have even occurred before it reaches the overt risk arena, as a result of expert technical identification, construction and communication of the risk. This assumption is in line with the views of Irwin (2015) who argued that there is a recurrent predisposition among political, regulatory and scientific institutions (charged with the responsibilities of managing the risk) to separate the processes of knowledge production and risk communication.

10.3 Social Amplification of Risk as a Multi-Channel process

A critical review of literature and insight from the analysis of the smoking, vaping and MMR vaccine debates suggests that risk signals may arise directly from personal experience of a risk, or through third party sources such as professional experts, government officials, activist groups, social networks, and media sources (Kasperson et al., 1988). This suggests that social amplification of risk occurs through multiple channels (Fischbacher-Smith, 2012). In reality, stakeholder groups engage in a two or multi-way exchange of information (or both) which sets out the parameters of communication process as an interactive one. This multi-channel and interactive process that may allow social amplification to thrive include the (simultaneous) use of

different communication channels or sources such as (a) internet websites sites (for example, the department of health launch of a new website - 'MMR: The facts' during the MMR vaccine controversy, to give parents information about the vaccine and the scientific studies supporting its safety including general news on the controversy. The website also allows interested persons to ask question or raise concerns with member of the department directly); (b) exchange of information via main stream media (e.g. recurrent tendency of expert debates, or press releases); (c) using social media sites such as Facebook and twitter to communicate about risk; a medium which is on the increase in recent decade and; (d) the use of poster campaigns and mail shots (used by the Health Education Authority when it issued two and a half million copies of the leaflet *'MMR: The Facts'* to parents and health workers in order to calm fears over a triple vaccination for measles, mumps and rubella. Other channels identified in literature are documents, reports, articles, laws and regulation, meetings and seminars (Jönsson et al., 2016). The use of multiple channels of risk communication to engage different groups within the public allows social amplification of risk to occur through multiple channels.

Regardless of the source or medium of communication, the main purpose of the process is for the information to reach the general public or the targeted audience with whom the information sender enters into information exchange relations. While the media has, for instance, remained an established means by which stakeholders engage in negotiation or deliberation over the identification, definition and communication of risk (Eldridge, 1999, Pett et al., 2001), these other channels of communication are also critical in these processes of political struggle. For example, the advancement in information communication technology (ICT) and the rise of social media and mobile communication is increasingly becoming pivotal in exchanging information, expertise and opinions. Moreover, it comes with the advantage of increasing the potential of multi-layered interaction, widening access to relevant information and expertise, easy identification of discourse coalitions, support, and surveillance, and ultimately, has the potential to exert influence upon policy choices (Moorhead et al, 2013).

The transmitter in risk communication has two roles in the communication process: (a) to receive information from sources; and (b) to process this information like the final receiver. It is within this process of encoding, transmission, decoding and re-coding that social amplification of risk occurs. For example, social amplification (or attenuation) may occur with personal selection filters and evaluation strategies, or professional and institutional rules governing the selection of received signals and their interpretation (Renn, 1991a). Journalists for instance, follow specific professional guidelines (e.g. hearing both sides in a controversy), as well as institutional rules such as the required editorial style and fulfilling the expectations of the perceived target audience of the medium in question (Petts et al., 2001). Social amplification (or attenuation) infuses this subjective act of value judgement. Moreover, recoding the risk message involves conscious or unconscious changes in the original information material (Renn, 1991a). For example, the choice of storyline, discourse, and framing or even the integration of a message from several sources by adding or removing comments, pictures or tune may serve to amplify or reduce risk. The understanding and re-coding of the incoming message through multi-channels is an integral part of the transmitting process and may serve to intensify or reduce risk magnitude and its consequences through multiple channels.

The amount of reporting and coverage (which although tending to signify the importance of the risk issues in the face of competing newsworthy events) only provides further layers for amplification. As a result, it is wrong to assume that the media is the main amplifier, as suggested by existing conceptualisation of SARF. This view corresponds to those of other studies such as (Petts et al., 2001) and may be one reason why Pett et al, (2001) fiercely refute Kasperson et al. (1998)'s claims that the media is the main amplification station. Social amplification of risk by expert groups may have occurred even before it reaches the public domain as a burden of proof debate within scientific discourse (especially where the experience of the risk is not one of a direct experience). What is more, insight from the analysis from the smoking, vaping and MMR vaccine debate has shown that technical experts are key influential amplification agents during unfolding public health controversies within the policy context because they play central roles in the identification, negotiation and

communication of risk. Therefore, the first impact of social amplification of risk may arise from the interpretation and framing of risk by experts (who observe the risk) but also those who experience the risk first hand. This first set of interpretation may then be re-interpreted and transmitted to further audiences, which may also lead to further amplification (and attenuation) of the risk signal.

Having discussed social amplification of risk as a multi-channel process, the following section discusses social amplification of risk as multi-dimensional process. Social amplification as a multi-channel process considered the sources and medium of risk information exchange. Social amplification of risk as a multi-dimensional process will now focus on factors that enable or constrain different stakeholder groups to influence risk-related agendas; to control communication and trust, including the nature of expertise brought to bear on risk in a way that permeates the entire public health communication processes.

10.4 Social Amplification of Risk as a Multi-Dimensional process

Insight from this study's PERC framework suggests that power, expertise, communication and trust are key factors driving social amplification (or attenuation) processes in public health risk communication within the policy context. Further analysis of the debates suggests that 'power', 'expertise', and 'communication' are important factors shaping the information mechanisms of risk. Trust on the other hand, were found to be a critical factor driving the response mechanism of social amplification of risk (as will be argued here).

10.4.1 Information Mechanism

The information mechanism of the SARF concerns the exchange of information about the risk (Kasperson, 2012b) including factors that shape (constrain and enable) the risk information exchange process.

Power

The analysis of the smoking, vaping and MMR vaccine debate suggests that there are multiple dimensions by which social amplification (or attenuation) of risk may occur. These include institutional, productive and structural factors that enable certain persons, issues or perspectives to gain dominance in a risk arena. For example, the analysis of the smoking risk debate shows how the medical research council and ministry of health exercised non-decision making (institutional) power (Bachrach and Baratz, 1962) by prioritizing inquiry into the relationship between smoking and lung cancer in the 1950's. The World Health Organisation also exercised such institutional power when it raised concerns about the uncertainty in the understanding of the safety and efficacy of electronic cigarettes (EC) as a smoking cessation aid. This directed the focus of the initial research of electronic cigarette into the safety and efficacy of electronic cigarettes (EC) as a smoking cessation aid. Similarly, public health authorities that determined what questions were asked in assessing the erroneous suggestion that the MMR vaccine was linked to autism exercised this institutional form of power. The ability of these public health institutions to identify that an uncertainty is significant to public health and safety is such that it draws attention to that particular arena, increasing its potential to exert influence upon a risk debate. This suggests that power lies in the ability of stakeholder individuals or groups to influence a risk agenda, which shapes the context, and the risk issues that are deliberated upon in a risk arena.

Power can also be exercised through mediated sources (such as technical expertise or media sources) whereby the public makes sense of the risk faced, which in turn shapes its perceptions, desires and needs (Lukes, 1974, Lukes, 2004). In the analysis of the

smoking, vaping and MMR vaccine debates, technical experts can be seen to play a central role in making sense of the risk faced in the identification, construction and communication of the risk *see also* (Collingridge and Reeve, 1986, Jasanoff, 1996, Fischbacher-Smith, 2012). The analysis also suggests that media sources are crucial in echoing these interpretations further. A good example of how technical expertise and the media shapes public perception is when Andrew Wakefield fraudulently suggested a link between MMR vaccine and autism, despite the fact that his research did not constitute proof of a link. Surely, it was his personal interpretation in the press conference before the publication of his paper and its subsequent presentation in the media that fuelled parents' concerns that MMR may in fact be linked to autism. This suggests that where there is residual uncertainty and where something of human value has been put at stake in the interpretation of risk signals, the potential for deceit and bias in technical expertise brought to bear is enhanced. The danger here is that such misconception may be echoed by media sources and carry to larger sections of the public in such a way that may create false perceptions.

Another dimension where power may be exercised to bring about social amplification (or attenuation) in risk communication is in direct and specific relationships between stakeholder groups (Barnett and Duvall, 2005). A typical example is how representatives of the tobacco industry sought to shape policy development through voluntary agreement with the UK Government on how to regulate tobacco sale and advertisement. This enabled them to develop a social and professional relationship that enabled them to gain insight into policy thinking, strengthening the industry's political positions and making possible exchanges of view in a way that exerted influence on risk acceptability debates and policy decision.

Expertise

As noted above, the analysis and discussion on expertise carried out in this study suggest that technical experts play a dominant role in helping the public make sense of the risk they face. However, a critical review of literature on 'expertise' and the analysis of the smoking, vaping and the MMR vaccine debates raised some caution around how technical expertise is used as a sense making aid in policy inquiry relating

to risk. Insight from the critical review and case study analysis suggests that technical experts and the nature of interpretation brought to bear on risk signals are shaped by many factors that may allow social amplification of risk to thrive. These include the epistemology and methodological orientation of scientists (Furlong and Marsh, 2010), paradigm blindness (Fischbacher-Smith, 2012), intrusion (Castel et al., 2007), motivational bias (Tversky and Kahneman, 1973, Slovic, 1993, Shrader-Frechette, 2010), organisational conditions and vested interests, as seen in the MMR vaccine debate arising from Andrew Wakefield's fraudulent claims (*see also* section 2.5 for in-depth discussion on expertise).

The significance of these intervening variables lies in how they shape the nature of interpretation brought to bear on risk signals and how technical experts engage with other available expertise (or local expertise) in their interpretation of the risk. For example, Furlong and Marsh (2010) argued that the ontological and epistemological position of scientists shapes their approach to theory, while the methodology that scientists use impacts on how they interpret risk signals. Having said this, where there is large residual uncertainty combined with vested interests, it is possible for technical experts, who often have the privilege of authority or dominate process of making sense of risk signal, and introduce bias into their selection and use of theories and methods in a way that may amplify or attenuate their interpretation of the risk. This also determines how and the extent to which they engage with local expertise (if they engage with it at all). Andrew Wakefield's MMR vaccine scaremongering continues to be a good example of how technical expertise and bias (brought about by vested economic interest, lies and deceit) shapes expert selection of evidence (where he cherry picked children showing signs of autism in his study) and interpretation of risk signals. Similarly, the smoking debate gives further credence to how bias can be introduced into expert interpretation where there is vested capital interest, as observed in how the tobacco industry attempted to debunk the link between tobacco and lung cancer for many decades.

In an ideal modern day risk communication, it would be expected that technical experts engage with local expertise (that is, the expertise of those who encounter the risk in

their day to day activities) to ease the burden of proof on technical experts, but also to improve on the robustness of evidence upon which decision makers and those who experience the risk can rely. This is because risk assessment decisions, as correctly suggested by Furlong and Marsh (2010) and other scholars, such as (Wynne, 1996, Stilgoe et al., 2006b, Stilgoe, 2007, Fischbacher-Smith, 2012, Irwin, 2014b, Welsh and Wynne, 2013), are value laden. As such, technical experts alone should not to have dominance or control in risk assessment and communication decisions, especially where there is large residual uncertainty and where something of human value is at stake. Public discussions (which go beyond science) play an important role in accounting for evidence, and the nature of expert opinion when it is not over-reaching (Brown, 2016). It reduces the potential for distributive inequities in risk decisions (Shrader-Frechette, 2010) and the discounting of local expertise, which in some cases may prove significant in pointing to public concerns and solving gaps in knowledge (Wynne, 1996, Stilgoe et al., 2006b, Stilgoe, 2007, Fischbacher-Smith, 2012, Irwin, 2014b, Welsh and Wynne, 2013). However, it is necessary to pay attention to the underlying and established structures of power that determine the risk agenda and who has the authority to speak (based on institutionalized perceived power position of technical expertise), to one where ideas and human experiences (Noväng et al., 2015) are central in public discussion of risk.

Communication

The thesis analysis and discussion on communication suggest that there are multiple ways in which communication may bring about social amplification (or attenuation) of risk. First, the nature of language used in the risk communication (debate) including the language used to qualify the risk. For example, where the language of uncertainty is used, the ability of stakeholders to refute or undermine damaging arguments is enhanced. The opposite is the case where language of certainty is used (especially when backed up with perceived credible scientific evidence and sources). This is exemplified in how representatives of the tobacco industry framed their arguments within the context of uncertainty, pointing to a lack of causal proof in the technical case made against smoking and lung cancer. Hence, they were able to create doubt in

the mind of the public, raising questions around the validity of such claims. The manner by which risk is framed may also amplify or reduce the perception of the risk.

In addition, communication may serve to heighten or reduce public concern through the quality of and interactive nature of feedback available that determines how risk is decoded. Two-way communication processes allow for clarification of meaning and discussion of sensitive issues. For example, the Department of Health's creation of a new website, 'MMR: The facts' gave parents easy access to the relevant information and also enabled them directly to question expert members of the Department of Health, which reduced the potential for amplification (or attenuation) of the risk concern by other mediated sources. Other important ways in which communication may bring about social amplification or attenuation of risk and which are already noted in literature are discourse characterisation of the risk (Kasperson, 2012a) and the source and channel of communication (Renn, 1991a).

10.4.2 Response Mechanism

The response mechanism is suggested to be the second major stage of social amplification of risk (Kasperson et al., 1988). A critical review of literature on 'trust' and the analysis of the smoking, vaping and the MMR vaccine debates suggests that trust is a key element driving individual or group behavioural responses to risk (Frewer, 2003, Earle and Siegrist, 2008), including how value was decoded and attached to the risk information received.

Trust

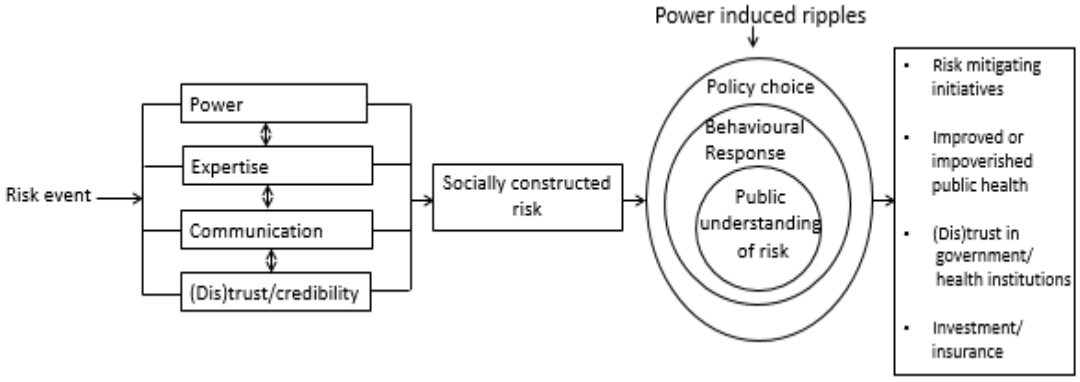
The findings in this study shown that 'trust in' and 'perceived credibility' of expert sources contributes to ease risk acceptability debate in terms of how decision makers take up expert interpretation and scientific advice. For example, key government

advisory bodies accepted Richard Doll and Bradford Hill's conclusion linking smoking to lung cancer (described by him as a 'real association') and as such shaped the policy perspective taken to smoking risk. This acceptance would have been based on some of level of trust in the credibility of Doll and Hill's research by these public experts who commissioned the report. According to Petty and Cacioppo (1984) trust contributes to how evidence and interpretation are received and scrutinised, which may serve to reassure (or alarm) the decoder. However, distrust, contributes to heighten tension and to fierce scrutinising of the arguments of those on the other side of the argument. The analysis of the smoking and vaping debate also suggests that (mis)trust has temporal and spatial effects, evident in how the lies, deceit and dishonest behaviour of representatives of tobacco industry in the smoking debate impacted on the nature of trust brought to bear on the vaping debate.

These four factors (power, expertise, communication and trust) are the means by which an argument within a set of risk arguments may become amplified in a policy context and as such, they are the means whereby 'power' may be expressed in public health risk communication as it relates to policy making. The above account of SARF as a multi-dimensional process is depicted in understanding of risk.

Figure 10.1 which shows how power, expertise, communication and trust shapes the public understanding of risk.

Figure 10.1: Alternative perspective to social amplification of risk



Ripple Effect

As depicted in understanding of risk.

Figure 10.1, the outcomes of power, expertise, communication and trust that bring about social amplification (or attenuation) of certain aspects of risk shape the socially negotiated risk. The negotiated understanding of risk forms the basis for policy interventions and individual and group responses to these, which ultimately shape public understanding of the risk. Instead of Kasperson et al (1988)'s linear model of ripples spreading out from a stone dropped into water, which suggest that amplification also occurs even in its transmission, this account of SARF suggests that this (amplification in its transmission) might not always be the case, since the waves will find traction in certain areas (due to the expression of power by different stakeholders) as they continue to respond to the action or inaction of the other. In other words, the ripples will be differential in their dispersion and impact. These behavioural responses and the evolving nature of evidence and information may create real consequences (or secondary impacts) including social-political, economic (e.g. investment and insurance) and improved or impoverished public health and safety.

10.5 Four Hypothetical Scenarios of Social Amplification of Risk and the Implication for Risk Communication and Public Health and Safety

One key conclusion drawn from the critical review of literature and the analysis of smoking, vaping and MMR vaccine debate is that *power may be expressed through technical expertise, control of communication and creation of trust (through scientific credibility).* This conclusion highlights the importance of power, expertise,

communication and trust in shaping the social amplification (or attenuation) processes in public health risk communication as argued and evidenced throughout this thesis.

Table 10.1 further highlights the importance of these factors by giving illustrative scenarios of how they shape the social amplification (or attenuation) of public health risk and the implication this has for public health and safety. This was done by creating hypothetical scenarios that highlight how social amplification of risk affects different stakeholder groups. This hypothetical scenario can also be used as a framework by risk regulator or experts in accessing risk within a local context. In particular, to understand how salient factors such as power and expertise may create problems for public health risk communication, especially where the management of the perception of risk is crucial. This also makes a further case for the need to pay attention to the notion of power and expertise in risk communication, hence, highlighting further the significance of this study.

Table 10.1 Hypothetical Scenarios of Social Amplification (or attenuation) of Risk and Implication for Public Health

Scenario	Scientist	Media	Policy makers	Population at risk	Organizations
Over use of power of experts by stakeholder groups with conflicting science.	Not affected directly but the value of science and expertise diminishes in the eyes of (individuals, groups or policy) decision makers.	Presenting conflicting information to the public leaving the conclusions to different media outlets.	Cannot use evidence well. Rely on perception and uninformed debate. Politicizing policy decisions.	Confused. Do not engage or disengage having been alerted to the risk issue. Ignore science (and scientific advice).	Not sure how to intervene to solve problems. Ignore the risk issue in business endeavours. Exploit the situation.
Extreme exercise of salient (e.g. institutional, economic and structural) power in risk communication.	Influence the direction of science in the technical verification of risk.	Some risk issues do not make it in to the risk agenda therefore leading to one-sided reporting of the risk issue.	Disadvantages certain perspective in policymaking. Creates scenario where policy decisions do not reflect the risk experience of locals.	Science may not reflect local experience or expertise. Heighten the potential for resisting science and policy intervention.	Enjoy benefits or suffer loss in the public understanding or policy perspective taken to the risk.
Inappropriate exercise of power to control communication (who says what, when, how and how much).	May not understand or have the full access to evidence and interpret the risk in its totality. Increasing the potential to introduce bias and intrusions where gaps in knowledge exist.	Unable to access the requisite expertise, information or evidence to make sense of the risk faced by and to the public.	Cannot decode meaning in or access relevant science to make informed policy decision.	Unable to engage in risk debate. Rely on the interpretation of third party sources increasing chances of errors in understanding.	Produce own science which may be costly to generate or rely on third party sources to make business decision
Over use of power to create trust through science and its experts.	Relied on to make sense of risk signal even where margin of errors or large uncertainty exist.	Re-echoing the interpretation of science as if it were the ultimate truth creating false perception.	Dangerously trusting technical experts. Reduced preparedness for emergent conditions.	Dangerously trusting science and its experts in the interpretation taken to risk in decision-making.	Rely on expert interpretation in business decisions.
Social and Health consequences	Errors in understanding the nature of risk. Undermines the value of science in risk decision making.	One sided story telling. Media blamed for emergent conditions and undesired behavioural responses.	Delay in appropriate policy interventions. Loss of trust in government officials to protect public health.	Longer period of exposure to health risk and danger due to errors in the understanding of risk.	Raises moral and ethical debate (CSR) in business conducts.
Positive outcome	Raise research interest and creates knowledge in certain domains of risk	Raising awareness of some potential risk and danger	Policy consideration of (some aspect of) the risk issue	Risk awareness	Consideration of (some aspect of) the risk issue in business decision

10.6 Summary of Key Points and Conclusion

The aim of this chapter is to provide a modified account of the social amplification of risk framework (SARF), based on the findings and discussions of power and expertise carried out here and also evidence from the extant literature. The account of SARF provided here focuses on the 'what' that factors shape amplification (and attenuation) in public health risk communication (see figure 9.1) and how they operate, especially in the information mechanism stage. The SARF was criticised for paying too little attention to the notion of power (Petts et al., 2001, Goodby, 2004) and the role that expertise can play within the processes of risk communication (see chapter three). In addressing these weaknesses, the perspective of social amplification of risk provided in this chapter builds on the assumption that the social amplification of risk is a multi-channel and multi-dimensional process (Fischbacher-Smith et al. 2012). Power, expertise and communication were identified as factors shaping the information mechanism of social amplification of risk. Trust was identified to be a key element shaping the response mechanism of the SARF. Further research will require this account of SARF to be used on an international basis to test for its robustness, usefulness and to check for errors.

The next chapter (eleven) summaries the research work carried out in this thesis, illustrating how the thesis addressed the study aims and objectives set out in chapter one, and also sets out a series of recommendations for further research. Best practice in risk communication, especially as it relates to policy-making, is also offered, based on insights drawn from this study. The main contributions and the limitations of this study are also set out in the final chapter.

11 Recommendations and Conclusions

11.1 Introduction

This research set out to explore the role of power and expertise in public health risk communication as it relates to policy making. In particular, it sought to address the question of *how does an argument within a set of risk argument become amplified in a policy context.* The social amplification of risk framework (SARF) was used as lens to investigate this question from the risk perspective and was therefore critically reviewed (in chapter three). The identified weaknesses of existing conceptualisation of the SARF formed the basis of the literature review that followed in that chapter. The over critical and under critical models were further used as a framework to assess the research question within its policy context (see chapter four). The synthesis of this study perspective of social amplification of risk with the over critical and under critical models, led to the development of a new model - the policy evaluation risk communication (PERC) framework (see chapter four), aimed at explicitly addressing the study research question. The PERC framework was empirically tested (in chapters six, seven and eight) using three public health risk debates as situational context to investigate the issues under consideration. Further discussion and cross case analysis of the empirical findings was carried out (in chapter nine) through the lens of the PERC framework. The critical review of the literature (in chapter three) and the study's empirical findings were then used to advance existing conceptualization of the SARF (in chapter ten).

This conclusion chapter (eleven) summarises the knowledge and understanding gained from the study findings and discussions in the preceding chapters. Also presented in this chapter are recommendations for best practice public health risk communication and future research. There is also a personal reflection of the Ph.D. journey highlighting the limitations of study.

11.2 Summary of the Study

Chapter one of this study set out the problem space that laid down a foundation for the research. Three research aims were identified:

(a) Examine the role of power and expertise in risk communication in a policy context;
(b) Design a (or extend an existing) framework to understand how certain risk argument becomes dominant in a policy context;
(c) Draw lessons and identify best practices for public health risk communication as it relates to policy making.

A review of extant literature on the construction of risk and risk communication was carried out to set the study perspective of these ideas. The discussion of risk and risk communication was further contextualised within the policy context in chapter two. A critical review of the role of expertise within policy inquiry was also conducted in chapter two. Chapter three provided an account of the social amplification of risk framework (SARF) and then explored key concepts within the literature that can inform the critique of the framework. Based on insight from the inter-disciplinary literature review carried out in chapters one, two and three, two research gaps were identified. Firstly, understanding the role of power in public health risk communication remains weak and poorly documented in the extant literature. Secondly, the negotiation of policy arguments between over critical model (contested science) and under critical model (policy consensus) requires further investigation (Fischbacher-Smith, 2012). However, it must be noted that these two issues are linked with reference to the role of power and expertise in risk communication. Based on the identification of these two research gaps, the study research question was designed - how does a set of risk arguments evolve such that a particular perspective becomes dominant in a policy context?

The synthesis of insights from this study's conceptualisation of social amplification of risk framework and over critical and under critical models led to the development of a new model: the policy evaluation risk communication (PERC) framework (see section 4.7). The PERC framework is based in the hypothesis that social amplification (or attetuation) of risk is the driver behind the negotiation of public health risk argument between the overcritical model and under critical model in a science-policy relationship. Within the PERC framework, power, expertise,

communication and trust are identified as key factors shaping the amplification (or attenuation) processes in public health risk communication as it relates to policy making. Collectively, these salient factors drive the negotiation of risk argument between over critical and under critical models.

Chapter five presented the methodology and methods and explained why a case study approach was adopted. It also discussed in details the sources and processes of data collection, the data analysis and how the data was interpreted so as to inform the insights that followed in chapters six, seven and eight. Chapters six, seven and eight represented the finding and analysis chapters of this thesis. Public health risk debates were used as a situational context to investigate the research aim, due to its increasing trend in the UK (see section 1.5). In chapter nine, findings from the three case studies were discussed through the lens of the policy evaluation risk communication framework, and implications for risk communication outlined. The knowledge gained from the findings and analysis and discussion chapters of this thesis informed the philosophical remodelling of the social amplification of risk framework.

11.3 Synthesizing findings with the study research aim and objectives

Research aim one

The first aim of the study was to examine the role of power and expertise in public health risk communication within a policy context. The summary of findings are set in (

Table 9.2). Insights from the literature (see section 3.3) and the analysis and discussion (in chapters six to nine) led the study to conclude that 'power' in risk communication is embedded within institutional, productive, and structural forms of power. Further in-depth analysis of the smoking, vaping and MMR vaccine debates suggest that 'power' in risk communication may be expressed through technical expertise, control of communication and creation of trust (through scientific

credibility) (see chapter nine). Further analysis of the smoking, vaping and MMR vaccine debate suggests that those with economic and political power (agenda control and decision making power) demonstrated a greater ability to influence the technical expertise brought to bear on risk. An example of this concerns how representative of tobacco companies were able to engage and attack the technical case linking smoking to lung cancer using science through their own technical experts.

The economic power of the tobacco industry was observed to enhance its ability to establish social and professional relationships with policy makers (extending their structural power) through entering in into voluntary agreements, thereby obviating the need for formal legislation. From the analysis of the smoking, vaping and MMR vaccine debate, it was also found that those in charge of managing public health influenced the technical expertise brought to bear on risk through selection of members for expert committees who acted as advisors to policy makers. Furthermore, powerful individuals or groups who embodied the requisite knowledge and expertise were able to use their authority to shape risk communication (as seen in the MMR vaccine debate where Andrew Wakefield's suggestion that MMR vaccine was linked to autism triggered a controversy that saw for the first time a drop in vaccine uptake). When combined with vested interests (e.g. reputation, economic or professional gains), this could present a salient avenue of power in risk communication due to the perceived credibility of science and its experts that may disadvantage other credible risk perspectives

In terms of expertise, insight from the literature (see section 2.4 and 2.5) and the analysis and discussion (in chapters six to nine) suggest that technical experts play a dominant role in public health risk communication within its policy context This has become an area of contention within the extant literature, *see* post-positivist scholars (Wynne, 1989, Wynne, 1996, Smith, 1990, Irwin, 1995a, Fischer, 1998, Funtowicz and Ravetz, 2003, Stilgoe, 2004, Renn, 2008). Moreover, the analysis of the smoking, vaping and MMR vaccine debate suggests that there was a seeming

disregard for or discounting of other forms of expertise. A typical example is the case of the MMR vaccine debate where parents' observations and concerns were initially dismissed (see chapter seven). The centrality of science and its experts in making sense of the risk faced, led to the conclusion that technical experts are key influential amplification agents during the unfolding of public health controversies, especially in a policy context. This aligns with other studies that suggest that science and its experts are the means by which risk is identified, communicated and validated (Collingridge and Reeve, 1986, Jasanoff, 1996, Fischbacher-Smith, 2012).

The nature of communication or language in use was also identified as a key element in the amplification (or attenuation) process of risk. The analysis of the smoking debate (see chapter six) reveals how power may be exercised through the use of languages of (un)certainty (see Table one in chapter six). For example, representatives of the tobacco industry were able to attack the technical case made against smoking and refute damaging claims made against tobacco cigarettes by highlighting the uncertainty in the knowledge of the risk argument. Trust was also found to be essential in the perceived credibility of the stakeholders arguments brought to bear on the risk debate. For example, trust in the perceived credibility of industry representatives was implicated in the vaping risk debate as a result of many years of lies and deceit during which the tobacco industry engaged in attempts to cover-up evidence that smoking was linked to lung cancer and other diseases. This raised concerns about the credibility of the arguments of corporations, which were seen to be enjoying economic benefit associated with the product. The knock-on effect was that it created a lot of tension around the vaping risk acceptability debate; this was one reason why the debate around the regulation of ECs was so fiercely contested (see analysis of the vaping in chapter seven).

The study also found that errors in the understanding of risk, and delays in policy interventions have negative consequences for public health. Unfortunately, the cost and benefits are unevenly distributed amongst different public groups (see Table 6.5, event iii). For example, the second Royal College of Physicians Report, *Smoking and Health Now* published in January 1971 refered to cigarette smoking as a present day

"holocaust" and suggested a clear socio-economic divide in smoking behaviours. For example, those in professional classes (e.g. doctors) were giving up smoking, while people in manual and unwaged groups maintained their smoking behaviour (RCP Report, 1971). This suggested there are distributive inequalities associated with errors or inadequacies in the understanding of risk and government action or inaction. This therefore, supports the argument that the powerless (typically the poor) suffer the consequences of inadequacies or errors in the public understanding of smoking risk.

Research aim two

The second aim of this study is to design a framework or extend an existing one to understand how certain risk arguments become dominant in a policy context. This aim was addressed through the development of the PERC framework (in chapter four) and the extension of the SAR framework (in chapter ten).

Research aim three

The final aim of this study is to identify and recommend best practice public health risk communication in a policy context. This is outlined in the section (11.4) that follows.

11.4 Best Practice Public Health Risk Communication in a Policy Domain

An open, engaging and transparent process of risk communication

The findings from the investigation carried out in this study provide a number of opportunities to improve on public health risk communication and its related policy development. Chief among these is the opportunity for policy makers, risk regulators, and stakeholder representatives to engage in a more open, engaging and transparent process of risk identification, communication and validation that

involves the exchange of multiple levels of expertise, views and information. Policy development relating to public health and safety already rely on the use of technical expertise (Wynne, 1989, Wynne, 1996, Smith, 1990, Irwin, 1995a, Fischer, 1998, Funtowicz and Ravetz, 2003, Stilgoe, 2004, Renn, 2008) as a means to make sense of the risk faced. However, using these means alone can serve to reinforce misconceptions and misunderstandings about the nature of possible threats to public health and safety. The empirical findings from the analysis of smoking, vaping and MMR vaccine debate carried out in this study highlight the idea that scientific interpretations must be treated with caution and not as more reliable than they are. This is important for the viewpoint that suggests that 'technical expertise is domain specific' (Schneider et al., 1989, McGraw and Pinney, 1990, Smith and McCloskey, 2000, Castel et al., 2007) since it is necessary to acknowledge a reduced validity of technical expertise where there are unknowns or large residual uncertainties or when dealing with interdisciplinary issues.

Since many public health risks are interdisciplinary (Fischbacher-Smith, 2012), there are bound to be gaps in knowledge which may be subjected to intrusions, bias and paradigm blindness (*see* section 3.4). The significance of this (according to the analysis of smoking, vaping and MMR vaccine debate) lies in the imbalance of power amongst the different stakeholder groups, and the ability of powerful elite groups to acquire the necessary technical expertise and other professional means to shape public health risk communication and exert influence upon public perception and policy perspectives taken to risk.

The importance of local (experiential) expertise in risk communication

Local expertise and those in close proximity to a risk are highly important in developing an understanding of and framing a public health risk (Wynne, 1996, Stilgoe et al., 2006b, Stilgoe, 2007, Fischbacher-Smith, 2012, Irwin, 2014b, Welsh and Wynne, 2013). It has been highlighted in the literature that local expertise could serve as a target (Stilgoe, 2004) for scientific research in such a way that could lead to co-production of knowledge about risk. It could also ease the burden of proof on

technical experts and improve on the robustness of evidence upon which decision makers and those who experience the risk can effectively rely. This is important as risk assessment decisions are value laden (Wynne, 1996, Stilgoe et al., 2006b, Stilgoe, 2007, Fischbacher-Smith, 2012, Irwin, 2014b, Welsh and Wynne, 2013, Furlong and Marsh, 2010). Moreover, it allows us to draw on expertise and insights that lie outside normal scientific boundaries, which could provide a unique perspective to risk that would otherwise not have been considered in a scientific setting (Stilgoe, 2004).

If the public feel a sense of disempowerment, this may discourage them from taking up public health advice. Besides, this eases tension around risk tolerance and acceptability debates as compromises and trade-offs associated with risk issues will be well understood by the public (Adekola et al., 2017). Local expertise, even if anecdotal, forms important bricks that build or provide a viewing perspective that shapes risk perception in a way that may lead to estimation of the likelihood of outcomes (Rosenbaum, 2016) and bring technical data alive (Covello, 2003) with careful and systematic filtering (Bates and Byrne, 2007). As such, a paradigm shift is necessary from the reductionist view that considers local expertise or knowledge of those in close proximity to the risk as inconsequential or bad science, to one that acknowledges its relevance in shaping risk perception and understanding of risk, *see* (Irwin, 1995b, Irwin, 2015). Furthermore, drawing on local expertise reinforces the view that suggests that risk assessment should consider the views of all stakeholder groups (Bennett, 2010) and it is the means by which the less powerful can call to account those charged with the responsibility of managing the risk.

The role of the media

Having stated this, the media and academics have a role to play here. The media play a critical role (Lichtenberg and MacLean, 1991) in information exchange and sharing of expertise (Murdock et al., 2003) since the media tend to be accessible to the majority of society and are largely relied upon as a means of making sense of risk. Media sources can also have vital influence in shaping the policy agenda as well as

set the agenda for public discussion of risk issues (Lupton, 1993). However, advances in ICT and the rise of social media (Wendling et al., 2013, Gutteling) have enhanced the abilities of interested stakeholders within the risk arena, by use of new ways of directly reaching the wider public. In addition, the growing use of digital media by traditional media organisations has extended further their reach (Petts et al., 2001). It is however, more useful to think of mainstream media and social media as two parallel media sources rather than as one more authentic than the other (Petts et al., 2001). Formal media outlets have a moral obligation to engage multiple levels of expertise (including the experiences and expertise of those who encounter the risk) to ensure a robust and balanced view that helps the public to make sense of health risks. This is particularly important in the social media age where it may be difficult to discern the differences between credible arguments from propaganda when dealing with public health risk issues or emergencies. The media also have a role in reflecting the diversity of public concerns, more explicitly bringing these to the consciousness of experts, academics and politicians, and highlighting uncertainties where they exist.

The role of Academics or Technical Experts

Academics or technical experts also have a role here. It is necessary for academics to acknowledge the relevance of local expertise (Irwin, 2015) or the experiences of those in close proximity to the risk when they identify, interpret and make sense of risk signals. Academics must do more to counter the enduring ideology that the experience and expertise of those in close proximity to the risk is ‘anecdotal’ and therefore ‘bad science’. Rather they should adopt one that sees space for contrary experiences and work out how facts and evidence interact with them and where public discussion fails adequately to account for the facts, evidence, even for expert opinion. This makes science relevant to the audience it serves and presents a higher potential of communicating relevant risk messages with greater impact to the different audiences.

A two-way communication

Moreover, drawing on multiple stakeholders in public health risk communication encourages a two-way communication in risk assessment and, reduces the burden of erroneously trusting or relying on technical experts to make value judgements on behalf of individuals or groups in situations of risk and uncertainty. The importance of this lies in the reduced validity of expertise when dealing with interdisciplinary health risk issues and the avoidance the pitfall of extending margins of error for expert judgement in unfamiliar risk circumstances. Moreover, there is an opportunity to take advantage of recent advances in communication technology (e.g. social media) to engage the wider public, share views, information, expertise and opinion and, to an extent, redistribute power associated with control of communication (Riedlinger and Rea, 2015).

Indeed, with advancements in ICT, the public is now more than ever able to seek knowledge, engage in public debates relating to science and risk, to share expertise and even challenge existing states of knowledge and assumptions. The upsurge in use of mobile telephone technology and electronic social media represents a further opportunity to enhance the potency of risk communication (Veil et al., 2011), especially in terms of expertise and information sharing. For example, a recent Google report suggested that over 75% of Europeans have Internet access, with an average of 1.25 mobile subscriptions per person. In the same report, it was suggested that people on average spend over 1,900 minutes per month online, which is equivalent to over 30 hours (*see the digital garage website*). Social media supports public access to relevant risk information and increases the likelihood of public engagement with organisations (or those in charge of managing risk). Such technological advances can reduce the extent to which information and communication can be controlled and used as means to exercise power in public health risk communication and shape policy decisions. It is also possible to use the upsurge in the use of ICT and social media to engage the public to identify concerns and questions, in order that these can be addressed during the technical analysis of risk. It has been suggested that where sensitive issues and public concern are

addressed, the pressure for social amplification of risk is reduced (Fischbacher-Smith et al, 2009).

The selection of scientific committees

It is also important to make the process of expert or scientific committee selection more transparent and open to public scrutiny. This will reduce the chances of cherry picking experts whose opinions fit in with policy ideology and thereby bring about bias in the nature of subsequent interpretations and policy recommendations. Also, effort must be made by policy makers to avoid disadvantaging other groups by making possible stakeholder relationships that may privilege certain exchanges of views, information and ideologies in risk communication. Those in charge of managing the risk need to reach out to and build relationships with all stakeholder groups including local experts or those in close proximity to the source of the risk before policy decisions are made. This was seen to some extent in the vaping risk debate, where through consultation the public was able to input to decision-making relating to how ECs should be regulated.

Trust relationship

However, more needs to be done in establishing trustworthy relationships with all stakeholders at all stages of the risk (including the technical) debate. In this arena, social media may play an important role in establishing and sustaining (a low cost) relationships with relevant stakeholder groups. While social media comes with added advantages as outlined above, it must be noted that using social media (such as Facebook or Twitter) for risk communication has its own disadvantages since these can be used for political propaganda or as a way of spreading so called ‘fake news’. When this is combined with the unwillingness of some public groups critically to investigate or research the credibility of such information, this could prove problematic in creating false public perception of risk. Therefore, risk regulators and policy makers need to make efforts to establish a social media presence, and relay reliable and credible information of what is known and not known. Social media

organisations also have a role to play in minimizing the use of their sites for political propaganda and spreading fake news.

Making scientific information more useable to all stakeholders

Furthermore, several steps are required to make scientific information more useable when drawing on multiple stakeholder groups. Care must be taken in how risk messages are coded to avoid communication barriers *see* (Bernstein, 2003). Most important is that fact that the use of unfamiliar (or technical) terms may be 'intentional', designed to keep those who do not understand these codes outside of the risk debate and thereby deny them the opportunity to express their right to participate freely in political decision making (Adekola et al., 2017). Language codification has the potential to create power imbalances between actors in certain domains of risk in such a way that allows the domination of certain worldviews in policy debates relating to risk at the expense of others.

The need to reflect uncertainty or gaps in knowledge in the risk messages

It is also important to reflect uncertainty or gaps in knowledge in risk messages and policy decisions. In this way it is possible to distinguish evidential knowledge from political decisions, and to understand the nature of disputes and how to resolve them. It also aids risk regulators and managers to better prepare for any emergent properties of risk.

The need for a 'reflective risk inquiry'

Finally, there is a need for a 'reflective risk inquiry'. Reflective risk inquiry allows a deconstruction of risk assessment practices - a powerful way to uncover assumptions and contradictions that guides (tacitly or explicitly) risk assessment and communication practices, moving such assumptions and contradictions from the

unconscious into the conscious management psyche. Scholars such as Hilgartner (1992) have argued that risk assessment practices pay too little attention to processes by which risk objects are conceptualised and constructed. Of importance is the fact that social construction of risk does not just exist in a vacuum, but is contingent upon the social construction of risk practices that makes the construction of public health risk possible (Power, 2007).

A 'reflective risk inquiry' will involve questioning whether the assumptions and rationality upon which risk assessment inquiry is conducted may amplify or attenuate certain perspectives and stakeholder voices over others. This reflective approach goes beyond not only the science of risk assessment and its epistemological debates, but also the regulatory, institutional and organisational (managerial) processes in which it is embedded. If we as society want to ensure that policy decisions relating to risk are not solely the product of powerful stakeholders who are able to shape the risk debate, there is a need to embrace what (Irwin, 2015) described as 'contemporary knowledge relations' where both citizens as well as scientific and institutional organisations engage in critical reflection and reflection-informed practice (p.10). In this way, there is greater potential to break power barriers in public health policy making and ensure that policy decisions relating to risk are not solely the product of powerful stakeholders, who are able to shape the risk debate. Furthermore, it presents an opportunity to empower the powerless (and typically economically poor) who would otherwise suffer in the distributive inequalities of health risk.

11.5 Contribution of Study to Theory

This study makes four important contributions. Firstly, it brings together key theories in the field of risk communication and policy science and develops them into a new policy evaluation risk communication (PERC) framework that both addresses gaps in the literature, and goes beyond existing substantive theories. It proposes a detailed understanding of policy making in contemporary risk arenas where power dynamics are at play, and which have so far lacked depth and empirical validation. Secondly, the study contributes to the literature on public health risk communication by

advancing knowledge of the role of power and expertise in public health risk communication within its policy context. It discusses in detail how risk communication is embedded in institutional, productive and structural forms of power. Thirdly, it extends the knowledge of social amplification of risk framework by clearly highlighting how power interacts with expertise, communication and trust to shape social amplification of risk communication processes within policy domains. This is significant because it highlights salient mechanisms of power that can shape risk communication in a way that may go unnoticed and unscrutinised. Finally, the study also makes significant theoretical contributions to the over critical and under critical models set out by Collingridge and Reeve (1986) by looking at the negotiation of policy arguments between the two models. This sheds light on how certain risk arguments become amplified in a policy context where there are multiple legitimate viewpoints, values and power dynamics brought to bear on policy debates. It also elaborates on the science-policy relationship.

11.6 Limitation of study

While this study has made significant contribution to knowledge, there are however some limitations that must be highlighted. Firstly, the study uses an interpretivist philosophy and social constructionist approach (see section 3). Hence, the interpretation made throughout this study is contingent upon the interpretation of the researcher and the methodology used in the analysis. In addition, the sources of data collection (published sources), which are considered one of the strengths of this study, could potentially also be a limitation. Data was collected from archival and documentary sources and were therefore not specifically produced within the context of this study. However, these sources of data were used because they contain the exact information about names, references, dates and details of events, thereby broadly covering a long span of time, many events and contexts (Yin, 2011, Yin, 2013). The use of published sources also enabled the study to capture the views and input of various stakeholders, and allowed the researcher to reflect on the debates by drawing differentially on evidence and experts. Hence, it provided greater insight to each case in such a way that available evidence was more readily comparable across

cases. Despite the aforementioned possible limitations, the researcher took measures to verify the work and conclusions drawn in this study by using multiple data sources. The work was also presented at academic conferences to get feedback; the researcher has moreover sought to address the study's limitations.

11.7 Recommendation for further study

This interdisciplinary public health risk communication study has covered a broad area of research, which requires further theoretical and empirical attention. Therefore, several recommendations for future research are set out here.

a) In order to test the robustness, to point to areas for improvement and general application of the PERC framework developed in this study, future research will need to collect empirical data, using different methods of data collection and within different contexts. Such data collection may involve interviewing elite/powerful stakeholders and other key stakeholders within a context relevant to the understanding of public health.

b) There is a need to further ascertain empirically the extent to which new emergent forms of risk are influencing processes of policy decision-making.

c) Future research should look to empirically investigating how behavioural responses influence policy positions and strategies and then ideologies of risk. A good case example is where the government in Canada had to change its power strategy by reducing tobacco tax (which was initially increased) to curb illegal importation. This will require further investigation to provide perspectives that will improve public health policy making.

d) It will also be useful to investigate the extent to which there are costs or benefits associated with inadequacies or errors in the understanding of the nature of actual public health risks, and the implications that these may have for public health and safety.

e) There is also a need to further elaborate how errors or inadequacies in the understanding of risk bring about distributive inequalities and the impact this has for public health and safety.

f) Future research should look to using the modified account of SARF on an international basis to test for its robustness, utility and to check for errors.

11.8 Conclusion

The study examined the role of power and expertise in risk communication. Within this, it aimed to understand how a set of risk arguments evolves in such a way that one argument becomes dominant in a policy context. Although the notion of 'expertise' in risk communication has received some level of attention in existing studies, our understanding of the role of power in risk communication is weak and under developed. Against the background of theoretical conceptualisations and using a rich and complex set of published data, this study shed light on how a particular risk argument becomes amplified in a policy context, and explicates the transition of risk arguments between over critical and under critical models. The key contribution lies in explaining factors that shape the social amplification of risk in a policy context, namely, power, technical expertise, communication and trust. The findings also offer detailed explorations of the relationships between science and policy making.

Further research in public health risk communication would include collecting primary data in different contexts to test for the robustness and usefulness of the PERC framework. Such data collection may involve interviewing elite/powerful stakeholders and other key stakeholders within a context relevant to the understanding of public health. There is also the need to empirically investigate how behavioural responses influence policy strategies, and the transition between over critical and under critical models. In addition, it is necessary to further ascertain empirically the extent to which new emergent forms of risk are changing processes of policy decision-making. Finally, it will also be useful to investigate the extent to

which there are costs (to stakeholders such as the government or other groups) associated with inadequacies or errors in the understanding of the nature of actual public health risks and the implication that this may have for public health and safe.

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