Making sense of risk together: a dissertation on the social factors that drive risk talk

Perlstein, S.G.

Chapter 2

Risk Perception and Interpersonal Discussion on Risk: A Systematic Literature Review

This chapter has been published by Risk Analysis *under the following citation:*

Perlstein, S. (2024). Risk perception and interpersonal discussion on risk: A systematic literature review. *Risk Analysis, 44(7)*, 1666-1680. DOI: 10.1111/risa.14264.

It was subsequently awarded the distinction as a top-viewed article among articles published in Risk Analysis *in 2023.*
In this chapter, risk talk is referred to as interpersonal discussion on risk.

Abstract. Risk perception research has long been attentive to the fact that risk is a social construction. Nevertheless, this fact has not been integrated into empirical research in any systematic manner. Empirical studies that do focus on the social construction of risk often do so from very different positions and with different objectives in mind. Interpersonal discussion, while considered an

important medium of social construction, is rarely given consideration. This systematic literature review aims to provide a coherent foundation for empirical studies of interpersonal discussion on risk. Specifically, it summarizes existing research into the reciprocal relationship between interpersonal discussion on risk and individual-level risk perception. The systematic literature review adheres to the Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines. A total of 843 unique articles were identified, of which 60 are included in the review. A majority of the articles in the corpus found a positive association between interpersonal discussion on risk and risk perception. This association, however, lacks robustness, especially in terms of the direction of causality. Three theoretical interpretations of the relationship are found in the corpus: (1) interpersonal discussion as a conduit for risk information, (2) risk perception as shared social schemata, and (3) interpersonal discussion on risk as a facilitator of similarity between network members. Implications for future research are discussed. This literature review concludes with six guiding principles for future research into the interpersonal discussion–risk perception relationship.

2.1 Introduction

Risk perception research has long recognized the fact that risk perception is shaped by social interactions and is not simply a product of individual cognition (Breakwell, 2010; Douglas & Wildavsky, 1982; Russell & Babrow, 2011). Nevertheless, most empirical branches of the field prioritize individual factors above social interaction effects (Godovykh et al., 2021; Lechowska, 2018; Siegrist & Árvai, 2020). This gap is particularly conspicuous in the case of interpersonal discussion on risk, which, while considered an important locus of risk perception formation by most theoretical contributions on the topic, is rarely incorporated into empirical studies (Liu & Viens, 2020).

A principal challenge of the study of social interaction effects of risk perception is the fact that the topic is being approached from multiple angles with little coordination, leading to literature fragmentation. There is limited terminological agreement, with interpersonal discussion on risk falling under the terminological umbrella of such diverse theoretical concepts as *social contagion* (Scherer & Cho, 2003), *interpersonal amplification of risk* (Binder et al., 2011), *narrowcast* (an antonym of broadcast) (Onggo et al., 2015), and *risk talk* (Kusumi et al., 2017). A likely explanation is that risk perception research was initially an offshoot of risk analysis meant to investigate why public risk perceptions did not mirror those of risk analysts (Fischhoff, 1995; Ot-

way & Thomas, 1982). While more subjective takes on risk perception have since been provided by other fields, such as psychology (Slovic, 1987; Slovic et al., 1982), sociology (Luhmann et al., 2017), as well as anthropology and political science (Douglas & Wildavsky, 1982), empirical studies of interpersonal discussion still have not succeeded in fundamentally reaching the core of risk perception research. Consequently, studies of interpersonal discussion on risk remain relegated to the periphery, staying within their respective fields.

A comprehensive systematic literature review is thus needed to assess what we know about interpersonal discussion on risk and to serve as an anchor point for future research into the interplay between interpersonal discussion on risk and risk perception. This review aims to address the following research question: *What is known from an empirical perspective about the relationship between interpersonal discussion on risk and individual-level risk perception?*

The results of this study are relevant to both risk communication practitioners and policymakers. Despite risk perception being socially embedded, risk communication is still largely conducted as one-way communication on the part of authorities (D. K. D. Kim & Kreps, 2020; Liao et al., 2019; Regan et al., 2016). The importance of interpersonal discussion for risk perception suggests that a continuous and reciprocal bottom–up approach may be more effective in enhancing people's understanding of risk (see also Qiu et al., 2016). A better grasp of the social construction of risk can also help explain why otherwise similar communities come to different conclusions about risk despite being subjected to the same risk communication and amplification/attenuation processes (Cuevas-Muñiz & Gavilanes-Ruiz, 2017; Lam, 2005; Riad et al., 1999).

2.2 Theoretical Background

Theory on the social construction of risk is almost 40 years in the making. Going back to 1983, the seminal essay *Risk and Culture—An Essay on the Selection of Technological and Environmental Dangers* by Douglas and Wildavsky was one of the first contributions to challenge the notion of objective risk analysis (1982). Risk analysis, they argued, is no value-free exercise. Individuals, as well as society at large, face too many risks to pay attention to all of them. Which of the risks one pays attention to is invariably a value-based judgment dictated by social convention as well as personal and cultural priorities. Moreover, because judgments cannot be reduced to an unequivocally right or wrong answer, even the most rigorous risk analyst is forced to

let themselves be guided by values.

The contributions of Douglas and Wildavsky have had a significant impact on the field of risk perception, and many models, for example, the theory of cultural cognition, now include cultural and value-related determinants (Kahan et al., 2007; Slovic, 1987). Nevertheless, risk is often treated as if social influence stops there: the individual both encounters and assesses a given risk without deliberating with others (Carlton et al., 2016; Cori et al., 2020; Godovykh et al., 2021; Lechowska, 2018; T. M. Lee et al., 2015; Malik et al., 2020; Poortinga et al., 2019; Siegrist & Árvai, 2020). A recent review of the past 40 years of risk perception research (Siegrist & Árvai, 2020) provides a clear illustration of this phenomenon. In this review, the focus is on the individual's perception and assessment of a given risk: risk perception features as a product of hazard characteristics (dread risk, unknown risk), on the one hand, and risk perceiver characteristics (demographics, knowledge, value orientation, psychological traits, and optimism bias) and heuristics (availability, affect, natural-is-better, and trust) on the other. In other words, a risk with a given set of risk characteristics is perceived by an individual, and that individual then produces a certain risk perception based on individual-level factors.

While individual-level factors are undoubtedly important in understanding risk perception, this approach underemphasizes the significance of the numerous social factors impacting the construction of risk perception. Even if one were to accept the above-mentioned premise of looking at social factors exclusively as predictors of risk perception, the risk perception of an individual is affected by a multitude of social characteristics, including the characteristics of their social network such as network structure and social norms, as well as the position of the individual within said network, from a structural point of view as well as in terms of power dynamics (Bajos, 1997; Griffin et al., 2008; Wall & Olofsson, 2008). In actuality, however, the interplay between risk perception and social factors is vastly more complex: Individual-level risk perceptions are inherently ingrained within collective processes that are not reducible to aggregates of individual cognitions and exist in a continuous process of transmutation (Burgess, 2015; Douglas & Wildavsky, 1982; Horlick-Jones & Prades, 2009; Russell & Babrow, 2011).

Even considering this, it may be argued that it is not necessary for the field of risk perception research to undertake this study, as risk communication research already addresses the social elements of risk perception. Leaving this field of study to risk communication only, however, would lead to underappreciation of the psychosocial aspects of risk perception. The distinct foci of the respective fields of risk percep-

tion and risk communication have led to a division between psychological and social factors, treating psychological processes as solely occurring within individuals, and social factors as aggregate effects influencing individual-level risk perception. It is vital to recognize that this division is artificial, as individual psychological processes are deeply embedded in a social context, and social processes, in turn, are influenced by psychological factors (e.g., biases). The interconnectedness of psychological and social aspects is therefore vital for the formation and transformation of risk perception. Moreover, merely considering social factors as predictors of risk perception and leaving the causal direction to the field of risk communication does not capture the reciprocal nature of the relationship between the psychological and the social. While the above-mentioned division has predominantly led to studies at the aggregate level, usually in the form of media effects (Goerlandt et al., 2020; McComas, 2006), there is a critical need to delve deeper into the dynamics of social events at the individual or small-group level for a more comprehensive understanding of risk perception. The construction of risk within social networks is an active process: network members engage in collective sensemaking to understand new or changed risks, and they negotiate how to overcome dissonance between the norms of the social network on the one hand and risk communication and preventative behavior on the other (Bajos, 1997; Horlick-Jones & Prades, 2009; Russell & Babrow, 2011). Furthermore, because all these negotiations happen implicitly and mostly subconsciously (Bargh, 2013; Bargh & Morsella, 2008; Pryor et al., 2019), understanding the effects of risk perception is a more challenging endeavor than simply asking people how they approach new risks. Nevertheless, this complex reality is exactly why risk perception research is sure to benefit from increased attention to the social processes of risk.

One aspect of social risk reality at the individual level, which has the potential to yield substantial insights, is interpersonal discussion. Interpersonal discussion (whether face-to-face or online) is the primary way in which humans engage in two-way communication (as opposed to media consumption) without time delay (as opposed to letters or email). At the individual level, interpersonal discussion is arguably the most impactful medium of communication (R. Han & Xu, 2020; Roessler, 1999; Schmitt-Beck, 2003). Lay people, by definition, do not engage with detailed expert information on a regular basis. Even so, at least some risks are extensively discussed among laypeople, as many of us have witnessed firsthand during the recent COVID-19 pandemic (Britt et al., 2023; Salin et al., 2020). Furthermore, people are likely to engage in discussions about the expert information or risk communication they receive (Cho & Salmon, 2007)—in fact, this is often a desired effect (Moorhead

et al., 2013; Thomas, 2006). Such discussions may transform in the hands of the recipients, often in unexpected ways (Benoit, 2018; Cho & Salmon, 2007; Welch Cline et al., 1992). We therefore need additional exploration of interpersonal discussion and the interconnected psychosocial dynamics that shape and influence both risk perception and effective communication.

2.3 Method and Data

2.3.1 *Procedure*

The systematic literature review was conducted according to the Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines (Page et al., 2021). Available research on the relationship between informal conversations on risk and individual-level risk perception holds little terminological consensus, so the approach of a systematic literature review was chosen to demonstrate transparency in terms of where and how the data were obtained. The PRISMA guidelines provide the structural basis for the review due to their comprehensiveness and their status as the gold standard for systematic literature reviews.

2.3.2 *Inclusion/Exclusion Criteria*

This literature review does not make a prior call on the causal direction of this relationship but instead includes this question in the selection of articles and analysis of the data. Neither does the review distinguish between *risk talk and hazard talk* (conversations on the hazard itself, which may or may not include the risks of the hazard). While one may argue that questions such as "How often do you talk about nuclear power?" do not necessarily guarantee that the conversation includes risk, this phrasing is nevertheless commonly used by researchers of interpersonal discussion on risk. As such, the following criteria apply:

- An article should be an empirical research article. This includes both quantitative and qualitative approaches as well as review articles.
- The article must conceptualize interpersonal discussion on risk and risk perception as correlated or interrelated in some form. This excludes articles, in which both interpersonal discussion and risk perception are predictors of a dependent variable only (e.g., behavior).

- Interpersonal discussion on risk should be operationalized as an active and reciprocal verbal process from the point of view of the participants. Hence, interpersonal discussion should imply active participation of the participant (as opposed to passive consumption of, e.g., mass media) and be verbal (as opposed to nonverbal cues and signaling). For an in-depth discussion of this criterion, please refer to the Appendix 2A.
- Risks should be limited to those directly threatening life and/or physical health. This excludes risks such as financial risk and privacy risk, even if these may indirectly affect physical health. For an in-depth discussion of this criterion, please refer to Appendix 2A.
- Risk conversations should be peer-to-peer among laypeople. This excludes expert-to-layman risk talk and expert-to-expert professional talk. For an in-depth of this criterion, please refer to Appendix 2A.

2.3.3 *Search strategy*

An informal review was performed to identify pertinent keywords. Fifteen articles were determined as suitable to serve as a terminological guideline. The list of these articles as well as the terminology identified may be found in Appendix 2B. The terminology from the 15 articles was supplemented by additional terminology, which may be considered synonymous.

The search query was entered into Web of Science, Scopus, and Academic Search Premier (see Appendix 2C for the search queries) in February 2023, with results limited to titles and abstracts. The results were refined to include only empirical, peer-reviewed articles in English published in any year before 2022.

2.3.4 *Preprocessing*

The initial results of the search delivered a total of 1514 articles. Manual preprocessing was performed by the author and included the following steps: (1) duplicate removal, (2) title screening, (3) abstract screening, and (4) full-text screening. A total of 843 unique articles were identified through the search databases. In addition, four articles that had not appeared in the initial results were suggested by reviewers. In total, 60 articles met the inclusion criteria (see Appendix 2D for the full list). A visualization of the preprocessing procedure may be found in Figure 2.1.

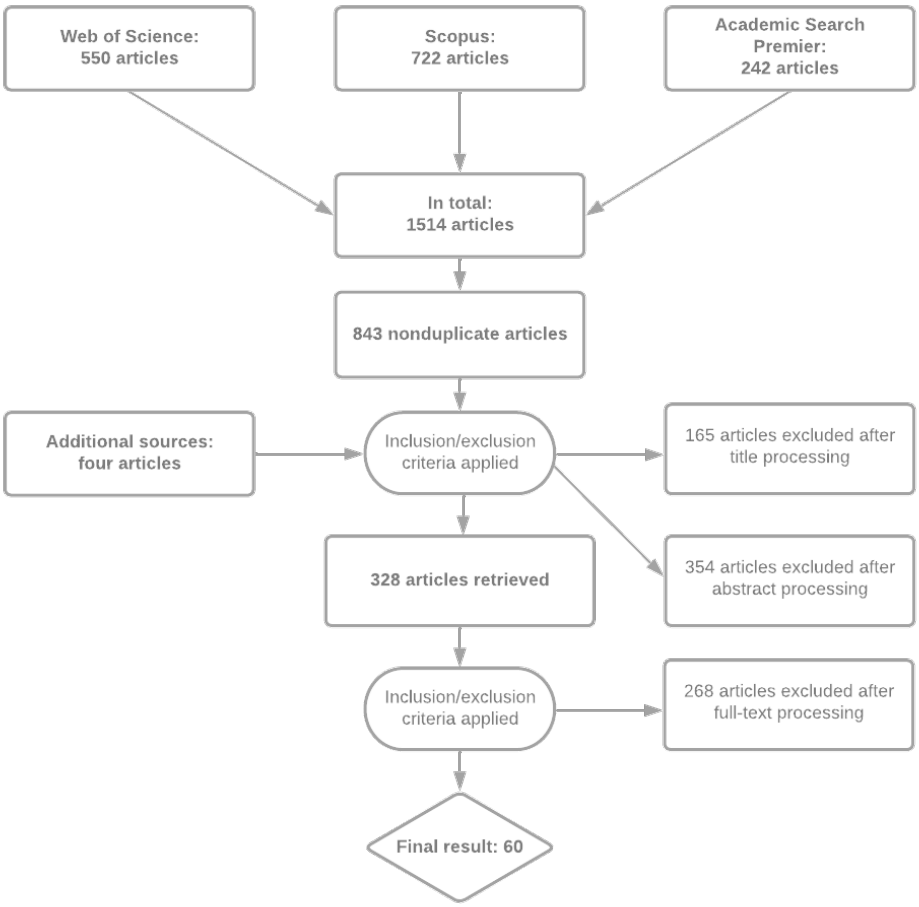

Figure 2.1: Flowchart of the article selection process.

To support the analysis, a local citation network generator web app, Local Citation Network (Wölfle, 2019) was used to generate additional data on citations among the articles in the corpus. Detailed data on the local citation network may be found in Appendix 2E.

2.4 Findings

Table 2.1 provides general statistics about the corpus. The table reveals a relatively young field that dates to only the mid-1990s and began to proliferate in the early

2000s. Unsurprisingly, the field is dominated by journals dedicated to risk, health, and communication (see Appendix 2F for a full overview of the journal topics). A considerable proportion of the studies are dedicated to illnesses, in the form of either infectious diseases or cancer, and the majority of studies originate in Asia and North America.

Category	Characteristics	Count
Publication years	2020–2021	17
	2015–2019	16
	2010–2014	10
	2005–2009	5
	2000–2004	7
	1993–1999	5
Top four publications	Health Communication	6
	Risk Analysis	5
	Journal of Risk Research	4
	Journal of Health Communication	3
Type	Qualitative	19
	Quantitative	38
	Review[a]	2
	Simulation[b]	1
Risk type	Infectious diseases	19
	Substances	7
	Environmental	6
	Natural hazards	6
	Nuclear	6
	Cancer	5
	Technology	2
	Various/other	9
Data origin[a]	Africa	4
	Asia	19
	Central- and South America	4
	Europe	5
	North America	20
	Oceania	5
	Various or no data	5
Direction of causality[b] (conceptualization/framing)	Correlation	8
	Interpersonal discussion on risk → risk perception	47
	Risk perception → interpersonal discussion on risk	6
No. of articles containing positive, negative, or insignificant results	Positive	32
	Negative	12
	Not significant	16

[a] Two studies employed both US and Chinese data, making the total cumulative value of this category 62.
[b] One study investigated both directions of causality, making the total cumulative value of this category 61.

Table 2.1: Composition of final results (N = 60).

2.4.1 *Corpus Composition: Citations and Methodological Makeup*

The local citation network analysis revealed a corpus with limited communication among its articles. Only two articles referred to more than three articles from the corpus (Sim et al., 2018; Yang et al., 2021), and 27 articles neither cited, nor were cited by, any other corpus articles. Five articles were referred to by four or more articles in the corpus and may thus be considered seminal articles of the field (Binder et al., 2011; Coleman, 1993; Morton & Duck, 2001; Scherer & Cho, 2003; Snyder & Rouse, 1995).

Quantitative studies made up two thirds of the corpus, employing mainly various types of regression analysis. Only three of these studies employed experimental designs, which would allow them to make statements about the causal nature of the relationship between interpersonal discussion on risk and risk perception (Basil & Brown, 1997; Hilverda & Kuttschreuter, 2018; Krishnatray & Elkote, 1998). Qualitative articles used a variety of methods, ranging from ethnographies (Meza-Palmeros, 2020) (Meza-Palmeros, 2020) over interviews (e.g., Cohen & Head, 2013; Keenan & Hanson, 2013) to analysis of online forums (e.g., Akerlof et al., 2016; Crawford et al., 2018; Van Hout, 2014). Furthermore, while many quantitative studies in the corpus investigated interpersonal effects and risk perception as their main aim (e.g., Binder et al., 2011; Kusumi et al., 2017; Morton & Duck, 2001; Yang et al., 2021), most qualitative studies studied interpersonal discussion as one among a multitude of variables involved in risk perception, for example, Rau et al. (2010, p. 89), whose research "set out to understand how a group of university students experience risk in their everyday lives." Similarly, Khan and Chreim's study "explores perceptions of radon health risk and examines the factors that enable and hinder the adoption of preventive measures among Ottawa-Gatineau residents" (S. M. Khan & Chreim, 2019, p. 1). Furthermore, while some intertextuality was present among the quantitative articles, only one qualitative article (Keenan & Hanson, 2013) contained a reference to another corpus article (to Scherer & Cho, 2003), and only one qualitative article was referenced by another article (S. Khan et al. (2021) referencing S. M. Khan and Chreim (2019)).

2.4.2 *Operationalization of Key Concepts*

Operationalization of interpersonal discussion on risk is subject to little streamlining. Most operationalizations, at least those of quantitative articles, focus on two factors: frequency of interpersonal discussion on risk (usually on a Likert-type scale) (Beck et al., 2013; Binder et al., 2011; Lin et al., 2017; Wild & Cunningham, 2001; Yang et

al., 2021, and others), and/or social relation, that is, with whom was the respondent talking (Chizimba et al., 2015; E. W. J. Lee et al., 2016; Lin et al., 2017; Park et al., 2001; Zhang & Li, 2015, and others). Most articles with experimental designs operationalize interpersonal discussion on risk as small group discussion, especially those with a focus on deliberation as a democratic (Akerlof et al., 2016; P. Kim et al., 2020; Krishnatray & Elkote, 1998). A few articles utilize network analysis, thereby capturing dyadic relationships (Jones et al., 2013; Wang et al., 2021). Furthermore, most operationalizations of interpersonal discussion on risk, in truth, measure *hazard talk*. Rather than pertaining to probability and impact, most studies instead ask about conversations about the hazard itself, for example, "With whom [. . .] have you talked about nuclear power or shale gas/fracking?" (e.g., de Groot et al., 2020; Morton & Duck, 2001; Yang et al., 2021). This choice does not seem to be motivated by validity tests, neither in the articles themselves nor in prior research.

Risk perception, while also subject to a multitude of operationalizations, generally comprises two aspects: perceived likelihood (Binder et al., 2011; G. Han et al., 2014; Morton & Duck, 2001; Wu & Li, 2017; Zhang & Li, 2015, and others), and perceived severity (Karletsos et al., 2021; S. M. Khan & Chreim, 2019; Kusumi et al., 2017; Meng et al., 2021; Nazione et al., 2021, and others). Some articles distinguish between personal risk and societal risk (Morton & Duck, 2001; Wu & Li, 2017; Yang et al., 2021; Yoo, 2019) or even personal, societal, group, and global risk (G. Han et al., 2014). Other operationalizations include personal worry or anxiety (Hilverda & Kuttschreuter, 2018; Meng et al., 2021; Morton & Duck, 2001), or importance (Morton & Duck, 2001; Yoo, 2019). In many articles, respondents are asked directly about the "risk" of a given hazard or behavior without further definition (de Groot et al., 2020; Snyder & Rouse, 1995; Trujillo et al., 2015; Vyncke et al., 2017; Wang et al., 2021).

The operationalizations of the key constructs within the corpus pose two primary concerns. First, a substantial lack of evidence exists regarding the validity and reliability of commonly employed indicator variables used to measure these core concepts. As a rule, validity and reliability tests were not used for the operationalizations of risk perception and interpersonal discussion in the corpus, and alternative operationalizations were rarely discussed. For example, although it is plausible that a single in-depth conversation may have a more profound impact than three superficial conversations, most articles relying on quantifiable indicators used frequency (e.g., Binder et al., 2011; E. W. J. Lee et al., 2016; Lin et al., 2017), and no articles provided any explicit comparisons between conversation frequency and conversation length. Second, the

lack of consistency makes a comparison of results of different studies difficult. These differences and inconsistencies in operationalization may implicate the overall evidence of the interplay between interpersonal discussion on risk and risk perception.

2.4.3 *The Association between Interpersonal Discussion on Risk and Risk Perception*

In most circumstances, engagement in interpersonal discussion on risk seems to correlate with an increase in perceived risk: 32 of 37 articles measuring a correlation included at least one instance of a significant positive correlation (Griffin & Dunwoody, 2000; G. Han et al., 2014; E. W. J. Lee et al., 2016; Lin et al., 2017; Morton & Duck, 2001, and others)(see the Chapter 2 Appendices for a full overview). Twelve articles included at least one instance of a significant negative correlation (Kohler et al., 2007; Sim et al., 2018; Zhao et al., 2020), while 16 articles included results, which were not significant (e.g., Binder et al., 2011; Park et al., 2001; Sim et al., 2018). In many cases, where interpersonal discussion on risk and risk perception were negatively associated, it seemed to concern mainly those risks that accompany clear rewards or satisfy thrill-seeking. Rau et al. (2010), studying HIV/AIDS risk perception and behavior among students at a South African university, described how risky sexual behavior was encouraged through social interactions, not only through collective disregard of risk but also because taking risks was seen as thrilling. In a qualitative reading of an online forum for Australians traveling in Thailand, Crawford et al. (2018) showed that risk of sexually transmitted diseases was discussed by forum users as either a necessary byproduct of traveling or even part of the allure. The correlation between interpersonal discussion on risk and risk perception seems to be different for involuntary risks.

Though many articles treated the relationship between interpersonal discussion on risk and risk perception as linear, reality may be less straightforward (Lin et al., 2017; Nazione et al., 2021; Wu & Li, 2017; Yang et al., 2021). Kohler et al. (2007) found that, while interpersonal discussion on risk and risk perception were positively correlated within networks with at least one member with high risk perception, there was no significant correlation in networks where all members had low risk perception. Binder et al. (2011), in a study on the risk and benefit perceptions of a new biological research facility, found that risk perception was amplified through interpersonal discussion on risk in whichever direction characterized the initial attitude of the participants. Individuals who saw more risks than benefits from the construction of a

biological research facility in their area would indeed be subject to heightened risk perception through interpersonal discussion. However, if an individual initially saw more benefits than risks, engaging in interpersonal discussion instead increased benefit perceptions and decreased risk perceptions. A similar pattern was found as a function of conversation valence, even when controlling for initial attitude: conversations with a supporter predicted increased benefit perceptions and decreased risk perceptions, while a conversation with an opponent predicted increased risk perceptions and decreased benefit perceptions. Interpersonal discussion on risk was also observed to lead to higher similarity in risk perception in one study (Scherer & Cho, 2003).

In terms of causality, more studies treated interpersonal discussion on risk as a predictor of risk perception than the other way around. Three studies employed an experimental design suitable for confirming the predictive power of interpersonal discussion on risk on risk perception (see Akerlof et al., 2016; Basil & Brown, 1997; Krishnatray & Elkote, 1998). In a study by Basil and Brown, discussion on Magic Johnson's announcement of being HIV positive led to decreased risk perception—an effect that was fully mediated by identification with Magic Johnson. Akerlof et al. (2016) observed that hierarchical individualists (as opposed to egalitarian solidarists) would change their risk perception following deliberation on the dangers of rising sea levels. The authors suggest that this finding may be a result of the hierarchical individualists in the study having the lowest preceding risk perception—and thereby the most room for change—rather than the intrinsic qualities of hierarchical individualism. Finally, Krishnatray and Melkote (1998) found risk deliberation to increase knowledge and decrease risk perception of leprosy, likely due to the correction of misinformation and the breaking down of taboos. It may be noted that the two latter studies both contained educational elements as part of the deliberative events. Even if the authors did not aim to "achieve closure on issues" (Krishnatray & Elkote, 1998, p. 333), then, these deliberations may mirror informal conversations to a lesser extent.

Only two studies attempted to investigate the reverse causal relationship (risk perception as a predictor for interpersonal discussion on risk) (see Dorsey et al., 1999; Kusumi et al., 2017). Kusumi et al. (2017) found risk perception to be a significant predictor of expected strength of the interpersonal discussion on risk—that is, what level of riskiness respondents indicated that they would communicate to a partner or an acquaintance about a given risk. Dorsey et al. (1999), using path modeling, found that risk perception was not a significant predictor of engagement in interpersonal discussion on risk, even though interpersonal discussion on risk significantly and positively predicted risk perception. While one interpretation could be that risk per-

ception increases the valence of interpersonal discussion on risk but not the frequency, another potential explanation is a difference in terms of social acceptability of the topics. While Kusumi et al. (2017) studied nuclear risk in the wake of the Fukushima triple disaster, which is less a topic subject to strong conversational norms, Dorsey et al. (1999) studied risks of alcohol consumption among students, which are subject to considerable normative restrictions (Leung et al., 2014; Nesi et al., 2017; Rau et al., 2010).

2.4.4 *Mediators and Moderators*

Some studies investigated the role of sociodemographic factors for the relationship between interpersonal discussion on risk and risk perception. Gender moderates the relationship between interpersonal discussion on risk and risk perception: not only is interpersonal discussion on risk a stronger predictor of risk perception for women (P. Kim et al., 2020; Meng et al., 2021), but women seem to also have deeper and more nuanced conversations on risk than men (Keenan & Hanson, 2013). In one study, individuals with higher levels of formal education, politically progressive views, as well as lower household incomes were more likely to increase their risk perception of the potential construction of a new nuclear reactor through deliberation, whereas conservative and higher-income individuals were more likely to decrease their risk perception (P. Kim et al., 2020). In contrast, Akerlof et al. (2016) did not find political affiliation (Democrat vs. Republican) to be a significant predictor of the relationship between deliberation and subsequent risk perception. One study found that being an ethnic minority as well as having lower social status predicted reliance on family and friends for risk-related information (Griffin & Dunwoody, 2000). Finally, two separate studies found differences in relationship strength between Chinese and US students (see G. Han et al., 2014; Yang et al., 2021). In a study by Han et al. (2014), interpersonal discussion on risk predicted risk perception on four levels (personal, group, societal, and global) for US students but only on two levels (group, societal) for Chinese students. Yang et al. (2021) found that interpersonal discussion on risk is a stronger predictor of both personal and societal risk perception for Chinese students than for US students.

Another moderator is risk literacy, that is, "the ability to deal with uncertainties in an informed way" (Nikiforidou, 2017, p.323). Risk literacy includes skills such as numeracy, uncertainty tolerance, and critical thinking (Gigerenzer, 2012; Nikiforidou, 2017). Kusumi et al. (2017) show that risk literacy results in higher stability of both

risk communication and risk perception, and subsequently in a weaker relationship between interpersonal discussion on risk and risk perception.

In addition, the corpus referred to three social interaction effects affecting the relationship. The first, *group polarization*, refers to the phenomenon by which social groups, when discussing a given topic, arrive at a more polarized opinion than any of the members held individually at the outset (Brauer et al., 1995; Moscovici & Zavalloni, 1969). The second, *social proof*, is a heuristic, through which an individual perceives the opinion of another person perceived to be more similar to themselves as more relevant to the individual's own behavior, attitudes, and beliefs (Hilverda & Kuttschreuter, 2018). Finally, *Perceived Risk Opinion Distribution (PROD)* refers to the perception of an individual of how risk perception in their community is distributed. Kusumi et al. (2017) found that individuals will adjust the strength of their statements on risk based on their PROD. In other words, if an individual perceives their community to have a low risk perception of a given hazard, then the individual is likely to tone down any statements they make on the riskiness of that hazard, and vice versa. Researchers investigating risk perception in social contexts should thus consider whether these effects may affect the validity of their results when creating their research design.

2.4.5 *Theories Applied*

Three overarching theoretical branches explaining the association between interpersonal discussion on risk and risk perception were found in the corpus: (1) interpersonal discussion on risk as a process of information sharing, (2) interpersonal discussion on risk as a product and discussion of shared social schemata, and (3) the spread of risk attitudes as an unintentional byproduct of social interactions (social contagion).

Information Seeking, Information Sharing, and Higher-Order Processing

According to the first branch, risk perception and interpersonal discussion on risk exist in a reciprocal and mutually reinforcing relationship of information collection, sharing, and processing. According to the Cognitive Mediation Model, this process starts when an individual experiences something that raises their motivation to engage with information on a given topic (E. W. J. Lee et al., 2016; Zhang & Li, 2015). In the context of risk perception, the individual may come across information about a risk that heightens their risk perception (Chizimba et al., 2015; Park et al., 2001; Wu & Li, 2017). The heightened risk perception makes the individual both more receptive

to, and more active in seeking out, new information on the topic. If the individual chooses to gather risk information through interpersonal discussion, this information channel, in itself, is likely to lead to increased information processing and synthesis: interpersonal discussion, being obtrusive, forces interlocutors to react, which activates higher-order processing (Binder et al., 2011; E. W. Lee et al., 2013; Lin et al., 2017; Wu & Li, 2017). If the outcome of the process is even more heightened risk perception, then the process may become recursive.

Research indicates that this process is especially salient if the initial change targets personal-level risk perception. According to the Impersonal Impact Hypothesis (Akerlof et al., 2016; Coleman, 1993; G. Han et al., 2014; Wu & Li, 2017), mass media tends to affect societal-level risk perception, whereas interpersonal discussion has a more profound effect on personal-level risk perceptions (Akerlof et al., 2016; Park et al., 2001; Tyler & Cook, 1984). While mass media often talks about risk to a "generalized other," discussing risks with a peer makes those risks more personally relevant, especially if the peer has first or second-hand accounts of the consequences of the risk in question (Cho et al., 2013; S. M. Khan & Chreim, 2019). In other words, interpersonal discussion has the ability to overcome optimism bias by illustrating to the individual that the hazard can happen to "someone like them" (Morton & Duck, 2001; Nazione et al., 2021; Park et al., 2001).

Shared Social Schemata

The second branch states that risk perception is the outcome of shared social schemata. When faced with a risk, a community may engage in collective sensemaking (Lindland & Ermakova, 2020) to develop a "shared sense of what is reasonable in the face of danger" (Myers, 2003, p.218). According to Social Representations Theory, all communication within a community happens on the basis of systems of values, ideas, and practices (Höijer, 2011). In order for communication to happen, new information, for example, a new risk, must be conceptualized in a way that is compatible with these systems (Cuevas-Muñiz and Gavilanes-Ruiz (2017), see also Breakwell (2010)). As such, members of the community must adapt their own risk perception to these shared social schemata (Chatterjee et al., 2021; Scherer & Cho, 2003; Zhang & Li, 2015). The introduction of a new risk may even be seen as a threat to these social schemata. According to the notion of facework, social life is a reflexive and collaborative performance, whereby the individual both performs the self, which they would like the other person to perceive, but also monitors the reactions of the other person to ensure that their own performance is coming across as intended (Crawford et al.,

2018; Myers, 2003). In this context, the simple act of communicating a new risk may be construed as a threat to the performed self of the recipient: by telling the recipient about a new risk, the risk communicator simultaneously implies that the recipient holds insufficient knowledge or false beliefs, or that they are acting immorally. For instance, Cohen and Head (2013) found that many nonadopters of the HPV vaccine did not see themselves as vulnerable, because they saw HPV as a risk for sexually promiscuous individuals only—a designation incompatible with their own self-image. These theories, then, may be helpful in explaining both how new risks are collectively processed, and why the perception of a given risk may be persistent despite extensive risk communication.

Effects of Social Contagion, Amplification, and Attenuation

The final theoretical branch focuses on *how* risk perception is spread within social networks. The most impactful of these, the Social Amplification of Risk Framework (SARF) (Binder et al. (2011), Onggo et al. (2015), Sim et al. (2018), and Wang et al. (2021); see also Kasperson et al. (1988)), states that risks may be amplified or attenuated via "amplification stations": individuals or social networks, who filter, process, interpret, and ultimately shape risk event signals, thereby intensifying and weakening the signals. These signals, in turn, prompt different behavioral responses. The framework primarily provides an overview of potential subjects of research within the topic of social risk perception and is less concerned with why some risk information may be subject to amplification or attenuation. Another approach, the Social Network Contagion Theory of Risk Perception (Meng et al., 2021; Scherer & Cho, 2003), holds that risk perceptions of individuals in close proximity in a social network, over time, become increasingly similar through communication exchanges.

In Summation

The majority of theoretical contextualization within the corpus can be classified into the three branches outlined above. The Information-seeking, information-sharing, and higher-order processing approaches are notably prevalent in quantitative articles, whereas the shared schemata approaches are predominantly represented within qualitative articles. The social contagion, amplification, and attenuation approaches are observed in both quantitative articles and articles utilizing simulation approaches.

It is worth noting that there are other approaches present within the corpus. However, some, like the Health Belief Model and the Theory of Reasoned Action, were not

included in the overview provided above because these approaches do not primarily seek to explain risk perception or interpersonal discussion on risk; rather, they incorporate elements of risk perception and interpersonal discussion on risk within broader explanations of risk-avoidant and risk-protective behavior.

2.5 Discussion

This systematic literature review asked the question "What is known from an empirical perspective about the relationship between interpersonal discussion on risk and individual-level risk perception?" The overall conclusion of the review is that most studies report a positive correlation between interpersonal discussion on risk and risk perception. As such, this review documents a significant body of research that underscores the influence of interpersonal conversation as a component of social risk construction. Next to the areas covered in the literature review by Siegrist and Árvai (2020), the field of risk perception research should thus consider interpersonal discussion on risk an important new field of study going forward.

An important finding of the review is that the corpus contains significant theoretical contributions, despite including empirical articles only. While the SARF is still of major influence, several additional promising theoretical approaches are found. In particular, the Social Representations Theory is an important contribution, which creates a framework for the empirical investigation of the social construction of risk as a collective process. In addition, both the Cognitive Mediation Model and the Impersonal Impact Hypothesis have proven relevant to the understanding of interpersonal discussion on risk by theorizing the concrete processes linking interpersonal discussion on risk with risk perception, for example, information-seeking behavior as a motivator for engagement in interpersonal discussion on risk. These approaches identify some of the channels, through which social construction happens, thereby making the empirical investigation of social construction more tangible. As such, this review is one step on the way to increased congruity between the theoretical and empirical strands of research into the relationship between social interaction and risk perception.

Simultaneously, the analysis revealed a fragmented field in need of more robust research. This review proposes six guiding principles for future researchers studying the relationship between interpersonal discussion and risk perception.

1. *Authors should contextualize quantitative findings using qualitative designs.*

The corpus revealed a clear division between qualitative and quantitative branches with little coordination between the two. This was especially prevalent in qualitative studies: even though little is known about how interpersonal discussion on risk plays out in everyday contexts, these showed only limited interest in interpersonal discussion on risk as an aim in and of itself, and few of the theories laid out by quantitative branches were used as a basis for qualitative examination. For instance, the Impersonal Impact Hypothesis and the Cognitive Mediation Model could both be enriched by qualitative explorations of how individuals themselves contextualize different information sources in assessing risk as well as which motivations lead to which types of media consumption.

2. Authors should consider the differences between interpersonal discussion on risk and hazard talk.

Interpersonal discussion on risk was predominantly operationalized as hazard talk, which precludes any guarantee that topics of risk were, in fact, touched upon. For instance, a discussion on nuclear power may encompass scientific aspects, climate-related advantages, or political factors influencing power plant construction and decommissioning, without adequately addressing the associated risks. On the other hand, asking respondents specifically about the risk of a certain hazard may conceivably expose them to priming effects by making them focus on risks above benefits, or it may be unclear to respondents what topics constitute risk topics (de Bruin, 2011; Slovic & Peters, 2006). Future research should thus test the validity of the "hazard talk" operationalization and compare it to operationalizations with the term risk included.

3. Authors should provide deliberations on their operationalizations of risk perception and interpersonal discussion on risk.

The corpus showed considerable variety in terms of the operationalization of risk perception and interpersonal discussion on risk. While future research should test and compare different operationalizations of both interpersonal discussion on risk and risk perception, this review contends that researchers, going forward, should provide justification for their choice of operationalization as well as deliberation on the potential consequences of their choice. For instance, if one were to operationalize interpersonal discussion as the frequency, with which respondents have had conversations on risk, this does not take into account the possibility that one long conversation on risk, because of increased pressure to actively process the information in question, may be much more impactful than several short exchanges on the same risk.

In addition, an important observation of the literature review was the distinction between different levels of risk perception (personal, group, societal, and global risk) (e.g., G. Han et al., 2014; Snyder & Rouse, 1995; Wu & Li, 2017). Future researchers of risk perception, at least in the context of interpersonal discussion, should keep this distinction in mind and clarify which of these they target in their operationalization.

4. Authors should prioritize randomized control trials when asking cause-and-effect questions.

Interpersonal discussion on risk was determined to be correlated with risk perception, but the question of whether interpersonal discussion specifically *increases* risk perception was inconclusive. While existing research has prioritized survey research, future researchers should make it a point to prioritize experimental designs where feasible when investigating the relationship between risk perception and interpersonal discussion. A better understanding of this relationship will, on the one hand, improve predictions of when, where, and how interpersonal discussion on risk is likely to occur, and how it may affect risk perception. On the other hand, it has the capacity to improve and target risk communication based on such predictions.

This review suggests testing the following interpretation based on the findings of Binder et al. (2011), Kohler et al. (2007), Paton et al. (2008), and Scherer and Cho (2003) using experimental methods. Individuals with higher risk perception are more likely to engage in interpersonal discussion on risk. Interpersonal discussion, in turn, rather than increasing risk perception per se, instead polarizes and solidifies the already high risk perceptions of these individuals. Whether interpersonal discussion on risk increases risk perception or strengthens/solidifies initial positions could be examined by comparing discussion groups with all high, all low, or mixed risk perceptions: if polarization takes place, then it is likely that groups with all low or all high risk perception would further solidify their positions, whereas groups with mixed risk perceptions are likely to either move in whatever direction is most prevalent at the outset. Furthermore, this relationship should be studied as a function of social norms attached to the risk in question. Risk factors already normalized in society, for example, alcohol consumption or bicycle helmet wearing, are likely subject to very different social interaction effects than new or unfamiliar risks.

5. Authors should devote attention to contextual factors.

Aside from gender, not much is known about sociodemographic moderators, and the two articles that discussed cultural background as a predictor did not paint a conclusive picture (G. Han et al., 2014; Yang et al., 2021). A better understanding of how

interpersonal discussion on risk is conducted depending on social group is valuable, not only from a macro-level perspective but also on a more local level. An important aspect in this regard is the extent to which the relationship between interpersonal discussion on risk and risk perception is influenced by the social norms attached to the risk in question. Risk factors already normalized in society, for example, alcohol consumption or bicycle helmet wearing, are likely subject to very different social interaction effects than new or unfamiliar risks. In addition, if a community is skeptical of political and scientific authorities, do they rely on conversations to a further extent? How does the overall risk literacy within a group affect interpersonal discussion on risk? Answering these questions could explain some of the differences in results within the corpus as well as increase scientific understanding of the active processing of risk communication within communities.

This area of research may benefit from more qualitative approaches, including ethnographic investigations and comparative case studies. Such an investigation might compare social schemata of different sociocultural communities and explore their role in the collective sensemaking of risk. This extends to the digital sphere, where varying norms and social dynamics govern different platforms (Gillespie, 2018; Kender, 2022; Mellon & Prosser, 2017). In addition, future research could incorporate the concept of facework to explore the interplay between sociocultural backgrounds and the specific forms of risk communication that pose a threat to recipients' self-perceptions. This approach would contribute to the development of meaningful and effective risk communication strategies.

6. Authors should devote attention to motivations for interpersonal discussion on risk.

Motivations for active engagement in interpersonal discussion on risk are a promising direction of research. What makes people bring up risk in conversation? Is information seeking or deliberation of shared norms the only reason to strike up conversation on a given risk? Is it possible that there are emotional benefits to discussing risk, as indicated by a single study (Zhang, L. & Yang, X., 2021)? And to what extent is interpersonal discussion on risk used for other purposes, for instance, to gauge homophily? To illustrate, one may ask another person about their risk perception of COVID-19, not out of a need to discuss COVID-19 per se, but rather to evaluate whether the interlocutors are part of the same social group. A better understanding of why interpersonal discussion on risk and risk perception are correlated may facilitate more successful risk communication because risk communicators will be able to

predict, which situations result in stronger processes of risk construction through conversation within communities. Such predictions may aid in knowing when, and how often, to engage in additional risk communication efforts, and whether probability-based, familiarity-based, or normative communication is likely to be more successful. It may even be surmised that interpersonal discussion on risk could be leveraged as a communication channel—especially concerning social groups with greater separation from official communication channels, be it due to illiteracy, skepticism toward authorities, or insufficient physical or technological infrastructure. Personal motivations to engage in interpersonal discussion on risk might include the need for emotional support or an intent to gauge homophily, while conversation-related factors could encompass characteristics of the interlocutor or the group size. Surveys and interviews, methods that rely on self-reporting, could be effectively used to assess these personal motivations. The influence of conversation characteristics and the role of the interlocutor might be better studied through observational or experimental methods to add to our understanding of why people initiate and engage in risk-related discussions.

2.6 Conclusion

Despite a comprehensive body of theoretical considerations on the social construction of risk, empirical research into interpersonal discussion on risk in relation to risk perception has hitherto been fragmented and characterized by a lack of consensus in terms of operationalization and conceptualization. As the first review dedicated to the empirical study of this relationship, this review both serves as an anchor point for the field and highlights important research avenues. The review was subject to several limitations. First, the inclusion criteria of risk perception mean that the review may have overlooked more dedicated research—especially qualitative research such as ethnographic research, but also research looking at interpersonal discussion on risk in conjunction with other concepts, for example, as a predictor of behavior or as a function of risk communication. Furthermore, as the field is indeed scattered, it is likely that certain literature has been overlooked due to a lack of terminological consensus or technical limitations. For instance, the article "The Relation of Communication to Risk Judgment and Preventive Behavior Related to Lead in Tap Water" by Griffin and Dunwoody (2000) was found ex post facto to have been overlooked, because the construction of the search query required the risk term and the interaction term to both be present within either the title or the abstract. Finally, this review did not take into account scientific advances in related fields such as political deliberation research

or group effects not related to risk. Future research may benefit from referencing these fields. The results of this study are first and foremost relevant to the wider field of risk perception research. With the correlation between interpersonal discussion on risk and risk perception having been established, future research may focus to a further extent on the more intricate aspects of the relationship, such as the concrete mechanisms, through which interpersonal discussion on risk may impact risk perception and vice versa. Moreover, such investigations already have theoretical foundations to a considerable extent. Finally, the review highlighted several presumptions of the field in need of further investigation, such as the direction of causality and the operationalizations of key constructs. From a societal point of view, this review first and foremost highlights the importance of community variance within the context of risk communication: because effects of interpersonal conversation are significant, risk communicators should be aware of the possibility that similar communities may reach different conclusions based on the same risk communication. For this reason, risk communicators should both stay sensitive to the discourses occurring within individual communities as well as consider the potential for community-based and word-of-mouth approaches (see also Bradford et al., 2017). From a mass media perspective, the findings of the review highlight that an important task of mass media risk communication is bringing people to talk, that is, engage with the content (see also Southwell & Yzer, 2007); as such, communicators may benefit from considering how mass communication can best lead to interpersonal discussion of the risk topic in question.

Acknowledgments

I would like to express my sincere gratitude to my dedicated supervisors, Sanneke Kuipers, Jarek Kantorowicz, and Marieke Liem. Their unwavering support and invaluable feedback were instrumental in helping me to develop this article to its fullest potential.

Conflict of Interest Statement

The author declares no conflicts of interest.

References

Akerlof, K., Rowan, K., La Porte, T., Batten, B., Ernst, H., & Sklarew, D. (2016). Risky business: Engaging the public on sea level rise and inundation. *Environmental Science and Policy*, *66*, 314–323. https://doi.org/10.1016/j.envsci.2016.07.002

Bajos, N. (1997). Social factors and the process of risk construction in HIV sexual transmission. *AIDS care*, *9*(2), 227–238. https://doi.org/10.1080/09540129750125244

Bargh, J. A. (2013). *Social psychology and the unconscious: The automaticity of higher mental processes*. Psychology Press.

Bargh, J. A., & Morsella, E. (2008). The unconscious mind. *Perspectives on psychological science : a journal of the Association for Psychological Science*, *3*(1), 73–79. https://doi.org/10.1111/j.1745-6916.2008.00064.x

Basil, M. D., & Brown, W. J. (1997). Marketing AIDS prevention: The differential impact hypothesis versus identification effects. *Journal of consumer psychology*, *6*(4), 389–411. https://doi.org/10.1207/s15327663jcp0604_04

Beck, K. H., Ahmed, A. U., & Farkas, Z. A. (2013). Characteristics of DUI offenders with a high versus low perceived risk of arrest. *Traffic Injury Prevention*, *14*(1), 1–6. https://doi.org/10.1080/15389588.2012.683119

Benoit, W. L. (2018). Crisis and image repair at United Airlines: Fly the unfriendly skies. *Journal of International Crisis and Risk Communication Research*, *1*(1), 2. https://doi.org/10.30658/jicrcr.1.1.2

Binder, A. R., Scheufele, D. A., Brossard, D., & Gunther, A. C. (2011). Interpersonal amplification of risk? Citizen discussions and their impact on perceptions of risks and benefits of a biological research facility. *Risk Analysis*, *31*(2), 324–334. https://doi.org/10.1111/j.1539-6924.2010.01516.x

Bradford, L. E. A., Idowu, B., Zagozewski, R., & Bharadwaj, L. A. (2017). There is no publicity like word of mouth... Lessons for communicating drinking water risks in the urban setting. *Sustainable Cities and Society*, *29*, 23–40. https://doi.org/10.1016/j.scs.2016.11.008

Brauer, M., Judd, C. M., & Gliner, M. D. (1995). The effects of repeated expressions on attitude polarization during group discussions. *Journal of Personality and Social psychology*, *68*(6), 1014. https://doi.org/10.1037/0022-3514.68.6.1014

Breakwell, G. M. (2010). Models of risk construction: Some applications to climate change. *Wiley Interdisciplinary Reviews: Climate Change*, *1*(6), 857–870. https://doi.org/10.1002/wcc.74

Britt, R. K., Britt, B. C., Panek, E., & Lee, J. (2023). Communication Expressed on the COVID-19 Subreddit in the Midst of a Global Pandemic. *Health Communication*, *38*(6), 1157–1167. https://doi.org/10.1080/10410236.2021.1994190

Burgess, A. (2015). Social construction of risk. In H. Cho, T. Reimer, & K. A. McComas (Eds.), *The SAGE handbook of risk communication* (pp. 56–68). Sage Publications.

Carlton, J. S., Mase, A. S., Knutson, C. L., Lemos, M. C., Haigh, T., Todey, D. P., & Prokopy, L. S. (2016). The effects of extreme drought on climate change beliefs, risk perceptions, and adaptation attitudes. *Climatic Change*, *135*(2), 211–226. https://doi.org/10.1007/s10584-015-1561-5

Chatterjee, N., Gupte, H., & Mandal, G. (2021). A Qualitative Study of Perceptions and Practices Related to Areca Nut Use Among Adolescents in Mumbai, India. *Nicotine and Tobacco Research*, *23*(10), 1793–1800. https://doi.org/10.1093/ntr/ntab067

Chizimba, R., Christofides, N., Chirwa, T., Singini, I., Ozumba, C., Sikwese, S., Banda, H. T., Banda, R., Chimbali, H., Ngwira, B., Munthali, A., & Nyasulu, P. (2015). The Association between Multiple Sources of Information and Risk Perceptions of Tuberculosis, Ntcheu District, Malawi. *PLoS ONE*, *10*(4), 1–11. https://doi.org/10.1371/journal.pone.0122998

Cho, H., Lee, J.-S., & Lee, S. (2013). Optimistic bias about H1N1 flu: Testing the links between risk communication, optimistic bias, and self-protection behavior. *Health Communication*, *28*(2), 146–158. https://doi.org/10.1080/10410236.2012.664805

Cho, H., & Salmon, C. T. (2007). Unintended effects of health communication campaigns. *Journal of communication*, *57*(2), 293–317. https://doi.org/10.1111/j.1460-2466.2007.00344.x

Cohen, E. L., & Head, K. J. (2013). Identifying knowledge-attitude-practice gaps to enhance HPV vaccine diffusion. *Journal of Health Communication*, *18*(10), 1221–1234. https://doi.org/10.1080/10810730.2013.778357

Coleman, C.-L. (1993). The influence of mass media and interpersonal communication on societal and personal risk judgments. *Communication Research*, *20*(4), 611–628. https://doi.org/10.1177/009365093020004006

Cori, L., Bianchi, F., Cadum, E., & Anthonj, C. (2020). Risk perception and COVID-19. *International Journal of Environmental Research and Public Health*, *17*(9), 3114. https://doi.org/10.3390/ijerph17093114

Crawford, G., Maycock, B., Tobin, R., Brown, G., & Lobo, R. (2018). Prevention of HIV and other sexually transmissible infections in expatriates and traveler networks: Qualitative study of peer interaction in an online forum. *Journal of Medical Internet Research*, *20*(9), e10787. https://doi.org/10.2196/10787

Cuevas-Muñiz, A., & Gavilanes-Ruiz, J. C. (2017). Social representation of human resettlement associated with risk from Volcán de Colima, Mexico. In C. J. Fearnley, D. K. Bird, K. Haynes, W. J. McGuire, & G. Jolly (Eds.), *Observing the Volcano World. Advances in Volcanology.* (pp. 321–334). Springer. https://doi.org/10.1007/11157_2017_17

de Bruin, W. B. (2011). Framing effects in surveys: How respondents make sense of the questions we ask. In G. Keren (Ed.), *Perspectives on Framing, edited by Gideon Keren* (pp. 303–325). Psychology Press.

de Groot, J. I. M., Schweiger, E., & Schubert, I. (2020). Social influence, risk and benefit perceptions, and the acceptability of risky energy technologies: An explanatory model of nuclear power versus shale gas. *Risk Analysis*, *40*(6), 1226–1243. https://doi.org/10.1111/risa.13457

Dorsey, A. M., Miller, K. I., & Scherer, C. W. (1999). Communication, risk behavior, and perceptions of threat and efficacy: A test of a reciprocal model. *Journal of Applied Communication Research.* https://doi.org/10.1080/00909889909365546

Douglas, M., & Wildavsky, A. (1982). *Risk and culture: An essay on the selection of technological and environmental dangers.* Univ of California Press.

Fischhoff, B. (1995). Risk perception and communication unplugged: Twenty years of process. *Risk analysis*, *15*(2), 137–145. https://doi.org/10.1111/j.1539-6924.1995.tb00308.x

Gigerenzer, G. (2012). Risk literacy. In *This will make you smarter: New scientific concepts to improve your thinking* (pp. 259–261). Harper Perennial.

Gillespie, T. (2018). All Platforms Moderate. In *Custodians of the Internet* (pp. 1–23). Yale University Press.

Godovykh, M., Pizam, A., & Bahja, F. (2021). Antecedents and outcomes of health risk perceptions in tourism, following the COVID-19 pandemic. *Tourism Review.* https://doi.org/10.1108/tr-06-2020-0257

Goerlandt, F., Li, J., & Reniers, G. (2020). The landscape of risk communication research: A scientometric analysis. *International journal of environmental research and public health*, *17*(9), 3255. https://doi.org/10.3390/ijerph17093255

Griffin, R. J., & Dunwoody, S. (2000). The relation of communication to risk judgment and preventive behavior related to lead in tap water. *Health communication*, *12*(1), 81–107. https://doi.org/10.1207/S15327027HC1201_05

Griffin, R. J., Yang, Z., Ter Huurne, E., Boerner, F., Ortiz, S., & Dunwoody, S. (2008). After the flood: Anger, attribution, and the seeking of information. *Science communication*, *29*(3), 285–315. https://doi.org/10.1177/1075547007312309

Han, G., Zhang, J., Chu, K., & Shen, G. (2014). Self–Other Differences in H1N1 Flu Risk Perception in a Global Context: A Comparative Study Between the United States and China. *Health Communication*, *29*(2), 109–123. https://doi.org/10.1080/10410236.2012.723267

Han, R., & Xu, J. (2020). A comparative study of the role of interpersonal communication, traditional media and social media in pro-environmental behavior: A China-based study. *International journal of environmental research and public health*, *17*(6), 1883. https://doi.org/10.3390/ijerph17061883

Hilverda, F., & Kuttschreuter, M. (2018). Online information sharing about risks: The case of organic food. *Risk Analysis*, *38*(9), 1904–1920.

Höijer, B. (2011). Social Representations Theory. A New Theory for Media Research. *Nordicom Review*, *32*(2), 3–16. https://doi.org/10.1515/nor-2017-0109

Horlick-Jones, T., & Prades, A. (2009). On interpretative risk perception research: Some reflections on its origins; its nature; and its possible applications in risk communication practice. *Health, Risk & Society*, *11*(5), 409–430. https://doi.org/10.1080/13698570903180448

Jones, E., Faas, A., Murphy, A., Tobin, G., Whiteford, L., & McCarty, C. (2013). Cross-Cultural and Site-Based Influences on Demographic, Well-being, and Social Network Predictors of Risk Perception in Hazard and Disaster Settings in Ecuador and Mexico. *Human Nature*, *24*(1), 5–32. https://doi.org/10.1007/s12110-013-9162-3

Kahan, D. M., Braman, D., Gastil, J., Slovic, P., & Mertz, C. K. (2007). Culture and identity-protective cognition: Explaining the white-male effect in risk perception. *Journal of Empirical Legal Studies*, *4*(3), 465–505. https://doi.org/10.1111/j.1740-1461.2007.00097.x

Karletsos, D., Hutchinson, P., Leyton, A., & Meekers, D. (2021). The effect of interpersonal communication in tobacco control campaigns: A longitudinal media-

tion analysis of a Ghanaian adolescent population. *Preventive Medicine*, *142*, 106373. https://doi.org/10.1016/j.ypmed.2020.106373

Kasperson, R. E., Renn, O., Slovic, P., Brown, H. S., Emel, J., Goble, R., Kasperson, J. X., & Ratick, S. (1988). The social amplification of risk: A conceptual framework. *Risk Analysis*, *8*(2), 177–187. https://doi.org/10.1111/j.1539-6924.1988.tb01168.x

Keenan, K., & Hanson, S. (2013). Gender, Place, and Social Contacts: Understanding Awareness of Vulnerability to Terrorism. *Urban Geography*, *34*(5), 634–656. https://doi.org/10.1080/02723638.2013.778707

Kender, K. (2022). Tumblr is Queer and Twitter is Toxic: Speculating About the Vibe of Social Media Spaces. *NordiCHI '22: Nordic Human-Computer Interaction Conference*, 1–8. https://doi.org/10.1145/3546155.3547279

Khan, S. M., & Chreim, S. (2019). Residents' perceptions of radon health risks: A qualitative study. *BMC Public Health*, *19*(1), N.PAG–N.PAG. https://doi.org/10.1186/s12889-019-7449-y

Khan, S., Gomes, J., & Chreim, S. (2021). A Mixed Methods Population Health Approach to Explore Radon-Induced Lung Cancer Risk Perception in Canada. *Cancer Control*, *28*. https://doi.org/10.1177/10732748211039764

Kim, D. K. D., & Kreps, G. L. (2020). An analysis of government communication in the United States during the COVID-19 pandemic: Recommendations for effective government health risk communication. *World Medical & Health Policy*, *12*(4), 398–412. https://doi.org/10.1002/wmh3.363

Kim, P., Kim, J., & Yim, M.-S. (2020). How deliberation changes public opinions on nuclear energy: South Korea's deliberation on closing nuclear reactors. *Applied Energy*, *270*, N.PAG–N.PAG. https://doi.org/10.1016/j.apenergy.2020.115094

Kohler, H.-P., Behrman, J. R., & Watkins, S. C. (2007). Social networks and HIV/AIDS risk perceptions. *Demography*, *44*(1), 1–33. https://doi.org/10.1353/dem.2007.0006

Krishnatray, P. K., & Elkote, S. R. M. (1998). Public Communication Campaigns in the Destigmatization of Leprosy: A Comparative Analysis of Diffusion and Participatory Approaches. A Case Study in Gwalior, India. *Journal of Health Communication*, *3*(4), 327–344. https://doi.org/10.1080/108107398127148

Kusumi, T., Hirayama, R., & Kashima, Y. (2017). Risk Perception and Risk Talk: The Case of the Fukushima Daiichi Nuclear Radiation Risk. *Risk Analysis*, *37*(12), 2305–2320. https://doi.org/10.1111/risa.12784

Lam, L. T. (2005). Parental risk perceptions of childhood pedestrian road safety: A cross cultural comparison. *Journal of Safety Research*, *36*(2), 181–187. https://doi.org/10.1016/j.jsr.2005.03.003

Lechowska, E. (2018). What determines flood risk perception? A review of factors of flood risk perception and relations between its basic elements. *Natural Hazards*, *94*(3), 1341–1366. https://doi.org/10.1007/s11069-018-3480-z

Lee, E. W. J., Shin, M., Kawaja, A., & Ho, S. S. (2016). The Augmented Cognitive Mediation Model: Examining Antecedents of Factual and Structural Breast Cancer Knowledge Among Singaporean Women. *Journal of Health Communication*, *21*(5), 583–592. https://doi.org/10.1080/10810730.2015.1114053

Lee, E. W., Ho, S. S., Chow, J. K., Wu, Y. Y., & Yang, Z. (2013). Communication and knowledge as motivators: Understanding Singaporean women's perceived risks of breast cancer and intentions to engage in preventive measures. *Journal of Risk Research*, *16*(7), 879–902. https://doi.org/10.1080/13669877.2012.761264

Lee, T. M., Markowitz, E. M., Howe, P. D., Ko, C.-Y., & Leiserowitz, A. A. (2015). Predictors of public climate change awareness and risk perception around the world. *Nature Climate Change*, *5*(11), 1014–1020. https://doi.org/10.1038/nclimate2728

Leung, R. K., Toumbourou, J. W., & Hemphill, S. A. (2014). The effect of peer influence and selection processes on adolescent alcohol use: A systematic review of longitudinal studies. *Health psychology review*, *8*(4), 426–457. https://doi.org/10.1080/17437199.2011.587961

Liao, Y.-W., Huang, C.-W., & Su, Z.-Y. (2019). Exploring the Effects of Third-party Logins on Consumer's Online Shopping Behavior. *Proc. - Int. Conf. Intell. Comput. Emerg. Appl., ICEA*, 11–15. https://doi.org/10.1109/ICEA.2019.8858294

Lin, T. T. C., Li, L., & Bautista, J. R. (2017). Examining How Communication and Knowledge Relate to Singaporean Youths' Perceived Risk of Haze and Intentions to Take Preventive Behaviors. *Health Communication*, *32*(6), 749–758. https://doi.org/10.1080/10410236.2016.1172288

Lindland, K. M., & Ermakova, F. P. (2020). One Foot in Each Culture: Exercising Social Responsibility and Reducing Risk in a New Culture. *Proceedings of the 30th European Safety and Reliability Conference and 15th Probabilistic Safety Assessment and Management Conference*, 4379–4386. https://doi.org/10.3850/978-981-14-8593-0_3927-cd

Liu, B. F., & Viens, J. (2020). Crisis and risk communication scholarship of the future: Reflections on research gaps. *Journal of International Crisis and Risk Communication Research*, *3*(1), 7–13. https://doi.org/10.30658/jicrcr.3.1.1

Luhmann, N., Barrell, R., Stehr, N., & Bechmann, G. (2017). *Risk: A sociological theory*. Routledge.

Malik, A. A., McFadden, S. M., Elharake, J., & Omer, S. B. (2020). Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine*, *26*, 100495. https://doi.org/10.1016/j.eclinm.2020.100495

McComas, K. A. (2006). Defining moments in risk communication research: 1996–2005. *Journal of health communication*, *11*(1), 75–91. https://doi.org/10.1080/10810730500461091

Mellon, J., & Prosser, C. (2017). Twitter and Facebook are not representative of the general population: Political attitudes and demographics of British social media users. *Research & Politics*, *4*(3), 2053168017720008.

Meng, Y., Khan, A., Bibi, S., Wu, H., Lee, Y., & Chen, W. (2021). The Effects of COVID-19 Risk Perception on Travel Intention: Evidence From Chinese Travelers. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.655860

Meza-Palmeros, J. A. (2020). Risk perception, coronavirus and precariousness. A reflection on fieldwork under quarantine. *Health Sociology Review*, *29*(2), 113–121. https://doi.org/10.1080/14461242.2020.1785321

Moorhead, S. A., Hazlett, D. E., Harrison, L., Carroll, J. K., Irwin, A., & Hoving, C. (2013). A new dimension of health care: Systematic review of the uses, benefits, and limitations of social media for health communication. *Journal of medical Internet research*, *15*(4), e1933. https://doi.org/10.2196/jmir.1933

Morton, T. A., & Duck, J. M. (2001). Communication and health beliefs: Mass and interpersonal influences on perceptions of risk to self and others. *Communication Research*, *28*(5), 602–626. https://doi.org/10.1177/009365001028005002

Moscovici, S., & Zavalloni, M. (1969). The group as a polarizer of attitudes. *Journal of personality and social psychology*, *12*(2), 125. https://doi.org/10.1037/h0027568

Myers, G. (2003). Risk and face: A review of the six studies. *Health, Risk & Society*, *5*(2), 215. https://doi.org/10.1080/1369857031000123984

Nazione, S., Perrault, E., & Pace, K. (2021). Impact of Information Exposure on Perceived Risk, Efficacy, and Preventative Behaviors at the Beginning of the COVID-19 Pandemic in the United States. *Health Communication*, *36*(1), 23–31. https://doi.org/10.1080/10410236.2020.1847446

Nesi, J., Rothenberg, W. A., Hussong, A. M., & Jackson, K. M. (2017). Friends' alcohol-related social networking site activity predicts escalations in adolescent drinking: Mediation by peer norms. *Journal of Adolescent Health*, *60*(6), 641–647. https://doi.org/10.1016/j.jadohealth.2017.01.009

Nikiforidou, Z. (2017). Risk literacy: Concepts and pedagogical implications for early childhood education. *Contemporary Issues in Early Childhood*, *18*(3), 322–332. https://doi.org/10.1177/1463949117731027

Onggo, B., Busby, J., & Liu, Y. (2015). Using agent-based simulation to analyse the effect of broadcast and narrowcast on public perception: A case in social risk amplification. In Tolk A., Yilmaz L., Diallo S.Y., & Ryzhov I.O. (Eds.), *Proc. Winter Simul. Conf.* (pp. 322–333, Vol. 2015-January). Institute of Electrical and Electronics Engineers Inc. https://doi.org/10.1109/WSC.2014.7019899

Otway, H., & Thomas, K. (1982). Reflections on risk perception and policy 1, 2. *Risk Analysis*, *2*(2), 69–82. https://doi.org/10.1111/j.1539-6924.1982.tb01368.x

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., & Brennan, S. E. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Systematic reviews*, *10*(1), 1–11. https://doi.org/10.1136/bmj.n71

Park, E., Scherer, C. W., & Glynn, C. J. (2001). Community involvement and risk perception at personal and societal levels. *Health, Risk & Society*, *3*(3), 281–292. https://doi.org/Communityinvolvementandriskperceptionatpersonalandsocietallevels

Paton, D., Smith, L., Daly, M., & Johnston, D. (2008). Risk perception and volcanic hazard mitigation: Individual and social perspectives. *Journal of Volcanology & Geothermal Research*, *172*(3/4), 179–188. https://doi.org/10.1016/j.jvolgeores.2007.12.026

Poortinga, W., Whitmarsh, L., Steg, L., Böhm, G., & Fisher, S. (2019). Climate change perceptions and their individual-level determinants: A cross-European analysis. *Global environmental change*, *55*, 25–35. https://doi.org/10.1016/j.ijdrr.2022.103369

Pryor, C., Perfors, A., & Howe, P. D. L. (2019). Even arbitrary norms influence moral decision-making. *Nature Human Behaviour*, *3*(1), 57–62. https://doi.org/10.1038/s41562-018-0489-y

Qiu, W., Rutherford, S., Chu, C., Mao, A., & Hou, X. (2016). Risk communication and public health. *Global Journal of Medicine and Public Health*, *5*(4), 1–11.

Rau, A., Coetzee, J. K., & Vice, A. (2010). Narrating student life in a time of risk. *Qualitative Sociology Review*, *6*(3), 81–98. https://doi.org/10.18778/1733-8077.6.3.04

Regan, Á., Raats, M., Shan, L. C., Wall, P. G., & McConnon, Á. (2016). Risk communication and social media during food safety crises: A study of stakeholders' opinions in Ireland. *Journal of Risk Research*, *19*(1), 119–133. https://doi.org/10.1080/13669877.2014.961517

Riad, J. K., Ruback, R. B., & Norris, F. H. (1999). Predicting Evacuation in Two Major Disasters: Risk Perception, Social Influence, and Access to Resources. *Journal of Applied Social Psychology*, *29*(5), 918–934. https://doi.org/10.1111/j.1559-1816.1999.tb00132.x

Roessler, P. (1999). The individual agenda-designing process: How interpersonal communication, egocentric networks, and mass media shape the perception of political issues by individuals. *Communication Research*, *26*(6), 666–700. https://doi.org/10.1177/00936509902600600

Russell, L. D., & Babrow, A. S. (2011). Risk in the making: Narrative, problematic integration, and the social construction of risk. *Communication Theory*, *21*(3), 239–260. https://doi.org/10.1111/j.1468-2885.2011.01386.x

Salin, M., Kaittila, A., Hakovirta, M., & Anttila, M. (2020). Family coping strategies during Finland's COVID-19 lockdown. *Sustainability*, *12*(21), 9133. https://doi.org/10.3390/su12219133

Scherer, C., & Cho, H. (2003). A social network contagion theory of risk perception. *Risk Analysis*, *23*(2), 261–267. https://doi.org/10.1111/1539-6924.00306

Schmitt-Beck, R. (2003). Mass communication, personal communication and vote choice: The filter hypothesis of media influence in comparative perspective. *British Journal of Political Science*, *33*(02). https://doi.org/10.1017/S0007123403000103

Siegrist, M., & Árvai, J. (2020). Risk perception: Reflections on 40 years of research. *Risk Analysis*, *40*(S1), 2191–2206. https://doi.org/10.1111/risa.13599

Sim, T., Hung, L.-S., Su, G.-W., & Cui, K. (2018). Interpersonal communication sources and natural hazard risk perception: A case study of a rural Chinese village. *Natural Hazards*, *94*(3), 1307–1326. https://doi.org/10.1007/s11069-018-3478-6

Slovic, P. (1987). Perception of risk. *Science*, *236*(4799), 280–285. https://doi.org/10.1126/science.3563507

Slovic, P., Fischhoff, B., & Lichtenstein, S. (1982). Why study risk perception? *Risk Analysis*, *2*(2), 83–93. https://doi.org/10.1111/j.1539-6924.1982.tb01369.x

Slovic, P., & Peters, E. (2006). Risk perception and affect. *Current directions in psychological science*, *15*(6), 322–325. https://doi.org/10.1111/j.1467-8721.2006.00461.x

Snyder, L. B., & Rouse, R. A. (1995). The media can have more than an impersonal impact: The case of aids risk perceptions and behavior. *Health Communication*, *7*(2), 125–145. https://doi.org/10.1207/s15327027hc0702_3

Southwell, B., & Yzer, M. (2007). The roles of interpersonal communication in mass media campaigns. *Communication Yearbook*, *31*, 419–462. https://doi.org/10.1080/23808985.2007.11679072

Thomas, R. K. (2006). *Traditional approaches to health communication*. Springer.

Trujillo, E. M., Suárez, D. E., Lema, M., & Londoño, A. (2015). How adolescents learn about risk perception and behavior in regards to alcohol use in light of social learning theory: A qualitative study in Bogotá, Colombia. *International Journal of Adolescent Medicine and Health*, *27*(1), 3–9. https://doi.org/10.1515/ijamh-2014-0003

Tyler, T. R., & Cook, F. L. (1984). The Mass Media and Judgments of Risk: Distinguishing Impact on Personal and Societal Level Judgments. *Journal of Personality and Social Psychology*, *47*, 693–708. https://doi.org/JournalofPersonalityandSocialPsy

Van Hout, M. (2014). SMART: An Internet study of users experiences of synthetic tanning. *Performance Enhancement and Health*, *3*(1), 3–14. https://doi.org/10.1016/j.peh.2014.05.001

Vyncke, B., Perko, T., & Van Gorp, B. (2017). Information sources as explanatory variables for the Belgian health-related risk perception of the Fukushima nuclear accident. *Risk Analysis*, *37*(3), 570–582. https://doi.org/10.1111/risa.12618

Wall, E., & Olofsson, A. (2008). Young people making sense of risk: How meanings of risk are materialized within the social context of everyday life. *Young*, *16*(4), 431–448. https://doi.org/10.1177/110330880801600405

Wang, W., Rui, & MINGHAO, H. (2021). Risk Perception of Chinese Urban Residents: An Institutional Theory Perspective. *Journal of Asian Sociology*, *50*(4), 545–572. https://doi.org/10.21588/DNS.2021.50.4.001

Welch Cline, R. J., Johnson, S. J., & Freeman, K. E. (1992). Talk among sexual partners about AIDS: Interpersonal communication for risk reduction or risk enhancement? *Health Communication*, *4*(1), 39–56. https://doi.org/10.1207/s15327027hc0401_4

Wild, T., & Cunningham, J. (2001). Psychosocial determinants of perceived vulnerability to harm among adult drinkers. *Journal of Studies on Alcohol*, *62*(1), 105–113. https://doi.org/10.15288/jsa.2001.62.105

Wölfle, T. (2019). *Local Citation Network [web app]*. https://localcitationnetwork.github.io.

Wu, X., & Li, X. (2017). Effects of mass media exposure and social network site involvement on risk perception of and precautionary behavior toward the haze issue in China. *International Journal of Communication*, *11*, 3975–3997. https://ijoc.org/index.php/ijoc/article/view/6529

Yang, Y., Liu, R.-D., Ding, Y., Wang, J., Hong, W., & Wu, Y. (2021). The Influence of Communication on College Students' Self–Other Risk Perceptions of COVID-19: A Comparative Study of China and the United States. *International Journal of Environmental Research and Public Health*, *18*(23), 12491. https://doi.org/10.3390/ijerph182312491

Yoo, W. (2019). How Risk Communication via Facebook and Twitter Shapes Behavioral Intentions: The Case of Fine Dust Pollution in South Korea. *Journal of Health Communication*, *24*(7–8), 663–673. https://doi.org/10.1080/10810730.2019.1655607

Zhang, L.-Y., & Li, F. (2015). The impact of risk perception on developing incentive systems for relational contracting. *KSCE Journal of Civil Engineering*, *19*(5), 1203–1213. https://doi.org/10.1007/s12205-013-0450-6

Zhang, L. & Yang, X. (2021). Linking Risk Perception to Breast Cancer Examination Intention in China: Examining an Adapted Cognitive Mediation Model. *Health Communication*, *36*(14), 1813–1824. https://doi.org/10.1080/10410236.2020.1796283

Zhao, M., Liu, H., Qu, S., He, L., & Campy, K. (2020). Factors associated with parental acceptance of influenza vaccination for their children: The evidence from four cities of China. *Human Vaccines and Immunotherapeutics*, 1–8. https://doi.org/10.1080/21645515.2020.1771988