

Discourse-semantics of risk in *The New York Times*, 1963,  
1987–2014: a corpus linguistic approach

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## Abstract

Since the 1980s and 1990s the notion of risk has become increasingly influential in societal discourses and scholarly debate (Skolbekken, 1995). From early work on risk and culture (Douglas, 1986, 2013) to the *risk society* thesis (Beck, 1992, 2009; Giddens, 2002), from governmentality theorists working in the tradition of Foucault (Dean, 2010; O’Malley, 2012; Rose, 1999) to modern systems theory (Luhmann, 1993) all have built their work around the notion of risk and implicitly or explicitly refer to linguistic changes. Though this body of literature offers different explanations for the shift towards *risk* and its connection to social change, to date there has been no attempt to empirically examine their relative ability to explain this change in the communication of possible harm.

To address this deficit, we conduct a corpus-based investigation of risk words in *The New York Times* in 1963, as well as all editions published between 1987 and mid-2014. The investigation involves the creation of an annotated corpus of over 240,000 unique risk tokens and their co-text. Purpose-built functions for manipulating this dataset and visualising results were created and used to investigate the corpus according to a systemic-functional conceptualisation of the transitivity and mood systems of language. This toolkit is freely available at <https://github.com/interrogator/corpkit>. Following the corpus interrogation, we use functional linguistics and sociological risk theory in tandem to analyse the findings. First, systemic-functional linguistics is used to link lexicogrammatical phenomena to discourse-semantic meaning of the texts. Longitudinal changes in risk language are then mapped to key events, as well as broader social movements.

This report is accompanied by an interactive *IPython Notebook* interface to our corpus and developed computational tools. Key findings from this report are stored there, as well as additional information (e.g. concordance lines, keywords, collocations), that could not be included in this report due to spatial considerations. It is available for both interactive and static viewing at <https://github.com/interrogator/risk>.

# Contents

<b>1</b>	<b>Introduction</b>	<b>4</b>
<b>2</b>	<b>Conceptual foundations of our project</b>	<b>7</b>
1	Theories explaining the shift towards <i>risk</i> . . . . .	7
2	Empirical evidence and shortcomings . . . . .	9
3	Central hypotheses in risk studies . . . . .	11
4	Linguistic concepts for researching risk . . . . .	12
5	Our research approach . . . . .	13
<b>3</b>	<b>The case study: <i>The New York Times</i>, 1963, 1987–2014</b>	<b>16</b>
1	Selecting <i>The New York Times</i> as a case study . . . . .	16
2	Building the <i>Risk Corpus</i> . . . . .	17
3	Tools and interface used for corpus interrogation . . . . .	20
<b>4</b>	<b>Methodology</b>	<b>22</b>
1	A systemic-functional conceptualisation of language . . . . .	22
2	Risk words and the systemic functional grammar . . . . .	24
2.1	Risk and the experiential metafunction . . . . .	24
2.2	Risk and the interpersonal function: arguability . . . . .	25
3	SFL and corpus linguistics . . . . .	27
4	Discourse-semantic areas of interest . . . . .	30
5	Lexicogrammatical realisations of discourse-semantic meanings . . . . .	31
<b>5</b>	<b>Findings</b>	<b>32</b>
1	How frequently do risk words appear? . . . . .	32
2	Which experiential roles do risk words occupy? . . . . .	34
3	Is risk more commonly in the position of experiential subject or experiential object? . . . . .	35
4	What processes are involved when risk is a participant? . . . . .	36
5	How are participant risks modified? . . . . .	37
6	What kinds of risk processes are there, and what are their relative frequencies? . . . . .	39
7	When risk is a process, what participants are involved? . . . . .	40
8	When risk is a modifier, what are the most common forms? . . . . .	42
9	When risk is a modifier, what is being modified? . . . . .	44
10	How arguable is risk? . . . . .	45
11	Risk words and proper nouns . . . . .	48
12	Summary of key findings . . . . .	50
<b>6</b>	<b>Risk in health articles in the NYT</b>	<b>52</b>
1	Introduction . . . . .	53
2	State of research and some key questions . . . . .	54
3	Towards a usage-driven account of risk . . . . .	56
4	Significant increase of the usage of risk in the NYT after WW2 . . . . .	56
5	Hypotheses: general trend towards risk . . . . .	57
6	The centrality of the health sector in driving public risk debates . . . . .	58
7	Hypotheses: health domain . . . . .	59
8	Methodology and methods . . . . .	59

8.1	Risk in Frame Semantics . . . . .	60
8.2	Systemic functional linguistics and the systemic-functional grammar . . . . .	61
9	Research strategy . . . . .	62
10	Results . . . . .	62
10.1	General changes in the behaviour of risk words . . . . .	63
10.2	Shifts within risk words as participants, processes and modifiers . . . . .	63
10.3	From calculated to probabilistic risk . . . . .	64
10.4	Decreasing agency in risk processes (technocratic risk talk) . . . . .	64
10.5	The institutionalisation of risk practices . . . . .	66
10.6	Risk takers and risk bearers . . . . .	67
10.7	The risk semantic in health discourse . . . . .	69
10.8	The shift towards individualism in health discourse . . . . .	70
10.9	Health discourse is driven by increasing reference to scientific expertise . . . . .	72
11	Concluding remarks . . . . .	73
<b>7</b>	<b>Discourse-semantics of <i>risk</i> in the NYT</b>	<b>76</b>
1	A monochronic description of risk . . . . .	76
2	Shifting discourse-semantics of risk in the NYT . . . . .	78
2.1	Word class and experiential role of risk words . . . . .	78
2.2	Domains of risk discourse . . . . .	79
2.3	Implicitness of risk . . . . .	80
2.4	Low-risk, moderate-risk, high-risk . . . . .	81
2.5	Risk as modifier . . . . .	82
3	People and risk . . . . .	83
4	Sociological perspectives . . . . .	83
<b>8</b>	<b>Limitations and future directions</b>	<b>87</b>
1	Limitations of scope . . . . .	87
2	Shortcomings in natural language processing tools . . . . .	88
3	The limits of lexicogrammatical querying . . . . .	89
4	Research agenda . . . . .	90
5	Conclusions . . . . .	91

# List of Tables

3.1	Metadata tags and content . . . . .	18
3.2	Subcorpora, their wordcount, file count and number of risk words . . . . .	19
3.3	Core Python functions developed for our investigation . . . . .	20
4.1	Rank Scale in SFL . . . . .	25
4.2	Arguability of risk words in differing mood constituents . . . . .	27
4.3	Arguability of risk words as either head or non-head . . . . .	27
5.1	Key differences between word class and experiential role . . . . .	34
5.2	Examples of risk as experiential subject and object in 2001 . . . . .	36
5.3	Processes when risk is experiential subject . . . . .	37
5.4	Processes when risk is experiential object . . . . .	37
5.5	Pre-head modification of participant risk . . . . .	38
5.6	Pre-head modification of participant risk . . . . .	38
5.7	Riskers and risked things and/or potential harms . . . . .	41
5.8	Most common embedded processes in risk processes . . . . .	41
5.9	<i>To risk becoming</i> in 2013 subcorpus . . . . .	42
5.10	Types of risk-as-modifier . . . . .	43
5.11	Randomised concordance lines for <i>risk factor</i> in 2013 . . . . .	43
5.12	Most common risk-modified participants in the corpus . . . . .	44
5.13	Most common at-risk participants in the corpus . . . . .	44
5.14	<i>investment(s), business(es)</i> and <i>behavior(s)</i> modified by <i>risk</i> in 2014 . . . . .	45
5.15	Examples of risk words near to and far from <i>root</i> in 2014 . . . . .	47

# List of Figures

3.1 Example file: NYT-1995-12-30-10.txt . . . . .	19
3.2 Python function for getting n-grams from corpus data . . . . .	21
4.1 Strata and metafunctions of language . . . . .	23
4.2 Transitivity analysis of a clause . . . . .	24
4.3 Mood analysis of a clause . . . . .	26
4.4 Risk frame . . . . .	29
4.5 <i>Tregex</i> -based search query and gloss . . . . .	30
5.1 Relative frequency of risk words . . . . .	33
5.2 Relative frequency by word class . . . . .	33
5.3 Percentage of each open word class that are risk words . . . . .	33
5.4 Unique risk words . . . . .	34
5.5 Experiential roles of risk words . . . . .	35
5.6 Risk as experiential subject and object as percentage of all risk roles . . . . .	35
5.7 Selected modifiers of participant risk as percentage of all risk modifiers . . . . .	38
5.8 Risk processes as percentage of all parsed processes . . . . .	39
5.9 Relative frequencies of common riskers . . . . .	42
5.10 Riskers, sorted by most increasing (left) and most decreasing (right) . . . . .	42
5.11 Types of risk modifier . . . . .	43
5.12 Relative frequency of <i>risk factor</i> . . . . .	43
5.13 Common adjectival risk words as percentage of all adjectival risks . . . . .	43
5.14 Distance from <i>root</i> of risk words by year . . . . .	46
5.15 Frequency of risk words for each Mood component . . . . .	48
5.16 Proper noun groups co-occurring with risk . . . . .	49
6.1 Number of articles with at least one risk token, 1852–2008 . . . . .	57
6.2 Number of articles containing at least one risk token by topic . . . . .	58
6.3 Risk as Participant, Process and Modifier (general corpus) . . . . .	63
6.4 Risk as experiential subject/object (general corpus) . . . . .	64
6.5 Adjectives modifying nominal risk (general corpus) . . . . .	65
6.6 Risk processes (general corpus) . . . . .	65
6.7 Types of risk modifiers (general corpus) . . . . .	66
6.8 Riskers (general corpus) . . . . .	67
6.9 Percentage of common participants that are in the role of risker (general corpus) . . . . .	68
6.10 Comparing social actors that co-occur with risk . . . . .	69
6.11 Risk of (noun) (general corpus) . . . . .	70
6.12 Institutional participants (health subcorpus) . . . . .	70
6.13 Everyday participants (health subcorpus) . . . . .	71
6.14 n-grams, increasing (health subcorpus) . . . . .	71
6.15 n-grams, decreasing (health subcorpus) . . . . .	72
6.16 Participants, increasing (health subcorpus) . . . . .	72
6.17 Major themes (health subcorpus) . . . . .	73
7.1 Comparing social actors that co-occur with risk . . . . .	79

## Executive summary

Since the middle of the 1980s sociologists have started to argue that after WW2 significant social transformations took place in most Western industrialised societies which have manifested in a shift towards the risk semantic. Risk has become pervasive in public and scholarly debates and practices in Europe and elsewhere in the world. Following the common assumption that societal changes and language changes are closely linked, this research report aims to contribute to advancing understanding of this social shift towards risk.

There is a wealth of literature and several sociological theories (e.g. risk society, socio-cultural, governmentality, systems theory, edgework) which offer different explanations for the shift towards risk and its connection to social change. Yet, to date there has been little attempts to empirically examine their relative ability to explain this change in the communication of possible harm. This research report addresses this deficit by:

1. Examining a number of claims made by different sociological theories and exploring linguistic changes which might not have been theoretically addressed yet.
2. Developing a corpus based research strategy and computational research tools to examine in detail how the institutional and sociocultural shift towards risk has manifested linguistically.

The study utilises The New York Times (NYT) as a case study for the US to reconstruct the growing usage of the term risk from 1987 to 2014 and examines how discourse-semantic shifts are linked to institutional and socio-cultural changes as well as socially relevant events (e.g. crises and disasters). In addition the study uses a sample of volume 1963 articles of the NYT to contrast the results with much earlier ways of risk reporting.

The investigation involves the creation of an annotated corpus of over 150,000 unique risk tokens and their co-text. Purpose-built functions for manipulating this dataset and visualising results were created and used to investigate the corpus according to a systemic functional conceptualisation of the transitivity and mood systems of language. This toolkit is freely available at <https://github.com/interrogator/corpkit>.

Following the corpus interrogation, we use functional linguistics and sociological risk theory in tandem to analyse the findings. First, systemic functional linguistics is used to link lexicogrammatical phenomena to discourse-semantic meaning of the texts. Longitudinal changes in risk language are then mapped to key events, as well as broader social processes and changes.

This report is accompanied by an interactive IPython Notebook interface to our corpus and developed computational tools. Key findings from this report are stored there, as well as additional information (e.g. concordance lines, keywords, collocations), that could not be included in this report due to spatial considerations. It is available for both interactive and static viewing at <https://github.com/interrogator/risk>.

## Research question, hypotheses

Most generally, the study examines *how the institutionalisation of new societal practices manifest linguistically in the change of risk discourses and the use of risk language*. We also examine a number of hypotheses derived from mainstream sociological risk theorising:

1. Is there a shift in discourses from the positive notion of risk-taking to the negative meaning of risk?

2. Can we observe an increasing salience of the at-risk status of social groups?
3. Is there evidence for the assumption of individualised experience of risk?
4. Is there any evidence for the decreasing calculability/controllability of risk?
5. Are there any differences between different social groups in the exposure to risk?

## Outcomes

1. The linguistic analyses on the lexicogrammatical level and in discourse semantics give clear indications for a growing routinisation and institutionalisation of risk. We found a growing number of forms such as risk assessment or risk regulator which indicate the institutionalisation of risk practices. Decreasing arguability and growing implicitness of risk in the clause indicated a shift from the centre to the ancillary parts of the sentence.
2. There are also clear hints that the negative notion of risk is becoming more common, indicated by a clear tendency to nominalisation but also to processes where agency is minimal (e.g. put at-risk).
3. There is a clear trend towards decreasing agency in risk processes from risking and taking risk to running risk and putting at-risk. Thus the strong norm of individual responsibility and risk-taking is accompanied by media-coverage which emphasises lacking agency in risk.
4. There is a clear increase of reporting on issues where people and particular social groups are presented as lacking control especially regarding health issues.
5. Risk reporting, in particular in the health sector, is driven by reference to scientific research supporting a rationalised approach to risk with formalised concepts such as risk factors and reference to research terms on the rise. However, expressions of control such as calculated risk are decreasing while expressions indicating the possibility of negative outcomes are increasing indicating a rise of a probabilistic notion of risk.
6. New coverage in the NYT shows a clear difference between powerful risk-takers and relatively powerless at-risk groups. The difference between the groups is sharpening over time. The powerful take more social risks while the powerless take much more substantial risks often related to illness, injury and death.

## Key methodological issues

The study demonstrates the potential for large annotated corpora to examine key claims of sociological theory about social change. It is innovative in creating a corpus comprised by annual subcorpora which allows detailed longitudinal interrogations. It takes advantage of major developments in computational linguistics/natural language processing such as constituency and dependency parsing. Both allow much more detailed and nuanced investigations than generally seen in CADS.

The advantages of the longitudinal analysis of one newspaper had a price, however. It is limited to a case of one genre of newscoverage. Other forms of text are not considered and might show different patterns.

The Language processing tools developed and/or used in this study also have limitations. We have used the *Stanford CoreNLP* NLP suite, which outputs constituency and dependency parses, rather than systemic-functional parsers. Translating the former into the latter poses a number of serious challenges. In some cases, systemic features cannot be automatically recovered from the parses, limiting the kinds of phenomena that can be automatically located and/or counted.

## Perspectives

At the time of writing, our investigation is ongoing. In forthcoming work, we seek to:

1. Broaden the empirical basis integrating a growing number of US newspapers, in order to determine whether findings generated here may be generalised across mainstream U.S. print media.
2. Integrate data from newspapers of other countries (e.g. UK, Australia) into our corpus, in order to identify differences in institutional and linguistic practices across Anglophone countries.
3. Perform qualitative analysis of individual texts, in order to explore particular observations made in this report and their institutional contexts in more detail.

# Chapter 1

## Introduction

There is little doubt that risk has become a common experience of our times. This is most apparent in technical catastrophes (e.g. Chernobyl), environmental changes (e.g. climate change), international terrorism (Al-Qaida, IS) and global epidemics (BSE, bird flu), but it is in everyday life as well. We are concerned about whether and who to marry, what to study, which occupation to learn, how to be financially secure in retirement, and even what to eat or drink (Beck 1993, 2009, Giddens 2002). We can increasingly less build on established traditions or generally accepted models of a normal life or intimate relationship. Instead, we have to make risky decisions ourselves and negotiate them with others (Beck & Beck-Gernsheim, 2002). There is a vast amount of advisory literature, trainings, and advisors available which all offer their help. Risk and how it is assessed, evaluated, audited and managed have also become institutionalised in both public administration and private companies (Power 1997, 2004). Risk based procedures are in the core of the New Public (Risk) Management (Hood 2001; Black 2005; Kemshall 2002). This focus on risk avoidance is accompanied by the marketing campaigns of the insurance industry to take care for all the undesirable possible events which could happen to us from accidents, to burglary or even death. But is it possible or really desirable to live without risk? Wouldn't life 'be pretty dull without risk' (Lupton & Tulloch, 2002)? Some might seek risks in activities such as base jumping (Lyng, 1990), aidwork (Roth 2011) or mountain rescue work (Lois, 2003) to experience their real self while others might prefer risk free excitement.

The diversity of risk issues makes it even more difficult to understand what drives current debates about risk (Garland 2003). Has risk just become a buzz word in news media that will go away sooner or later as quick as it appeared? Is it too complex to find a shared core of all these ideas of the term risk referring to issues from harm to risk calculation and risk-taking? Is there any good reason that at times where we live in average longer, healthier and wealthier as ever before, risk has become such a common semantic in public discourses and news media? Haven't humans always been exposed to dangers, threats and harm and often their own behaviour was connected to it, whether they exposed themselves voluntary or involuntary to risk, they were aware of the risks or ignorant, whether they calculated them or just hoped that nothing goes wrong? What are the roots of our increased usage of the term risk?

The term 'risk'—as etymological research has shown—became more common in the 14th and 15th century—in particular in marine trading (Luhmann 1993, 9f.; Bonß 1995, 49f.). Luhmann (1993, 10) suggested that the invention of a new term—'risk'—became necessary to express a socially new experience: 'Since the existing language has words for danger, venture, chance, luck, courage, fear, adventure (aventuyre) etc. at its disposal, we may assume that a new term comes into use to indicate a

problem situation that cannot be expressed precisely enough with the vocabulary available'. This new experience was '... that certain advances are to be gained only if something is at stake. It is not a matter of the costs, which can be calculated beforehand and traded off against the advantages. It is rather a matter of a decision that, as can be foreseen, will be subsequently regretted if a loss that one had hoped to avert occurs' (Luhmann 1993, 11).

This was a typical experience for the merchants who sent out their ships to gain huge profit but were always in danger to lose their vessels and face bankruptcy. In response to these challenges they developed early support schemes and later marine insurance. While this notion of risk-taking developed and became common in the transition to modernity, it is only after WW2 that in scholarly work and public discourse the term risk experienced a triumphal procession in contrast to other terms such as danger, threat or harm (Zinn 2010). Why is it that the term risk shows such an outstanding development? How did the term behave and does risk show different behaviour in different contexts? Did it change its meaning as some scholars claimed? What does the term's behaviour tell us about our life and how it is changing?

This project combines the sociology of risk and uncertainty with linguistics to shed light on the historical social and linguistic changes linked to the term risk.

Since the 1980s and 1990s the notion of risk has become increasingly influential in societal discourses and scholarly debate (Skolbekken, 1995). From early work on risk and culture (Douglas, 1986, 1992) to the risk society thesis (Beck, 1992, 2009; Giddens, 2002), from governmentality theorists working in the tradition of Foucault (Dean, 2010; O'Malley, 2012; Rose, 1999) to modern systems theory (Luhmann, 1989, 1993) all have built their work around the notion of risk and implicitly or explicitly refer to linguistic changes. Though this body of literature offers different explanations for the shift towards risk and its connection to social change, to date there has been no attempt to empirically examine their relative ability to explain this change in the communication of possible harm.

This project conducts such an analysis to advance sociological theorising. It takes advantage of two developments: Firstly, in corpus/computational linguistics (Baker 2006, CASS 2015) more complex research tools have been developed which allow the analysis of large text data sets ('text corpora'). Secondly, news publishers have advanced in digitising and making publicly available their archives so that they can be used more easily for research purposes.

The project is the first that combines corpus/computational linguistic approaches with risk studies for a detailed analysis of the discursive social change towards risk after WW2 in the US. It breaks new ground by building the first grammatically parsed text corpus of The New York Times (NYT) including all articles containing risk tokens from 1987 to 2014, as well as a sample from 1963. The study proves the value of the used methodology, the applicability of a corpus approach for the analysis of long term social change and the fruitfulness of combining linguistic and sociological approaches in a research design to advance understanding of social change.

In the following we first introduce key elements of sociological risk approaches, review empirical shortcomings and present key hypotheses derived from risk theories. We then outline our linguistic approach starting from insights and shortcomings from frame semantics and utilising systemic functional linguistics for a more elaborated analysis of the corpus and the key hypotheses.

In the next step we outline our research design, including the selection of the case study of The New York Times, the building of the text corpus, and the tools to interrogate the text corpus. We follow two major lines of analysis: First, we are looking for different ways in which risk is instantiated, and how these have changed longitudinally. Second, we are also looking for specific claims made by sociological theories to find out whether there is any indication that they are correct or require specification.

Our investigation begins with a linguistic analysis of risk language in the NYT, exploring lexical

and grammatical phenomena, and moving freely between different levels of abstraction (from frequency counting to concordancing of linguistic phenomena, for example). Findings from this lexicogrammatical exploration are then abstracted, according to SFL theory, to form a description of the changing discourse-semantics of risk in the NYT. This description is linked to key sociological questions, as well as discussions concerning the extent the linguistic observations can help and inform these social changes.

Given the vast array of changes in the behaviour of risk words uncovered, as well as limitations of time and scope, our analysis is at this stage oriented more toward a longitudinal account of language, rather than sociological theory. We outline a number of promising leads for sociological analysis; developing links between linguistic and sociological reasoning that create pathways for further research and research strategies to answer key sociological questions about social change. We finish with discussing some technical issues and perspectives for digital humanities perspectives.

# Chapter 2

## Conceptual foundations of our project

### 1. Theories explaining the shift towards *risk*

Interdisciplinary risk research had traditionally been dominated by technical and psychological approaches examining public understanding and acceptance of risk. Since the 1980s social science have become more influential focusing on the social shaping and construction of risk (Zinn & Taylor-Gooby 2006) and thereby open debates for social explanations for the historical shift towards risk.

Seminal work of Mary Douglas introduced a sociocultural approach focussing on the social values which would determine what risks are selected and which responses are considered appropriate (e.g. Douglas & Wildavsky 1982). Douglas and Wildavsky argue that with the social institutions we also select the risks we are concerned about. Real dangers would be transformed into risks for the institutions and value of a social unit such as particular social group, organisations or society. They developed the grid-group schemes that provide a number of ideal types to characterise the different empirically observable cultures. They distinguished their types on two dimensions: the extent to which individual identities and cultural outlooks are fixed and predetermined and the amount of control members accept (grid-dimension), and second by the degree of commitment or solidarity individuals exhibit or feel towards a social group (group-dimension). The combination of these two dimensions resulted in four ideal types. Hierarchy, is characterised by a high predeterminedness of identities and control and a high degree of commitment to the group, which is typical for organisations such as the military, the Catholic Church and traditional bureaucracies. Conversely, in markets we find low predeterminedness and control and relatively little commitment to the group. This second ideal-type is termed individualism. Low predeterminedness and control of individual identity but high degree of commitment and solidarity characterises the third ideal-type, egalitarianism, which is typical for grassroots movements and communal groups. The fourth type, fatalism, occurs when predeterminedness of identity and control is high but solidarity and commitment are low, and when people are rather isolated and lack influence and commitment to a social group. On this basis, Douglas (1990, 15f.) argued that in an individualist culture, social concerns focus on the risks associated with the competitive culture of markets where the weak and the losers have to carry the blame for their failure. In a hierarchical culture, the focus is on social risks and those who deviate from the dominant social norms tend to be blamed for risks. In an egalitarian culture there is the tendency to focus on natural risks and to blame the system and faction leaders. In the fatalist perspective only fate, itself, is blamed.

Douglas' argues on the basis of her earlier anthropological work (1963, 1966) that concerns regarding

dirt and pollution are less about bacteria, viruses, or pollutants and more about socio-symbolic disorder than the lack of control of a group's boundaries. The control of the body and its margins serves as a symbol for controlling the rules that define a social group. The reality of danger becomes important for a social group as a threat to its boundaries, orders, and values. Similarly the modern notion of risk in secularized societies serves to protect the boundaries of social groups.

However, Douglas (1990) suggested, the term risk has changed its meaning in contemporary western societies. It is no longer a neutral but a negative term. Risk has come to mean danger and 'high risk means a lot of danger' (Douglas, 1990, p. 3).

Ulrich Beck introduced the most influential risk society theory with a focus on the impact of new risks which accompany successful modernisation processes. Economic, scientific and medical advancements manifest not only in increases in average wealth and health but also new risks. Beck and also Giddens emphasise that the modern world is characterised by risks which are increasingly produced by humanity itself rather than exposed to us by the environment (Beck 1992; Giddens 2002). As a result it was mainly up to us to deal with the risks and uncertainties of our world and the reality of increasingly self-produced risks and uncertainties ('manufactured risks' and 'manufactured uncertainties'). Nature and our environment would increasingly be experienced as shaped by humanity (e.g. climate change, genetic engineering). Beck also argued that individualisation processes would transform a society stabilised by traditions into social forms characterised by individual decisions (Beck 1992, 2009). But this is an ambivalent process. The social expectation that people should take on the responsibility to individually plan and shape their life were emphasised at a time of growing social complexity, instability and volatility. Individual control of outcomes becomes even more unlikely. As a result of new risks and individualisation risk and uncertainty have become a common experience of our time. It is characterised by increasing social and individual responsibility at a time when growing complexity and uncertainty makes it even more difficult to plan and shape our future purposefully.

Following Michel Foucault's work, a number of scholars understand risk as characterising a new way of governing societies on the basis of normative discourses of individual responsibility and improvement on the one hand and calculative technologies such as statistics and probability theory on the other (e.g. Dean 1999; O'Malley 2004; Rose 1999). In the governmentality perspective, risk is not so much about the reality of risk but a specific form to govern societies utilising calculative technologies and normative discourses of individual self-improvement and responsibility (e.g. Dean 1999). Framing the world in terms of risk was an expression of a new form of discursive power in late modern societies. Statistic probabilistic technologies are only part of these discourses among others though an important one. It produces an own rationality. Individuals are no longer approached as a whole but defined by particular factors which determine their status regarding particular regulative action (e.g. offenders risk to reoffend defined by a number of risk factors). How social groups are defined by such factors in tandem with normative discourses of individual self-improvement is a key theme of research in the governmentality tradition.

In addition to these mainstream approaches, Niklas Luhmann's systems theory emphasising the new ways how the shift from stratificatory differentiation to functional differentiation contributes to increased debates about risk (Luhmann, 1993). Social systems would try to get shift risk to other areas which would result in risk conflicts and negotiation of risk.

Finally, Steven Lyng's work on edgework engages with forms of voluntary risk taking (Lyng, 1990). He emphasises that people take risks out of desire to experience their real self, unmediated through social norms. He also considers the possibility that in advanced modernisation the ability to take risks and to deal with highly complex and volatile situations becomes a socially desirable skill. People's increasing

voluntary risk taking would therefore be an expression of common normative expectations.

It is likely that all these social changes proposed by different social theories manifest themselves somehow linguistically in everyday life usage of language as much as in the news media. However, these approaches have usually not explicitly developed a theory or explicit hypothesis about the connection between social change and linguistic change or news reporting. Usually the media get involved in risk studies since we do mainly only know about many risks because they are reported in the media and the media are often accused of contributing to public's distorted knowledge about risk (e.g. Jensen et al. 2014). It has also become common to emphasise the media's own rational in news production (Kitzinger, 1999; Kitzinger & Reilly, 1997) and the need to examine the missing link between risk studies and media studies to understand social perception and responses to risk (Cottle 1998; Tulloch & Zinn 2011). For example, at times of restricted financial resources, using scientific press releases, which typically contain some risk language, might be the most efficient strategy to produce news.

There is also a lot of research how particular risks have been communicated and presented in the media such as climate change. However, there has not yet been an analysis that—similarly to Luhmann's claim of the condition of a new semantic—examines how risk is utilised and behaves relatively independent from trends in the media (e.g. increasing nominalisation) and how broader social changes and significant events might influence the way how risk is understood and used in discursive practice—not only but also in the media. However, when sociology scholars referred to issues such as the common usage of risk language they often rely on more or less anecdotal analysis of historical and semantic change (e.g. Luhmann 1993, Giddens 2002; Beck 1992) or invent examples themselves (Lupton 1999).

## 2. Empirical evidence and shortcomings

Claims about historical social change made by Ulrich Beck (Beck 1992, 2009) with the most famous risk society thesis are based on general observations and exemplary evidence. It is difficult to provide comprehensive empirical evidence for the kind of structural and institutional changes Beck addresses with his theory. Tracing such changes through detailed analysis of linguistic changes could be a valuable strategy to show systematically in which societal areas social changes have manifested.

Detailed historical studies on risk are mainly provided by researchers from the governmentality perspective (Ewald 1986; Hacking 1991; Valverde 1998; but compare: Strydom 2002; Gamson 1989). They produce valuable knowledge on the prerequisites for, and impact of, the introduction of statistics and probability calculation, and how they contribute to the governing of societies. These studies are convincing in the reconstruction of changes in institutional risk practices by specific area- or case-studies. They contribute less, however, to our understanding of how these developments compete with or complement others, and how they combine to influence a general shift in the communication, comprehension and semantics of risk in the media.

Many theorists claim that the media are particularly influential in social risk discourse (Beck 1992), though conceptualisations like risk society are criticized for being undifferentiated and ignoring current trends in media research (Kitzinger & Reilly 1997; Cottle 1998; Kitzinger 1999). Media-oriented risk research mainly examines specific events or debates, such as Mad Cow Disease (BSE), genetically modified food, or international terrorism, and how news and risks are produced by the media (e.g. Allan, Adam & Carter 2000). It does not reconstruct how risk enters the media and how the understanding and usage of the term may have changed over time. Even the most recent special issue 'Media and Risk' in the Journal of Risk Research (vol.13, no.1) ignores this important aspect. One exception is Mairal (2008). He has

reconstructed how risk discourses developed over time in Spain and showed how earlier experiences and symbolical representation of risk influenced later discourses; but he did not examine semantic changes of the term risk.

There are strong streams of risk research on technological risk and risk assessment, health, social work and insurance. Authors such as (Strydom, 2002) claim that the nuclear power debates and technological risk analysis has been the major drivers for increasing concerns about risk. Similarly Beck (2009) focuses on new technologies as the driver for the growing anxiety about our future. This might underpin the different conceptualisation of risk as unexpected harm, part of statistic probabilistic calculation, or a conscious decision. Differing from Beck, first analyses have shown that in media discourses the risk semantic is less used in articles describing new risks. Instead, a majority of articles are on health and illness and economics (Zinn 2010, p.111f.).

Many linguists are interested in overcoming the strong focus on language in discourse analysis and in incorporating social dimensions (e.g. Van Dijk 1997, Wodak & Meyer 2001). In general, this stream of research has contributed little to the reconstruction of the historical development of discourses (Brinton, 2001; Harding, 2006; Carabine, 2001) although many cognitive linguists examine long term semantic changes (e.g. Nerlich & Clarke 1988, 1992, 2000; Traugott & Dasher 2002). Regarding risk, corpus linguists have shown that sociologists' assumptions about the usage of risk are often informed by everyday life knowledge rather than systematic empirical analysis of how the term risk is actually used (Hamilton et al. 2007). Frame Semantics has provided a detailed analysis of the available risk frames (Fillmore & Atkins 1992); but neither approach examines historical changes of the usage and notion of risk.

In interdisciplinary risk research there is a long-standing body of research focusing on risk communication between decision-makers and the public (e.g. Kasperson & Stallen 1991). This research has produced valuable knowledge about how to improve the communication of risk, while media coverage is discussed from the point of view of the public's risk perception (Bennett & Calman 1999; Slovic 2000). Some typical patterns of risk reporting are identified as well as factors which amplify and attenuate the communication of risk (Kasperson et al. 1988; Pidgeon et al. 2003; Flynn et al. 2001). However, this research contributes little to a historical perspective of how the risk semantic became pervasive in daily newspapers.

For risk research, the phase after WW2 has been identified as particularly crucial in the establishment of increasing debates about risk and the success of the risk semantic. Other semantics such as 'threat' had its establishing phase between WW1 and WW2 during which it established as a most common term in The New York Times' newspaper coverage which remains relatively stable after WW2 (Zinn 2010, p.117).

The triumphal procession of risk took off before iconic events such as the Chernobyl disaster or the 9/11 terrorist attacks took place. A more systematic analysis of the dynamics of the usage of the risk semantic would allow a detailed understanding of how our framing of the future in terms of risk was influenced by different forces and events.

Originally, social science debates had been dominated by the introduction of nuclear power and the social controversies accompanying them (Douglas & Wildavsky 1982; Perrow 1984; Beck 1992; Luhmann 1993). However, the debates about DDT-based insecticides had driven public conflicts much earlier. The publication 'The silent spring' (Carson 1962) did not trigger social science risk debates and did not stand out in the early debates of Douglas (1985) and later of Luhmann (1993) and Beck (1992) on risk. One reason might be that the semantic grounding of a risk framework had not been established at the time.

However, there are clear indications that the risk semantic and related discourses using a risk frame became increasingly dominant during the 1980s. With our study we wanted to examine in more detail

how institutional social change manifests in language. We assumed that fundamental changes such as towards a society increasingly concerned with self-produced risk would manifest in linguistic patterns even in a single genre such as print news media (similar to the Books of Manners in Norbert Elias' study). Building on an exploratory study that only counted the numbers of articles where a risk token was used at least once, Zinn (2011) provided evidence that even during a relatively short period of 1987 to 2014 we should be able to identify relatively short-term social changes within language.

### 3. Central hypotheses in risk studies

In order to test the applicability of our research strategy and computational tools for historical research we derived some central hypotheses from mainstream sociological risk theories.

First, a number of approaches frame risk not only as possible harm but a calculative technology to estimate possible harm and through this knowledge manage it. For example, in the governmentality perspective risk is considered a calculative technology (e.g. Ewald) which is used to manage harm. Similarly, in the risk society perspective insurance and science are characterised by risk calculation to minimise risk. In the risk society perspective the calculability of risk characterises first modern experience. If risks are not directly controllable by science/knowledge we still have the opportunity to manage them by insurance, for example. However, both governmentality theorists and risk society researchers have emphasised that uncertainties and non-knowledge would increase and we would observe a shift from the calculability of risk to the potentiality of harm. If this is correct it is more likely to find phrases which indicate the pure potentiality of risk rather than the calculability of risk.

Second, the risk literature about societal changes has also emphasised that the experience of risk has started to change during modernisation on another dimension. The positive side of risk as risk-taking would lose influence (Douglas 1990, Lupton 1999). Risk would mainly mean harm or danger and verbal forms involving an active decision to take a risk for something positive would decrease. We might even observe within the verbal forms a shift from positive risk taking to a pure exposure to risk where the possible gain disappears. For example, the notion of taking a risk or running a risk might increasingly be supplanted by notions of exposure to risk.

Third, governmentality theorists have claimed in recent decades that a neo-liberal agenda has become more dominant that shifts responsibility to individuals and the expectation that individuals actively make decisions and take risks. If this is correct we would expect more individualised phrases which express more active risk-taking.

However, Beck (1992) claimed that in recent decades one has to understand and act as an individualised planning office exactly at times where knowledge and control of the future is limited. That means an active risk taking citizen is expected at a time where it is even more unlikely that an individual can control outcomes. For such a contradictory situation we would expect less the communication of self-confident decision making and risk taking but individualised suffering and exposure to of all kinds of risk.

This would support the suggestion of social policy researchers that risk is increasingly shifted from organisations and institutions to individuals (Hacker 2006: risk shift). It is important to see that this happens as a legitimate shift not something what happens against public resistance. At least in a country such as the US where individual action is highly valued we would expect that this shift takes place legitimately and deeply rooted in the societal institutions. Rather than as a surprise it would be a consequent development following an already prepared path. As a result we would expect not only as a

rational of consequent media reporting that individual stories are but to sell to the public but that more generally the individual exposure to risk rather than individual agency would be emphasised.

Fourth, Ulrich Beck claimed in the chapter Beyond Class and Status in his famous book Risk Society that social inequalities and disadvantage would increasingly be framed in individualised terms. That means that risk is no longer attributed to social class or status but to social groups which are at-risk because of their particular behaviour rather than class affiliation. Researchers examining shifts in public/social policy and social work support Beck's suggestion and claim that social institutions would increasingly use practices that identify social groups at-risk on the basis of particular indicators which then characterise particular groups such as drug users, homeless, fatherlessness etc. as at-risk groups which require regulation, support, encouragement or protection. If Kemshall and others are correct that risk thinking has become a common societal practice this should be reflected in media coverage.

We would expect that groups reported on in the media are identified and reported about using their at-risk status rather than social class affiliation or general socio-structural conditions which influence their behaviour or shape their living conditions. Such generalised factors would be rather silenced or made invisible. We would expect that it is increasingly likely that we find groups characterised by attributed risk status.

Fifth, there is a tension in the debates about risk in the literature. Relative powerful middle class people are assumed to be individualisation winners, that means they have agency and can make decisions while more disadvantaged people lack agency and are approached by the state, encouraged or more broadly managed. They have a more intrinsic quality of being at-risk. For example, drug users might be a population at-risk by social definition. We would expect finding a clear distinction between powerful risk takers and powerless at-risk or vulnerable groups identified and characterised by a specific variable or characteristic.

Finally, we not only examine whether we can say something about these hypotheses. We will also use the data to explore and generate new insights with the help of the corpus linguistics research tools.

#### **4. Linguistic concepts for researching risk**

Recently, with rapid technological developments in the digitisation of historical newspaper archives and the computational analysis of text data, it has become possible to examine long term changes in media reporting and using the media as a source for analysis of long term societal changes. Accordingly, our research takes advantage of sophisticated linguistic tools for the analysis of long-term social change—a research agenda with roots not only within the media but in the larger (social) world which effects and shifts the lexis and grammar used when reporting risk.

Central to any well-considered study of language use is a theory of language, which may either implicitly or explicitly inform the kinds of analyses being done. A number of frameworks exist for connecting lexis and grammar to functional meanings. Notable within risk research has been frame semantics, which has been used to characterise risk as one or more cognitive frames/schemata involving a number of possible components, such as risker, risked thing, chance, and positive/negative outcomes. This theory has then been put to use within corpus linguistic approaches to risk, which have used large digitised datasets to understand how the risk frame(s) are typically constructed. Despite successes within this approach, it remains limited by the fact that corpora seldom provide researchers with opportunities to confirm cognitive hypotheses regarding the intentions of the writer, or the comprehension of the reader

Another popular functional linguistic framework is Systemic Functional Linguistics (see Halliday & Matthiessen, 2004), which conceptualises language as a sign system that is employed by users in order to achieve social functions. While sharing a functional view of language (as opposed to formalist views (e.g. Chomsky's *Generative Linguistics*)), SFL is a functional-semantic theory, rather than a cognitive-semantic one. While the remarkable achievement of frame semantics is its mapping out of cognitive frames, we are largely unable to operationalise these with our dataset, as we have little information regarding the specific interactants (writers and readers) of the original texts. Moreover, cognitive understandings of text are complicated in situations where the text's author is producing the text within an institutional context, for a readership. Without downplaying the potential importance of cognitivist accounts of risk, we have instead opted here to focus on risk words as instantiations of parts of the linguistic system for the purposes of meaning-making, rather than as a representation of the cognitive schemata that underlie our behaviour.

A second benefit of SFL for our purposes is that it provides the most detailed functional grammar of English (Eggins & Slade, 2004): when compared with frame semantics, it provides a more rigorous description of how risk can behave lexicogrammatically—that is, in relation to both other words and grammatical features—within a clause. This makes it possible to search parsed texts in nuanced ways.

The third benefit of SFL is that it provides not only a grammar, but a conceptualisation of the relationship between text and context. A foundational tenet of SFL, and a point of departure from other linguistic theories, is the notion that we can create a description of context based solely on the lexicogrammatical content of the text. This is particularly suitable for us, given that our texts arrived to us abstracted from their original contexts. This context was then further obscured through the parsing process. As such, SFL provides an ability to account for discourse-semantics using corpora that other theories cannot.

In many respects, the major challenge of this project has been to find ways how to combine a linguistic analysis that goes beyond tallying the co-occurrence of lexical and grammatical features with the sociological understanding and analysis of long-term social change. As a linguistic theory that provides a taxonomy of both language and context, SFL practitioners have to date been reluctant to engage with conceptualisations of context from other traditions within the Humanities and Social Sciences. This is disappointing, especially when considering that the most common criticism of SFL is that its theory of context is heavily influenced by its theory of grammar: in SFL, context is divided into three major dimensions (*Tenor*, *Field* and *Mode*), which are essentially projections of a language's major grammatical systems (*Mood*, *Transitivity* and *Theme*).

## 5. Our research approach

The social sense-making processes of risk depends on risks being communicated. Though people experience risk when they manifest personally, since risks are usually expectations towards the future, the social process that shape these expectations are crucial. Even when we make personal experiences it depends on broader social processes whether we interpret a hot summer as an indication for climate warming or just a normal variation.

Communication is mediated through language, and language is by no means restricted to a neutral communication of knowledge or information about events and happenings in the world. Language may shape what seems possible as much as what seems appropriate or inappropriate. It both constructs and responds to all kinds of information about the context in which it has been generated, the values

underpinning it, the power structures it reproduces or is structured by (sociolects; gendered language, etc.). Since language is such a rich resource for communicating information about social reality, it is also data that can be used to examine social change (e.g. Norbert Elias' historical analysis of the books of manners to examine the civilisation process).

The media plays an important role in communicating social life. It not only influences but also reflects what is considered important at a historical point in time not only in the form of selecting particular content but how it is presented. A careful analysis of linguistic change therefore requires not only investigation of what has been communicated through language, but how it has been communicated and how both lexis and grammar have changed over time in the communication of issues such as risk.

Sociology, linguistics and media studies provide slightly different concepts of both 'context' and of the forces that influence the selection and communication of social issues such as risk. Sociology is interested in wider and long term social changes. In a historical perspective, the focus is on how institutional and sociocultural social changes are reflected in the use of language. Sociologists are well aware of that the use of language is, for example, influenced by the social milieu a person is part of (e.g. working class, middle class) and such a context manifests not only in the content but also the form and the use of grammar of language. For sociologists, contexts and events within contexts are not necessarily socially triggered or caused. But how they are dealt with is mediated through language. The suppression of women in a society might be openly debated or not talked about. It might even be engraved in a language, where masculine nouns and/or pronouns have historically also been used to refer to general populations (e.g. A giant leap for mankind) or singular entities whose gender is unknown.

In many branches of functional linguistics, the understanding of context focusses on text. A particular text can be analysed regarding its form and structure and its origin. Through linguistic features of texts alone, genre can often be clearly determined. Whether a text is a newspaper article or a university lecture, a talk of a party leader to party members or a general public, can often be determined simply through an analysis of the lexis and grammar in a text, as well as the way in which stages of the text are ordered. The larger social conditions and how these might have influenced the content and use of language are less commonly examined. Despite increasing awareness and sensitivity to context in functional linguistics, context is more commonly operationalised as observable constellations of variables of a given interaction (speaker demographics, spoken/written, formality, etc), rather than as a set of broader social movements, ideas and values. Even researchers within systemic functional linguistics (SFL), which at one time explicitly attempted to delineate the relationship between realised language and social class and ideology, have revised the conceptualisation of context to exclude ideology as the greatest level of observable abstraction. Long-term historical analyses remain centred on language, and empirically driven attempts to connect language change to broader social change are exceptionally rare.

This is not to say that there is no value of linguistic theory and methods for the purposes of understanding the changing status of risk in society. In fact, the opposite is the case: linguistics (in our case, SFL) provides a framework for delineating the kinds of changes that risk language undergoes. For example, in order to understand how risk language has changed, we must first distinguish between risk as a participant within a communication about the world (The risk was serious) and risk as a process (Lives were risked). Our addition to more standard linguistic methods is not that we abstract the significance of linguistic changes—as this is a common task within linguistic discourse analysis—but rather that following from an abstracted discourse-semantic analysis of risk, we abstract again, to consider the influence of factors beyond what is captured within linguistic taxonomies of context.

Media studies are positioned in between sociological and linguistic approaches. Discourse analyses using media or print media often focus on content and the positive or negative representation of issues.

These studies do often not go into further detail regarding long term linguistic changes. They tend to focus on short term ways of representation of issues such as climate change. However, media studies have also raised awareness of the organisational and social context that shapes how news are produced (e.g. free press or more or less controlled press; economic pressure; political bias). Research has examined the production process of news and how this process follows an own logic of newsworthiness that influences which issues enter the media and which not. There is also awareness that there are events and dimensions of change which are not reported in the media. Not everything is newsworthy and what is selected follows the own media production logic of news. In this respect media reporting is selective and it is difficult to take stock of the aspects which have not been reported without looking beyond the media. These issues must be identified and approached differently. For example, it is important for linguistic research of texts alone to acknowledge that such approaches may not be able to consider what drives the media agenda and which kinds of texts might be systematically included/excluded as a result of unobserved institutional and contextual factors.

However, since the media are part of social change, it reflects as much as influences social changes, and, accordingly, can be used to examine long term social change. Since many risk issues are newsworthy, we can expect to find a lot of risk communication, which allows us to examine the changing practice of risk reporting and the use of the risk semantic. Broad changes in the relationship between news institutions and risk communication (e.g. which risks are considered, how they are reported, etc.) are so general and part of more generally changing discourses and linguistic practice that they will affect newspapers as well since they have to appeal to the public.

Given the novelty of Big Data and Big Data methods, investigations such as ours involve the development of theoretical frameworks for linking instantiated language to discourse-semantics. In our case, this involved a thorough investigation of the lexicogrammar of risk language in news journalism. In this report, we map out strategies for engaging with the systemic functional notion of experiential meaning primarily through complex querying of constituency parses. In terms of the systemic functional conceptualisation of the Mood system as a resource for making interpersonal meanings, as well as the notion of arguability, we demonstrate novel strategies of exploiting dependency parsing provided by the Stanford CoreNLP toolkit. Though existing automated parsing generally cannot provide the level of depth necessary for full systemic annotation of language, the partial account that can be provided still proves sufficient for connecting lexicogrammar to discourse-semantics in a rigorous and systematic fashion.

As these new methods involve automated analysis via computer programming, our project also contributes to methodology via a repository of code for manipulating large and complex linguistic datasets. This repository, though designed for our particular investigation, is readily reusable by other researchers interested in how language is used as a meaning-making resource. Our methodological work is available open source at <https://github.com/interrogator/risk>. Documentation and code used to build and annotate the NYT corpus is also freely available there.

# Chapter 3

## The case study: *The New York Times*, 1963, 1987–2014

### 1. Selecting *The New York Times* as a case study

There is good evidence that the risk semantic has become more common in societal discourses and practices. A direct count of articles which contain a risk token at least once showed how the dynamic of risk developed in many countries after WW2 (Zinn 2011). It clearly shows how risk is mainly a phenomenon that developed a particular dynamic after WW2 in particular in the late 1980s. It also shows that the risk semantic had been around for quite a while without a clear dynamic. This is interesting and invites more long term investigations.

With the current study we wanted to examine in much more detail whether during a historical relatively short period from 1987 to 2014 (we used a sample of the 1963 volume to contrast with the later years) significant shifts can be observed using much more sophisticated research strategies than used in earlier corpus based approaches on the risk semantic (e.g. Hamilton et al, 2007).

Therefore we selected only one newspaper—The New York Times—as a case study after careful consideration of other available resources. We aimed to find a resource that allows longitudinal analysis of long term social change with a limited number of intervening factors. We were looking for a paper which provided a high quality digitised archive and a central news institution over the centuries.

The (London) Times and the NYT seem suitable because of their important social role within a society. They also fulfil further selection criteria such as wide circulation (not just regional), good accessibility and high data quality. However the NYT has been finally selected because of the central role of the US in the world and the prestige and clout of the NYT. The NYT is a historically central institution of media coverage (Chapman 2005) with a continuously high status and standard of coverage. It is influential, highly circulated and publicly acknowledged news media. It contains extensive coverage of both national and international developments, its digital archive covers all years since WWII and is relatively easy to access.

Available Australian Newspapers such as The Australian or The Age offer similar digitised archives only for recent decades and at higher cost. Long term historical analyses are much more complicated and will be pursued when we have proven our methodology.

The project concentrates on a single newspaper and follows a reproduction logic (Yin 1989) for four

reasons:

1. The ‘historical change of concepts’ (Koselleck 2002) is so general that it can be identified even in specific newspapers though newspaper specific factors have to be considered.
2. A detailed analysis of available newspapers archives by the CI has found that, in the US, only the Washington Post provides a comparable archive. While both show no significant differences in the general increase of the usage of the risk semantic (Zinn 2010, p. 115), access and data management has proven easier and more reliable with the NYT.
3. The case study allows a more detailed analysis of how the change of the newspaper might have influenced the use of risk. A collection of newspapers, as in many linguistic text corpuses would not lead to representative results but would create uncontrolled biases. Instead, the case study of a specific newspaper allows a much more detailed analysis of how change of the newspaper itself, such as a change in leadership or style of news reporting, might have influenced the use of risk.
4. The study limits the amount of data and restricts costs without losing significant outcomes. Originally we wanted to compare the volumes 1963, 1988, 2013 of The New York Times. We soon found out about the availability of a high quality data resource, The New York Times Annotated Corpus which covers all articles published from 1987–mid-2007 and includes substantial metadata and contains 1,130,621,175 words. We complemented this dataset with articles from the NYT online archive up to 2013/14.

In order to further validate our results, future research has been planned that will compare our results with more recent data from other US newspapers. Though in the US many newspapers are digitised the main issue is that some papers are strictly PDF while some of these PDFs have the plain text version also available. We identified major newspapers which are suitable for comparative purposes in future research.

## 2. Building the *Risk Corpus*

Our investigation centred on digitised texts from New York Times editions in 1963 and between 1987–2014. These texts (defined here as individual, complete chunks of content) are predominantly news articles, but depending on archiving practices, also included in our corpus is text-based advertising, box scores, lists, classifieds, letters to the editor, and so on. More specifically, we were interested in any containing at least one ‘risk word’—any lexical item whose root is risk (risking, risky, riskers, etc.) or any adjective or adverb containing this root (e.g. *at-risk*, *risk-laden*, *no-risk*).

We relied on two sources for our data. *The New York Times Annotated Corpus* was used as the source for all articles published between 1987–2006. ProQuest was used to search for and download articles containing a risk word from 2007–2014, alongside some metadata, in HTML format. We also created a subcorpus of articles from NYT 1963 editions through optimal character recognition (OCR) of PDF documents archived by ProQuest as containing a risk word in either metadata (i.e. title, lede) or content. Due to the time-intensive nature of manual correction of OCR, a random sample of one-third (1218 texts) was selected, with paragraphs of texts containing a risk word being manually corrected by hand.<sup>1</sup>

Article text and any available metadata were extracted from this unstructured source content using *Python’s Beautiful Soup* library and added to uniquely named text files in annual subfolders. The kinds

Tag	Content
MA	Author(s)
MC	Librarian-added category tags
MD	Date of publication
MI	Unique identifier
MK	Mallet topic
MM	Manually annotated topic
MP	Section of newspaper
MS	Risk concordance line
MT	Article title
MU	URL for article
MZ	Annotator comment(s)

Table 3.1: Metadata tags and content

of metadata available varied according to the data source: The *New York Times Annotated Corpus* provides a number of potentially valuable metadata fields, such as author, newspaper section, and subject (manually added by trained archivists). These metadata fields provided both human-readable information for use during qualitative analysis of texts, and machine-readable information that could be used to restructure the corpus in future investigations.

We then value-added to this partially annotated corpus in three main ways. First, keywords and clusters for each article were calculated using *Spindle* (see Puerto, 2012) and added as metadata fields. Second, *Mallet* (see McCallum, 2002), a topic modelling tool, used LDA to algorithmically assign ‘topics’ to each article. The topics and their strengths were added as a metadata field. Finally, we used the *Stanford CoreNLP suite* (see Manning et al., 2014) to parse each risk token and its co-text for grammatical structure and dependencies.<sup>2</sup>

A key strength of the methodology is that subcorpora based on article or metadata attributes can be easily created and compared. Our interest was in creating a small set of topic-specific corpora in order to look for changes in risk word behaviour within a specific field of discourse. As a case study, we decided to focus on health articles. Librarian-added metadata concerning article topic/category (MC metadata field) was used to locate all articles tagged with the case-insensitive Regular Expression \bhealth.\*.<sup>3</sup>

We used some of the metadata fields to identify and remove listings (of best-selling books, plays, TV guides, etc.). Reasons for this were threefold. First, the jargon, abbreviations and non-clausal nature of listing language was not handled well by the parser. Second, list content was often repeated verbatim in multiple files, potentially skewing counts. Third, our two data sources archived listings in different ways. Listings were located by querying metadata fields in a number of ways. Files with titles such as *Spare Times*, *Best Sellers*, articles with keywords such as ‘theater’, ‘listing’, or days of the week. If a file contained only a listing, the file was removed. If a risk word appeared only within the list portion of an article, the file was deleted. If a file contained both a body and listing, only the listing was removed.

After all data processing, we had a 150 million word corpus of nearly 150,000 unique articles containing a risk word published in the NYT or NYT.com in 1963, and between 1987 and mid 2014. The corpus had 29 annual subcorpora. The health subcorpus contained a subset of 8,524023 words, 6,944 articles and 36,547 risk words. A breakdown of the size and composition of each annual subcorpus is provided in Table 3.2. During analysis, when conducting absolute frequency analysis, frequency counts in the 1963 subcorpus were multiplied by four, to account for the smaller sample size. Frequency counts for 2014 were multiplied by 1.37 to fill in the uncaptured period between August 18–December 31.

Subcorpus	Words	Articles	Risk words
<b>1963</b>	*83,188	1218	1,584
<b>1987</b>	4,885,883	4,878	7,690
<b>1988</b>	4,834,791	4,703	7,430
<b>1989</b>	5,059,517	4,997	7,810
<b>1990</b>	5,416,187	5,250	8,244
<b>1991</b>	4,748,975	4,774	7,493
<b>1992</b>	4,923,509	4,818	7,329
<b>1993</b>	4,686,181	4,615	7,330
<b>1994</b>	4,857,729	4,762	7,384
<b>1995</b>	5,130,206	5,150	7,834
<b>1996</b>	4,969,911	4,773	7,257
<b>1997</b>	5,121,088	4,759	7,318
<b>1998</b>	6,085,810	5,437	8,351
<b>1999</b>	6,053,731	5,392	8,248
<b>2000</b>	6,472,727	5,717	8,434
<b>2001</b>	6,603,456	5,902	8,722
<b>2002</b>	6,865,631	6,423	10,288
<b>2003</b>	6,795,591	6,481	10,066
<b>2004</b>	6,776,200	6,215	9,989
<b>2005</b>	6,722,240	6,191	10,031
<b>2006</b>	6,722,592	6,278	9,965
<b>2007</b>	**4,757,290	5,110	8,976
<b>2008</b>	5,300,254	5,384	9,645
<b>2009</b>	4,926,381	5,189	9,236
<b>2010</b>	5,443,658	5,527	9,560
<b>2011</b>	5,617,002	5,773	10,055
<b>2012</b>	5,366,342	5,302	9,095
<b>2013</b>	5,271,006	5,176	9,083
<b>2014</b>	3,331,580	3,310	5,635
<b>Total</b>	<b>153,828,656</b>	<b>149,504</b>	<b>240,082</b>

Table 3.2: Subcorpora, their wordcount, file count and number of risk words

\* Only a small window of co-text—usually two sentences either side of the risk word—was preserved in this subcorpus, hence the smaller size of this sample.

\*\* The drop in word-count here coincides with the switch from NYT Annotated Corpus to ProQuest as the data-source.

<MY>92 0.14 71 0.12</M>  
<MV>13 0.26 96 0.21</M>  
<MG>11 0.29 3 0.20</M>  
<MO>28 0.33 21 0.24</M>  
<MS>One family has lost a child and others may be at risk from a deadly brain  
inflammation, officials warned yesterday</M>  
<JJ>center: 45.444118, officials: 28.536198</M>  
<MT>New Jersey Daily Briefing ; Meningitis Warning Issued</M>  
<MC>MENINGITIS</M>  
<MU><http://query.nytimes.com/gst/fullpage.html?res=9B06EFDA1239F933A05751C1A963958260></M>  
>  
<MF>0819209.xml</M>  
<MA>KELLER, SUSAN JO</M>  
<MD>1995-12-30</M>  
One family has lost a child and others may be at risk from a deadly brain inflammation,  
officials warned yesterday. Bacterial meningitis recently killed a baby who attended  
the Center day-care program, officials say. They are urging parents and staff at  
the Center to contact their doctors or a hospital emergency room.

Figure 3.1: Example file: NYT-1995-12-30-10.txt

### 3. Tools and interface used for corpus interrogation

Special tools needed to be developed to work with the very large dataset of both raw NYT articles and parsed paragraphs containing a risk word. Given a well-established history of use within humanities and social sciences, as well as a particular strength in working with linguistic data, we developed a Python-based toolkit for querying our data and visualising query results. Our purpose-built toolkit provided the ability to quickly search each subcorpus of our data, edit the results from our searches, perform concordancing and thematic categorisation, and generate visualisations of results. Though many parts of the toolkit were designed with more general Digital Humanities projects in mind, certain components of the toolkit were designed exclusively to aid in our particular investigation (projection of counts from 1963 and 2014; automatically stripping names and titles from U.S. politician names, etc.). The most important functions and their purpose are outlined in Table 3.3, with a simple example of a function shown in Figure 3.2. More detailed explanations and demonstrations are provided at <http://nbviewer.ipython.org/github/interrogator/risk/blob/master/risk.ipynb>; the repository of code itself is available via GitHub (<https://github.com/interrogator/risk>), where it can freely be downloaded, or duplicated and modified.

Function name	Purpose
<code>interrogator()</code>	interrogate parse trees, find keywords, collocates, etc.
<code>plotter()</code>	visualise <code>interrogator()</code> results
<code>quickview()</code>	view <code>interrogator()</code> results
<code>editor()</code>	edit <code>interrogator()</code> results
<code>conc()</code>	complex concordancing of subcorpora
<code>collocates()</code>	get collocates from corpus/subcorpus/concordance lines
<code>quicktree()</code>	visually represent a parse tree
<code>searchtree()</code>	search a parse tree with a Tregex query

Table 3.3: Core Python functions developed for our investigation

Finally, we developed an IPython Notebook based interface for using these functions to investigate the NYT corpus (also available via our GitHub URL above). This served not only as our main platform for interrogating the dataset, but also as a means of dynamically disseminating results without being limited by considerations of space. In being open-source, and in explicitly showing the exact queries used to generate findings, the Notebook ensures both reproducibility and transparency of the entirety of our investigation. At the same time, it provides a framework for sophisticated corpus-assisted discourse analysis using cutting-edge digital research tools. Researchers are encouraged to run the Notebook in conjunction with this report, so that they can generate and manipulate our key findings as they see fit.

```

1  def ngrams(data,
2      reference_corpus = 'bnc.p',
3      clear = True,
4      printstatus = True,
5      n = 'all',
6      **kwargs):
7      """Feed this function some data and get its keywords.
8
9      You can use dictmaker() to build a new reference_corpus
10     to serve as reference corpus, or use bnc.p
11
12     A list of what counts as data is available in the
13     docstring of datareader().
14     """
15
16     import re
17     import time
18     from time import localtime, strftime
19     import pandas as pd
20     try:
21         from IPython.display import display, clear_output
22     except ImportError:
23         pass
24     from corpkit.keys import keywords_and_ngrams, turn_input_into_counter
25     from corpkit.other import datareader
26     from dictionaries.stopwords import stopwords as my_stopwords
27
28     loaded_ref_corpus = turn_input_into_counter(reference_corpus)
29
30     time = strftime("%H:%M:%S", localtime())
31     if printstatus:
32         print "\n%s: Generating ngrams... \n" % time
33     good = datareader(data, **kwargs)
34
35     regex_nonword_filter = re.compile("[A-Za-z-\\']")
36     good = [i for i in good if re.search(regex_nonword_filter, i)
37             and i not in my_stopwords]
38
39     ngrams = keywords_and_ngrams(good, reference_corpus = reference_corpus,
40                                   calc_all = calc_all, show = 'ngrams', **kwargs)
41
42     out = pd.Series([s for k, s in ngrams], index = [k for k, s in ngrams])
43     out.name = 'ngrams'
44
45     # print and return
46     if clear:
47         clear_output()
48     if printstatus:
49         time = strftime("%H:%M:%S", localtime())
50         print '%s: Done! %d results.\n' % (time, len(list(out.index)))
51     if n == 'all':
52         n = len(out)
53     return out[:n]

```

Figure 3.2: Python function for getting n-grams from corpus data

# Chapter 4

## Methodology

The challenge of making sense of enormous datasets is a formidable one, both at the practical level (the creation of scripts and search patterns, the transformation of search results into findings, etc), and at the more theoretical level of Big Data as both dataset and approach. *Big Data* approaches to social sciences and humanities research should be operationalised critically, with an acknowledgement that data size alone does not produce findings of higher truth or objectivity: automatic processing tools such as topic modellers and parsers do not provide perfect results, and their failures may often be buried within such large amounts of data.<sup>4</sup> Moreover, as boyd and Crawford (2012) note, even the imagination of phenomena as data itself constitutes an act of interpretation. There is also the potential for researchers to cherry-pick interesting or extreme examples from the set, rather than look for common patterns (Mautner, 2005). Finally, researchers must remain sensitive to the fact that the phenomenon under investigation (in this case, risk lexis) has been abstracted from its original multimodal context (as a component on a page in a daily paper).

To cope with these concerns in the context of natural language Big Data, we drew upon systemic functional linguistics (SFL) as a theory of language. SFL informed our study in two main respects: first, we relied on its conceptualisation of the stratal relationship between instantiated wordings in texts, their discourse-semantic functions, and the context they both respond to and construct; second, the systemic functional grammar (SFG) guided our attempt to locate specific sites of lexicogrammatical change in clauses containing one or more risk words.

### 1. A systemic-functional conceptualisation of language

SFL, as developed by Michael Halliday (see Halliday & Matthiessen, 2004) treats language as sign-system from which users select meanings for the purpose of achieving meaningful social functions. Inspired by the anthropological work of Malinowski, SFL divides the social functions of language into three realms of meaning: **interpersonal meanings**, which construct and negotiate role-relationships between speakers; **experiential meanings**, which communicate doings and happenings in the world; and **textual meanings**, which reflexively organise language into coherent, meaningful sequences.

One of the more radical dimensions of SFL is its inversion of the common discourse-analytic aim of analysing *texts in context*: in SFL, context is treated as being *contained within* instantiated texts—‘context is in text’ (Eggins, 2004). Based on the distribution of certain lexicogrammatical phenomena, we can accurately determine the overall genre/purpose of a text, even in highly decontextualised scenarios:

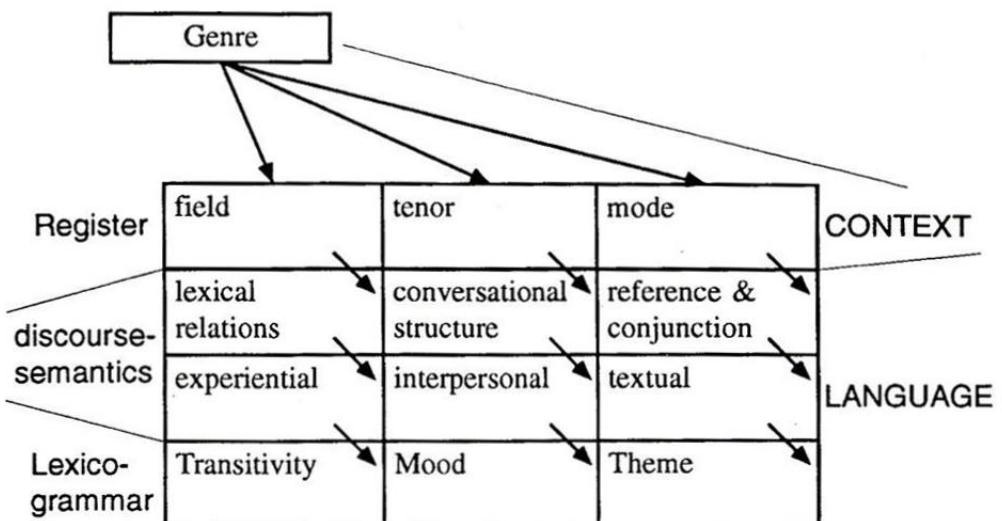


Figure 4.1: Strata and metafunctions of language (from Eggins, 2004)

‘*Submissions must contain 3–5 references*’ can be quickly identified as part of a set of instructions for an undergraduate assignment, based purely on its lexical (submissions, references) and grammatical (nominalisation, modalisation, etc.) properties. In the same way, Halliday conceptualises lexicogrammatical features of texts as probabilistically determined by their context. That is to say, a given constellation of interpersonal, experiential and textual variables (e.g. the writing of a professor to undergraduates in a written course overview) will likely contain the kinds of lexicogrammatical features described in the example above (Halliday, 1991).

In SFL and its expansions (e.g. Martin, 1984; Christie & Martin, 2005), culturally recognised constellations of these three variables are treated as *genres*, within which other micro-genres may also be contained. In our case, the vast majority of texts under consideration are within the genre of newspaper article, with micro-genres such as sports-journalism, editorials, opinion articles and so on being differentiated by the appearance of different lexicogrammatical choices within both mood (i.e. use of interrogative mood, modalisation to connote subjectivity/objectivity) and transitivity systems (what is being spoken about).<sup>5</sup>

Three key factors informed our decision to adopt the SFL framework for our study. First, in contrast to most mainstream grammars, SFL conceptualises lexis and grammar as being different ends of the same stratum of language: lexis is the most delicate realisation of grammar (see Hasan, 1987). Such a conceptualisation, we believe, is vital to an investigation of the behaviour of a concept in a large text corpus, as much of this behaviour will indeed be grammatical. Accordingly, in this study, automated parsing of corpus texts is used to carry out (generally simultaneous) searches of both grammatical and lexical features of sentences containing one or more risk words.

The second benefit of SFL to our research aims is that SFL is explicitly designed as a framework that makes it possible to say meaningful things about how real-world instances of language work to build meanings and perform social functions. It is thus an *applicable linguistics*, built to ‘empower researchers to undertake projects of investigation and intervention in many contexts that are critical to the workings of communities and the quality of human life’ (Matthiessen, 2013, p. 437).

Finally, SFL contains the best-articulated means of systematically connecting instantiated lexicogrammatical units (i.e. wordings) to the more abstract stratum of discourse-semantics (i.e. meanings) (Eggins & Slade, 2004). On the strength of this link is the whole endeavour of corpus-discourse research predicated: absent a systematic connection of these two planes of abstraction, corpus-assisted discourse studies lose much of their explanatory power, and corpus-informed discourse research becomes a contradiction in terms.

## 2. Risk words and the systemic functional grammar

Perhaps the most laudable achievement of SFL is the ability of its grammar (admitted even by critics, e.g. Widdowson, 2008) to connect the three kinds of meanings to distinct components of lexicogrammar in consistent, stable ways. Interpersonal meanings are made through the **mood system**, including features such as *modality* and *modulation*. Textual meanings are made through the use of **systems of reference and conjunction** between and within clauses. Experiential meanings are made via the **transitivity system** (predicators, their subjects and object arguments, and adjuncts, in more mainstream grammars). This latter system is of most interest to us.<sup>6</sup>

### 2.1. Risk and the experiential metafunction

In SFL, experiential meanings are made via the transitivity system. Transitivity analysis of a clause involves breaking it down into its *process*, *participants* and *circumstances*, realised congruently by verbal groups, nominal groups and adverbials/prepositional phrases, respectively. Most central is the process, whose head (the rightmost verb in a verbal group), may be grouped into five types: **material processes** (doing and happening: *Risk declined*), **mental processes** (thinking: *She thought it risky*), **verbal processes** (saying: *We talked about the risks*), **existential processes** (*There are risks*) and **relational processes** (being and having: *It seemed risk-free*). Each type has different configurations of possible participants, and is responsible for selecting the ways in which these participants are realised: mental processes have *Senser* and *Phenomenon* (the sensed); material processes generally have an *Actor*, in subject position, with optional participants such as *Goal*, *Range* and *Beneficiary*. Circumstances (e.g. ‘*this week*’ in Figure 4.2) provide specifications such as the manner, extent or location of the process. Circumstances are more syntactically flexible, in that they are often able to be placed in a number of positions within the clause.

<i>But</i>	<i>the bang of the gavel</i>	<i>can hold</i>	<i>risk</i>	<i>for novices</i>
	Participant: Carrier	Process: Relational attributive	Participant: Attribute	Circumstance: Extent

Figure 4.2: Transitivity analysis of a clause

An important caveat remains. SFL considers each kind of meaning as having a *congruent* realisation in the lexicogrammar—participants are congruently nominal; qualities as congruently adjectival. Aside from simply using native speaker intuition tests, SFL theorists argue that congruent forms often can be identified by their *typicality* and their *unmarkedness*: congruent realisations are expected to be more frequent in the language as a whole, and to involve fewer derivational morphemes (*nation* as a thing is less inflected than the quality, *national*) (Lassen, 2003). That said, as Halliday and Matthiessen (2004,

Clause complex
Clause
Group/phrase
Word
Morpheme

Table 4.1: Rank Scale in SFL

p. ?) explain, ‘it is by no means easy to decide what are metaphorical and what are congruent forms’. *Risk* is in itself a good example of a concept that straddles the terrain between participant, process and quality.

Incongruent choices, however, are also common in many kinds of texts, carrying a ‘very considerable semantic load’ (Halliday & Matthiessen, 2004, p. 365). First, through *grammatical metaphor*, semantic processes may be realised grammatically as participants (‘I accepted *the invitation*’) for the purpose of packing more information into clauses—a key feature of written journalistic text (Simon-Vandenbergen, Ravelli, & Taverniers, 2003). Furthermore, similar meanings may be made at different ranks/strata of language: ‘a good risk’ and ‘a risk is good’ communicate the same positive appraisal of the same participant, but at different levels (group/phrase level via adjectival modification in the first example; clause level via relational ascription in the second). Incongruence poses serious challenges for corpus linguistic studies of discourse, as it limits our ability to locate, for example, all the ways in which risk is evaluated, graded or judged. This issue is exacerbated if, in line with SFL theory, we consider all lexicogrammatical choices to be meaningful and purposive, including the author’s decision to invoke an incongruent form (as in Eggins, 2004). In some cases, rank-shifted meanings may be found using increasingly complicated lexicogrammatical search queries (see Figure 4.5 for an example). Automatic location of some other cases remain at this point beyond our capabilities: in appraisal at the level of clause-complex (‘*I see a risk—it’s a big one*’) extremely complex grammatical searches would be needed to first recover the identity of *it* and *one* as *a risk*, before we could automatically determine that the risk is being semantically modified by *big*. Accordingly, our analysis is limited to group/phrase and clausal levels, with meanings made via the clause complex excluded.

We situate our analysis of risk words predominantly within the experiential realm of meaning. At the most abstracted level of this dimension of language, we are interested in changes in the field of discourse in which risk as a concept is instantiated: *has risk shifted, as per key claims of sociological theory, from international relations toward population health?* Then, within these fields, we are interested in the constellations of happenings in which risk may play a role: *when risk is a process, what participants are involved? When risk is a participant, what is it a participant in, and with whom? And when risk is part of a modifier, what kind of participants and processes does it modify, and how?* Through categorisation of the kinds of fields in which risk appears, as well as the kind of participants who are positioned as riskers, risked things and potential harms, we can then empirically test the claims of influential sociological examination of risk discourse.

## 2.2. Risk and the interpersonal function: arguability

Though our analysis is for the most part concerned with experiential meanings (via the Transitivity system), some aspects of interpersonal meanings (via the Mood system) are also relevant. Accordingly, a brief sketch of the mood system is required.

In SFL, the Mood system is used to give and request information (semiotic commodities) or goods

and services (material commodities). Congruently, interrogatives request information, and imperatives request goods and services. Declaratives provide information. Being by far the most common mood type in news discourse, our analysis is focussed on the structure of the declarative. A declarative clause contains a Mood Block, which contains a Subject and Finite (see Figure 4.3). Locating the constituents of the Mood Block is simple: if a tag question is added to this declarative (*the bang ... can hold risks ... , can't it?*), the tag picks up the Subject and the Finite (with polarity reversed).

Modality, also a component of the interpersonal metafunction, concerns modification of propositions with speaker judgements.<sup>7</sup> Prototypically, Modality is expressed through modal auxiliaries in the Finite position (*I can/should/might go*). Through Modality, speakers ‘construe the region of uncertainty between yes and no’ (Halliday & Matthiessen, 2004, p. 147). In Figure 4.3, for example, *hold* is modalised through *can* in order to express the author’s judgement as to the possibility of the banging of the gavel holding risks.

<i>But</i>	<i>the bang of the gavel</i>	<i>can</i>	<i>hold</i>	<i>risk</i>	<i>for novices</i>
	Subject	Finite	Predicator	Complement	Adjunct
MOOD		RESIDUE			

Figure 4.3: Mood analysis of a clause

At a greater level of abstraction, these Mood and Modality choices are responsible for the construction of role relationships between interactants: where interactants are of equal status (i.e. friends chatting at a cafe), similar overall frequencies in mood choices for each interactant may be observed. In a situation with interactants of less equal status, mood choice frequencies may vary more widely for the different participants: in a typical interaction between a professor and an undergraduate, only the professor is likely to use imperatives to issue commands. Importantly, as with experiential meanings, incongruence may occur, though the motivation for incongruence is an interpersonal one, such as politeness or face saving (*Shut the door!/Could you shut the door?*). For us, however, this kind of incongruence does not pose the same level of challenge as experiential incongruence, as print news journalism as a genre rarely commands or requests information from the reader, and as the faces of both writer and reader are rarely under threat.

We are interested in Mood mostly because Mood is the system through which *arguability* of propositions is mediated. In SFL, arguability is used to denote the relative ease of challenging or refuting a proposition, and thus, the level of implicitness of a meaning made about the world.

Chiefly, arguability rests in the two components in the Mood Block—the Finite and the Subject. To make a proposition arguable, it must be grounded in time and space, or to a speaker judgement of its validity. These are the two potential functions of the Finite. Locating a proposition within time and space is done through adding primary tense (*lives were risked*). Meanings are linked to speaker judgements through modality (*lives might be risked*) (Halliday & Matthiessen, 2004, p. 116). In either case, the Finite grounds the proposition with reference to the current exchange being undertaken by the interactants. Primary tense situates a proposition according to what is present at the time the utterance is made—it indicates ‘the time relative to now’ (Halliday & Matthiessen, 2004, p. 116). Modality either expresses an assessment of the validity (probability, certainty, obligation, etc.) of a proposition (*it might/will/must happen*) or, in an interrogative, invites the addressee to make this assessment (*might/will/must it happen?*).

The Subject is the second component of arguability. Semantically, SFL treats the Subject as ‘some-

Role	Arguability	Example
Subject	Very high	<i>For Mobic, the <b>risks</b> of heart attack and stroke rose 37 percent, Dr. Graham's study showed.</i>
Finite/ Predicator	High	<i>But candid talk about job prospects and debt obligations <b>risked</b> the wrath of management, she said.</i>
Complement	Medium	<i>This approach holds some <b>risk</b> for a union boss.</i>
Adjunct	Low	<i>The wire is stretched very tautly, and we are at some significant <b>risk</b> it will snap from overload.</i>

Table 4.2: Arguability of risk words in differing mood constituents

Role	Arguability	Example
Head	Higher	<i>'So far, pregnancy <b>risk</b> does seem to come with this class of drugs,' Ms. Glynn said.</i>
Non-head	Lower	<i>They purchased billions of dollars in <b>risky</b> subprime mortgages.</i>

Table 4.3: Arguability of risk words as either head or non-head

thing by reference to which the proposition can be affirmed or denied' (Halliday & Matthiessen, 2004, p. 117). In the contexts of proposals and commands, it is the one who is supposed to perform the action (*Shut the door, will you?/I'll speak to her, shall I?*). In the case of declarative information provision, the Subject is the thing upon propositional validity rests. In *the bang of the gavel can hold risk for novices*, for example, a refutation still requires a coherent Subject and Finite, while the Residue is only required if it is the challenged component:

1. No, *it should* hold risks (refuting Modal Finite/speaker judgement)
2. No, but *a handshake can* (refuting Subject)
3. No, but *it can* hold excitement (refuting Complement)
4. No, but *it can* for experts (refuting Complement)

Thus, the Mood Block is the most arguable part of a proposition—'it carries the burden of the clause as an interactive event' (Halliday & Matthiessen, 2004, p. 118). The steps an interlocutor needs to take to deny the validity of a meaning are fewest when the disagreement concerns the composition of the Mood Block. Meanings made within Complements and Adjuncts, or within groups or phrases, are more implicit: they support, rather than enact, meanings made within the Mood Block (Matthiessen, 2002).

In the context of risk words, this conceptualisation of arguability can be used to empirically examine key sociological claims. Increasing prevalence of risk words generally would mean that risk words have an inbound trajectory in the NYT generally. Increasing risk words within the Mood Block and Predicator positions would indicate that risk is discussed and argued about. A shift from Mood Block to Residue (especially Complement and Adjunct positions) would indicate greater implicitness and inarguability of risk. At the same time, risk words as heads of groups/phrases would indicate greater discussion of risk, while risk words as modifiers would indicate implicitness.

The ways in which we operationalise the notion of arguability while interrogating the parsed data are outlined in Section 10.

### 3. SFL and corpus linguistics

Methodologically, our study may be characterised as an attempt to combine the systemic functional conceptualisation of language with practices from diachronic corpus linguistic (CL) research. As Hunston

(2013) notes, SFL and CL share a number of underlying similarities, such as an emphasis on natural language a focus on register/genre as shaping the lexicogrammatical choices made in texts. More fundamentally, both CL and SFL posit that we can learn about these texts through quantification of their various lexical, grammatical and semantic properties.

We use SFL and CL in tandem to locate patterns in texts without manual interpretation or categorisation. Sociological insights into key events and movements are then mapped at later stages to observed lexicogrammatical and discourse-semantic change in the behaviour of risk words (challenges in balancing the systemic-functional notion of context-in-text with the use of sociological methods are discussed below). Such an approach is characteristic of the emerging field of *corpus-assisted discourse studies* (CADS). The oft-noted ‘methodological synergy’ of CL and discourse analysis allows researchers a greater degree of empirical and quantitative support for claims, as well as a larger body of examples that can easily be accessed and qualitatively analysed (Baker et al., 2008). In terms of risk, corpus-based methods allow an empirical testing of sociological literature that has tended to invent examples of clauses containing risk words, despite there being little evidence that these phrases are commonly instantiated in general language use (Hamilton, Adolphs, & Nerlich, 2007). Research has also tended to conflate risk words with the concept of risk itself, even though the word may not be critical to the experiential meaning of a clause (*the risk management team went for coffee*) and even though the latter is often present without the linguistic instantiation of the former.

Work within CADS varies chiefly in the extent to which the corpus itself is the focus of the investigation. In *corpus-driven* work, researchers are attempting to demonstrate that the corpus itself contains particular patterns of discourse. Theories are developed inductively according to patterns located in the data. *Corpus-informed* studies, on the other hand, may use the corpus as a body of examples that can be drawn upon in discussion of broader trends in society (Baker et al., 2008).

Our study is in the latter domain.<sup>8</sup> As a diachronic investigation, we can further situate our method within *Modern Diachronic CADS*. As Partington explains,

[MD-CADS] employs relatively large corpora of a parallel structure and content from different moments of contemporary time ... in order to track changes in modern language usage but also social, cultural and political changes as reflected in language (2010, p. 83).

As newspapers are well-structured and archived in digital collections, they have formed a common data-source for CADS. Johnson and Suhr (2003) investigated shifts in the discursive construction of *political correctness* in German newspapers. Duguid (2010) performed thematic categorisation of the keywords from two collections of digitised newspapers from 1995 and 2005. Freake and Mary (2012) focussed on the ideological positioning of French and English in Canadian newspapers.

Ours is not the first corpus-based study of risk. Most well-known is Fillmore and Atkins (1992), who studied the behaviour of risk as both noun and verb in a 25 million word corpus of American English. Ultimately, the authors’ aims were lexicographic, rather than discourse-analytic, limiting the usefulness of the study’s methods for our purposes. A second key point of difference is the small size and lack of structure of their corpus (though their research was a certainly remarkable and groundbreaking effort at the time of publication). Finally, their study was neither longitudinal, nor designed to connect patterns to social/societal change.

More recently, Hamilton et al. (2007) used a frame semantics approach to understand the behaviour of risk in two corpora: the 56 million word *Collins WordbanksOnline Corpus* (N risk tokens) and the five million word *CANCODE* (235 risk tokens). We depart from their methods in five respects. First, they use general corpora, while we used a specialised corpus. Second, our study is diachronic, while theirs is largely

monochronic. Third, we differ dramatically in the number of risk words analysed (approximately 300/over 150,000). Fourth, they relied on collocation (without lemmatisation<sup>9</sup>), while we performed specific queries of the lexicogrammar, using lemmatisation where needed. Sixth, they used frame semantics, while we use SFL (though informed by Fillmore and Atkins' (1992) articulation of the components of the risk frame, as in Figure 4.4). Though these theories have a number of underlying similarities (both are semantically oriented grammars, for example), the two diverge in their treatment of the role of cognition and psychology. While frame semantics argues that lexicogrammatical instantiations are mapped by listeners to pre-existing cognitive frames or schemata, SFL is largely silent on the subject of cognition, preferring to map lexicogrammar to external variables of field, tenor and mode.

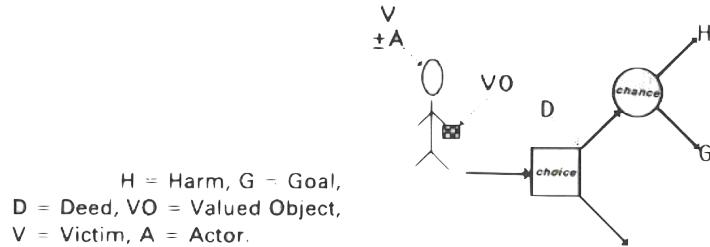


Figure 4.4: Risk frame (from Fillmore & Atkins, 1992)

Notably, our methodology also departs from typical methods of (MD-)CADS in a few key respects. First, CADS is often lexically-oriented, with techniques such as **keywording** used as a means of dis-interring the ‘aboutness of a text’ (Baker, 2004) and **clustering** and **collocation** used to look for the co-occurrence of lexical items absent any consideration of grammar. Hunston (2013) contends that despite a number of areas of overlap, SFL and CL are at odds in the sense that SFL is grammatically oriented while CL is lexically oriented. Though the majority of CADS does indeed focus on lexis, this preoccupation stems more from the relative simplicity of searching for tokens in corpora, compared to grammatical features, than it does from any theoretical motivation.<sup>10</sup> Accordingly, our use of grammatically parsed data and equal consideration of lexical and grammatical features, though in line with SFL, is against the grain of much contemporary CADS literature.

The second key difference from mainstream CADS is that our investigation did not typically involve common CADS practices such as keywording, clustering, collocation, or the use of stopword lists. Our reasons for avoiding these practices are varied. In the case of keywording, for example, we found the notion of using reference corpora comprised of ‘general’ language to be inherently problematic. The usefulness of this reference corpus is predicated on the idea of corpus balance—that is, the notion that a corpus of texts, if comprised of a wide variety of genres, and if the relative proportion of these texts is akin to their prevalence in culture, may be taken to be representative of language generally (Chen, Huang, Chang, & Hsu, 1996). As corpus balance is well-acknowledged by CADS practitioners to be only a theoretical ideal (Gries, 2009), we took a different approach. When the size of our corpus permitted, we simply counted the base forms of the most common heads of participants, processes and circumstances in each subcorpus. This also liberated us from the arbitrary nature of stopword lists (lists of very common words that are automatically excluded from search results), as most stopwords are determiners, prepositions, conjunctions and so on, which rarely occupy key experiential roles. In the case of smaller subcorpora, when lexicogrammatical queries typically did not yield large sets, though keywording was performed, we searched for keywords in each subcorpus, and used the entire corpus as the reference

```

__ >># (/ (NP | VP | PP) / > (VP
<<# processes.relational $ @NP <<# / (?i)\brisk.? /)))

```

In relational processes in which a risk word is the Token/Carrier, what is the head of the Value/Attribute?

Figure 4.5: *Tregex-based search query and gloss*

corpus, to avoid potential epistemological issues of non-representative or unbalanced data.

Clustering and collocation, though mainstays of CADS, are also largely absent in our analysis, as they consider only the co-occurrence of lexical items within a specified (and arbitrary) number of words, and accordingly do not take grammatical relationships between lexical items into account. As an example, *Men are from Mars, and women are from Venus* would contribute to an understanding of *Mars* and *women* as collocates, regardless of the fact that the experiential meaning of the clause has the opposite meaning. We instead created nuanced search queries capable of drawing on lemma lists and lists of process types (as in Figure 4.5). This luxury was afforded by grammatical (phrase structure and dependency) annotation of the corpus, as well as the development of scripts for quickly searching lexicogrammar.

## 4. Discourse-semantic areas of interest

Our interest is ultimately in discourse-semantic experiential and interpersonal meanings of risk words. The first point of interest is simply the relative frequency of risk words in the NYT generally, in absolute terms, by word class, and by experiential and interpersonal role. These areas of interest are at the clausal level. Within experiential meaning, we are interested the relative frequency of risk as a participant and as a process, as well as the behaviour of risk when occupying these roles. At the same time, we are interested in meanings made below clause level, within groups and phrases. When risk is a participant or process, we are interested in the ways it is modified. Furthermore, risk itself can be a modifier of participants and processes. Accordingly, we are also interested in both understanding the ways in which this modification happens and finding the participants and processes that risk commonly modifies. Finally, within the interpersonal realm of meaning, we are interested in the arguability of risk words—that is, the extent to which their meaning is symbolically available to negotiation by the writer/reader.

We can summarise our discourse-semantic interests with the following 10 questions. *In terms of longitudinal change in the NYT,*

1. *How frequently do risk words appear?*
2. *Which experiential roles do risk words occupy?*
3. *Is risk more commonly in the position of experiential subject or experiential object?*
4. *What processes are involved when risk is a participant?*
5. *How are participant risks modified?*
6. *What kinds of risk processes are there, and what are their relative frequencies?*
7. *When risk is a process, what participants are involved?*
8. *When risk is a modifier, what are the most common forms?*
9. *When risk is a modifier, what is being modified?*
10. *How arguable is risk?*

These questions are answered in this order in the Findings section. In the Discussion, these answers are synergised in order to perform a broader analysis of discourse-semantic change.

## 5. Lexicogrammatical realisations of discourse-semantic meanings

Discourse-semantic meanings are realised in texts by lexicogrammatical patterns. **Risk as participant** is congruently realised by a risk word at the head of a noun phrase that is an argument of a main verb. Other possible realisations of risk participants are adjectival risk words in participant positions (*The job is risky*) or risk words within prepositional phrases (*Votes were at risk*). SFL also treats prepositional phrases as partially realised relational processes, containing only object arguments. As this is perhaps a controversial analysis within linguistic theory generally, the treatment of risk within PPs is separated from risk as arguments of verbal groups. **Risk as a process** is congruently realised by a risk word as the main verb of a clause. When risk is instantiated here, we can extract the participants involved in the process. **Risk as a modifier** is realised by different word classes, depending on what is being modified. Risk can modify participants through pre-head or post-head modification. Analysed in this study<sup>11</sup> are adjectival pre-head modification (*a risky move*), nominal pre-head modification (*risk management*) and post-head modification via a prepositional phrase (*the electorate at risk*). **Arguability of risk words** can be determined by looking for the functional role of risk words within the Mood system: risk as Subject or Predicator is more arguable than risk as Complement and Adjunct (see Matthiessen, 1995).

The scope of our project necessitated some constraints on the kinds of patterns we analysed. Major constraints included our focussing on experiential meaning, perhaps at the expense of interpersonal meaning. Thus, the analysis contains little consideration of how risk may be operationalised in order to construct writer/reader or newspaper/readership relationships. Also largely unanalysed are the ways in which risk are appraised, judged, and graded in severity. This was mostly due to the lack of available automatic parsers for SFL's appraisal grammar (see Martin & White, 2005).

Finally, queries returning less salient or ambiguous results are omitted from discussion here. Counting the kinds of determiners that occur before a nominal risk (*this risk*, *a risk*, *the risk*) uncovered no particularly interesting patterns, for example. Because our analysis began with broader sites of change and progressed toward more micro-features upon discovery of interesting initial results (e.g. from the increasing frequency of risk as a modifier to the frequency of the modifier *at-risk*), it is possible that some micro-level features were obscured by the lack of significant change at broader levels.

# Chapter 5

## Findings

Findings are organised according to the formulation of areas of interest as questions. These questions progress from general frequency counting (Q1), through experiential meanings (Qs 2–7), to risk as modifier (Qs 8 & 9) and finally to arguability (Q10). Discussion of the general significance of individual findings is also presented in this section, as the Discussion section synergises all findings to explain the discourse-semantics of risk.

### Summary: an example

Summaries of each major finding will be presented in highlighted text boxes.

An *IPython Notebook* interface for navigating the corpus (see McKinney, 2012), as well as the code used to interrogate it and the findings we produced, are available online, at <https://github.com/interrogator/corpkit> and <https://github.com/interrogator/risk>. A non-interactive version is available at <http://nbviewer.ipython.org/github/interrogator/risk/blob/master/risk.ipynb>. This Notebook does not suffer from spatial limitations, and thus contains additional information, including the exact Tregex queries used in interrogations, as well as complete lists of the concordance lines discussed only briefly here. Tools and results from other kinds of corpus linguistic analysis, such as keywording and collocation, are also available there, but have not been described here.

### 1. How frequently do risk words appear?

The first point of interest was the overall frequency of risk words in the NYT (Figure 5.1) and the distribution of risk words by word class (nominal, verbal, adjectival/adverbial), absent any consideration of surrounding grammar (see Figure 5.2). In terms of the relative frequency of risk words, we note a general upward trend, with a number of peaks and troughs worthy of further investigation. In terms of word classes of risk, we found that not only are nominal forms by far the most common in the NYT, but that it is nominal risk words that vary the most in frequency, with the other categories remaining more or less stable. Interestingly, in the span for which we have no data (1964–1986), adjectival forms overtake verbal forms of risk in frequency.

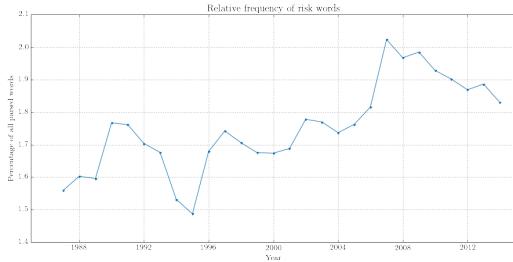


Figure 5.1: Relative frequency of risk words

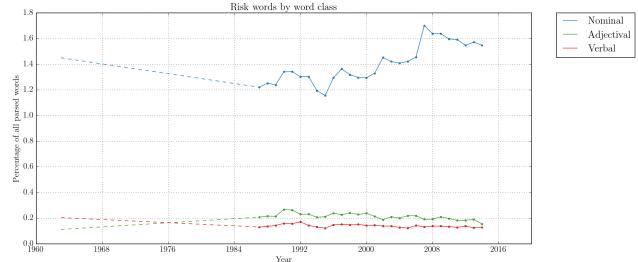


Figure 5.2: Relative frequency by word class

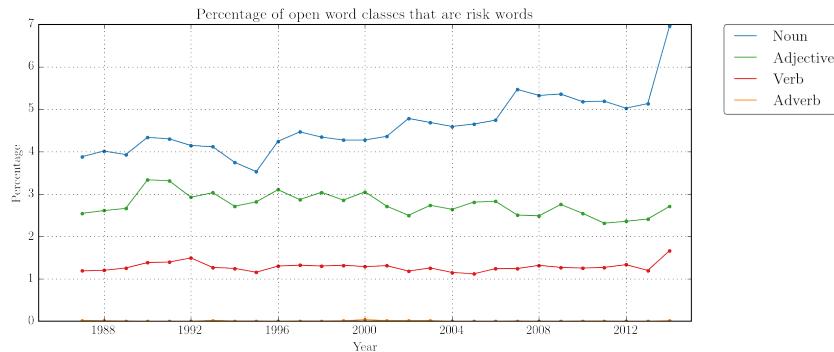


Figure 5.3: Percentage of each open word class that are risk words

We compared this against the relative frequencies of nominal, verbal and adjectival/adverbial lexical items in the corpus as a whole, in order to account for any trends toward nominalisation in our dataset more generally (Figure 5.2). This showed that even when compared to potential trends toward nominalisation generally (Figure 5.3), nominal risks are becoming more frequent in later NYT editions.

This is an important preliminary finding: verbal groups form the nucleus of experiential meanings, the shift toward nominal risk is in effect a shift toward risk discourse where risk is not the central event being depicted, but is instead a player within a broader range of events. Furthermore, given that nominal risk is closer to synonymous with harm or threat (see Section 2.1, shifts toward nominal risks are indeed evidence for Lupton's claim that the semantics of risk increasingly reflect negative outcomes.

These initial findings guided the rest of the investigation: particular attention was paid to nominal risks, as these were the site of the most longitudinal change. That said, these categories provide merely a categorisation of the formal features of risk words. Functionally, things are substantially more complicated: *running a risk*, for example, while featuring a nominal risk, is in reality a risk process; similarly, though risk is nominal in *risk management*, it functions as a modifier, rather than a participant. Accordingly, in our analysis, functional categories are typically preferred over formal categories where possible.

A similar question is the number of unique risk words appearing per year. Figure 5.4 demonstrates that there is a general increase in the relative number of unique risk words over time.<sup>12</sup>

#### Summary: frequency of risk words

Risk words appear to be increasing in relative frequency, with modest increases in the number of unique risk words per year.

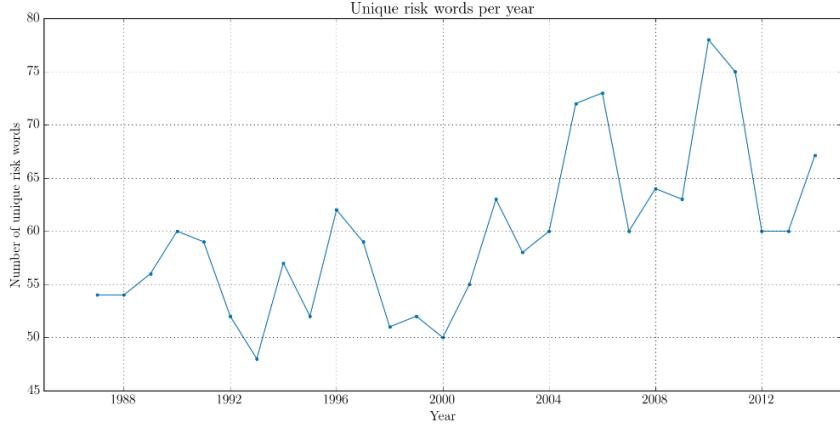


Figure 5.4: Unique risk words

## 2. Which experiential roles do risk words occupy?

In a systemic-functional conceptualisation of the experiential metafunction of language (that is, the ways in which language is used to communicate who did what to whom), risk words may take the form of a Participant (*The risk was there*), Process (*I risked it*) or a Modifier (*a risky encounter*). Though these pattern to some extent with word classes (e.g. *participant* = noun, *process* = verb, *modifier* = adjective), word classes on the whole are a poor indication of functional role, especially in genres such as print news journalism, which rely heavily on nominalisation and grammatical metaphor to pack large amounts of experiential information into each clause. As shown in Table 5.1, for example, nominal risks commonly perform Modifier functions, and adjectival functions often perform Participant functions.

Using Stanford CoreNLP's dependency parses, we counted the frequency of risk words within these three functional roles (Figure 5.5). In line with the results from word-class based searching, we find that risk as a Process is declining in use. Risk as Modifier, patterning in part with adjectival risk, appears to be increasing. That said, we can also see here the affordances of a functional grammar in corpus assisted discourse research: in this case, much richer evidence of changing usage of risk can be found through an understanding of its semantic function rather than its word class alone.

The decline of risk as a Process can be read as a shift away from the 'risk frame' identified by Fillmore and Atkins (1992). Their frame is essentially a mapping of the possible kinds of participants that can occur when risk is used as a process. In a very typical risk process, such as *He risked everything*, He is the Actor and everything is the *Valued Object*. Risk as participant is less likely to explicitly index the major components of the risk frame: in *The risk must be weighed against the benefit*, we are not given any specific information about the configuration of the risk scenario. (Risk as modifier encompasses a number of functional roles. As such, we leave this discussion for sections 8 and 9.)

Like with our analysis of the word classes of risk, we can also understand the shifts in the experi-

Example	Word class	Experiential role
<i>It was risky</i>	Adjective	Participant
<i>A risking of lives</i>	Noun	Nominalised process
<i>Risk management</i>	Noun	Modifier

Table 5.1: Key differences between word class and experiential role

ential roles of risk words as evidence for an increasing implicitness of risk in NYT news discourse. As mentioned earlier, in a systemic-functional conceptualisation of language, the process is the locus of experiential meaning—it selects the kinds of participants that can occur as its arguments. Modifiers and circumstances are the least consequential kinds of experiential meaning, as they provide ancillary or supplementary kinds of meaning, regarding the manners in which processes were performed, or characteristics of participants.

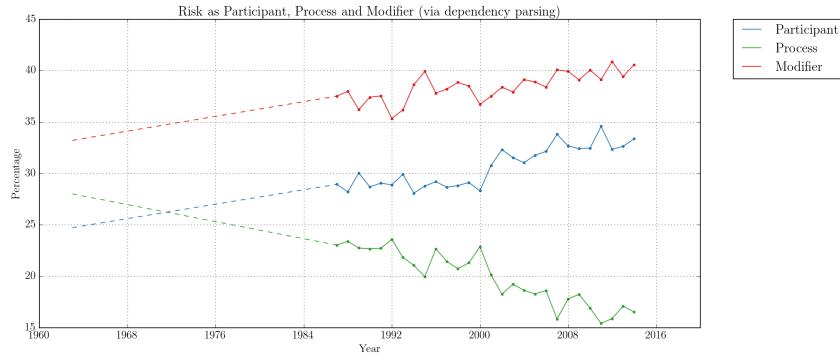


Figure 5.5: Experiential roles of risk words

#### Summary: experiential function of risk words

Risk as a process is declining in use, and has been overtaken in frequency by risk as a participant.

### 3. Is risk more commonly in the position of experiential subject or experiential object?

Risk as a participant may take the form of an experiential subject or an experiential object.<sup>13</sup> Our first area of interest was the proportion of each, with respect to general trends in the NYT. As shown in Figure 5.6, risk is more commonly an object than a subject. It is also apparent that risk as experiential subject is on an static trajectory, while risk as experiential object is inbound. The significance of this is discussed in more depth in Section 10.

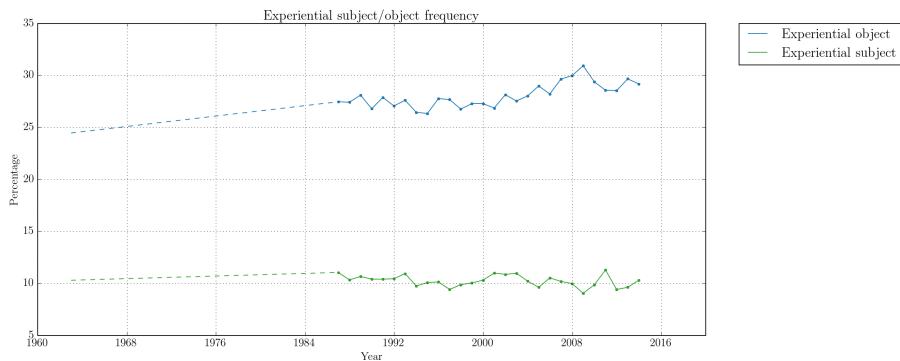


Figure 5.6: Risk as experiential subject and object as percentage of all risk roles

As subject	As object
1. But the most prevalent <b>risk</b> for the average traveler to Peru is the high altitude of the Andes	1. They said there was only a little <b>risk</b> , and now he 's not with us anymore
2. The <b>risk</b> would be that the stock would recover during the period that the investor was out of the stock	2. But an empty village is a big <b>risk</b> .
3. But the <b>risk</b> , though very small, that a man facing execution could win a new trial raises the question why this rule has proved so hard to follow	3. The company has resolved accounting problems, he said, and stabilized profit margins, while new management has reduced the company's <b>risks</b>

Table 5.2: Examples of risk as experiential subject and object in 2001

Summary: risk as experiential subject/object

Risk is more often an experiential object than an experiential subject. The gap has widened considerably over time, pointing to a decreasingly agentive role of risk as participant.

#### 4. What processes are involved when risk is a participant?

We then wanted to determine the most common processes in which risk as a participant is involved. Tables 5.3 and 5.4 show the top twenty processes for risk as experiential subject and object, taking passivisation into account.<sup>14</sup>

Interesting here is the dominance of processes seeking to quantify risk (*increase, outweigh, rise, grow*). Also salient is the presence of a large set of mental processes (*seem, appear, assess, understand, accept*). This may be seen as evidence for an increased demand for the control of risk (see discussion in sections 9; contrast with section 5)).

Summary: processes with risk participants

When risk is a participant, quantification is often at the centre of the experiential meaning. The high proportion of mental processes highlights a portrayal of risks as perceived.

Processes when risk is experiential subject	Total
be	8954
increase	460
outweigh	278
rise	269
say	222
come	201
remain	192
go	190
have	179
make	148
seem	148
involve	145
grow	133
exist	127
take	121
become	120
lose	120
include	113
appear	111
pay	100

Table 5.3: Processes when risk is experiential subject

Processes when risk is experiential object	Total
reduce	5609
pose	4179
increase	4063
have	2879
carry	2115
face	1477
raise	1115
minimize	1009
assess	841
create	731
outweigh	704
avoid	683
present	619
assume	593
consider	588
see	563
understand	493
accept	492
weigh	473
eliminate	450

Table 5.4: Processes when risk is experiential object

## 5. How are participant risks modified?

Most commonly, risk as a participant is modified through adjectival pre-head modification or post-head modification with a subordinate clause or prepositional phrase. Ignoring the distinction between subject and object risk, and collapsing pre-head and post-head kinds of modification, Tables 5.5 and 5.6 show the most common pre- and post-head modifiers of risk as a participant.

Some of these modifiers are undergoing longitudinal trajectory change. As can be seen in Figure 5.7, *calculated risk* has an outbound trajectory, decreasing steadily. The large number of occurrences projected for 1963, however, is partially the result of the 1962 Broadway play by the same name. Of course, the choice of name for the production may also serve as evidence for the salience of the construction in the earlier samples. *Potential risk*, on the other hand, is increasing in frequency. Also interesting is the spike in the *high risk* construction between 2002–2004. Here, concordancing reveals links to particular events. *High risk*, peaking in 2004, is associated with the outbreak of the H5N1 avian flu outbreak:

1. Mr. Johannessen said health care providers had a moral obligation to ensure - through direct questions and, if necessary, medical records - that people who asked for flu shots were at high risk.
2. Dr. Anthony S. Fauci, director of the National Institute of Allergy and Infectious Diseases, said that nearly 90 million Americans had a high risk of catching flu, with half of that number usually seeking vaccinations.
3. Nearly 90 million Americans are at high risk to contract a potentially fatal case of influenza.
4. Dr. Hinds said his county had about 90,000 people at high risk for flu.

Pre-head modifier	Total
high	4753
great	3444
big	1672
political	1520
potential	1340
financial	1164
low	1056
more	1051
significant	1003
serious	935
real	869
little	761
own	713
substantial	547
less	541
such	514
calculated	469
considerable	463
possible	458
other	423

Table 5.5: Pre-head modification of participant risk

Post-head modifier	Total
cancer	2344
disease	1777
attack	1597
death	1025
injury	823
infection	811
loss	408
war	391
failure	383
inflation	368
problem	346
default	336
stroke	325
complication	288
damage	251
transmission	248
harm	244
aid	227
recession	217
accident	208

Table 5.6: Pre-head modification of participant risk

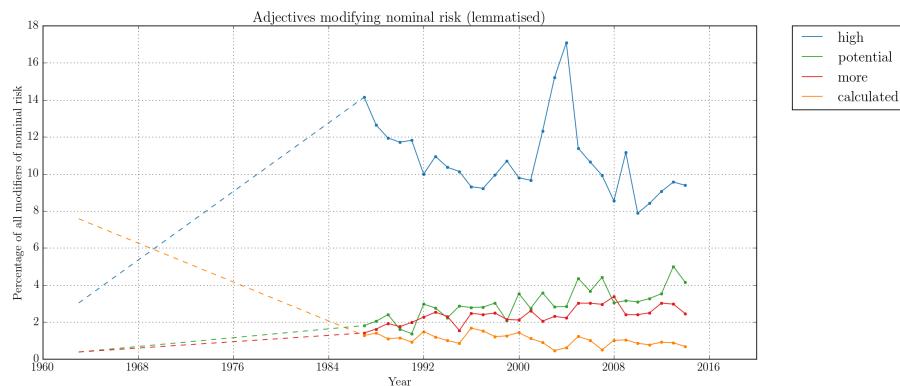


Figure 5.7: Selected modifiers of participant risk as percentage of all risk modifiers

## Summary: modifiers of risk as participant

*Calculated risk* has been overtaken by *potential risk* in overall frequency. *High-risk* spikes in frequency in references to H5N1.

## 6. What kinds of risk processes are there, and what are their relative frequencies?

Our second area of interest within the transitivity system is risk as a process. Within the corpus, we located five distinct risk processes. First, risk alone may be a process (*I won't risk it*). Second and third are *running risk* and *taking risk*—process–range configurations, where the verbal component is largely shorn of meaning, and with meaning conveyed primarily in the nominal in object position (Halliday & Matthiessen, 2004). Fourth is *putting somebody/something at risk*, which involves an obligatory nominal object argument and a prepositional-phrase complement. Finally, we have *pose risk*, which differs again in terms of participant roles: the entity who may suffer a negative outcome is realised circumstantially (*The legislation poses no risk to federally licensed facilities*), with the nature of the potential harm generally left implicit.

Other *process + nominal risk word* constructions sit on the cusp of being recognisable risk processes: *to carry risk*, for example, is frequent in the data, but we have not included it because we feel that the semantic burden of this process still lies in *carry* (unlike *pose* in *to pose risk*).<sup>15</sup> Our first interest is

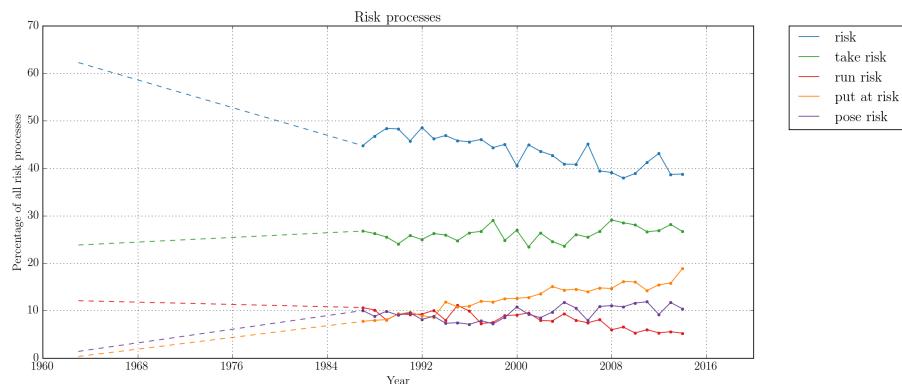


Figure 5.8: Risk processes as percentage of all parsed processes

the overall frequency of these five risk processes. Figure 5.8 charts the trajectory of the five identified risk processes. Most interesting here are that the ‘standard’ (i.e. predicatorial) risk process is steadily decreasing, in favour of the other processes, each of which seems to provide additional connotations of the agency of the risker as well as his/her/its understanding of the level of risk.

The second notable finding here is that *putting at risk* has overtaken *running risk* in frequency. Concordancing revealed that in 2014, *putting at risk* is used in cases where the potential harm is either implicit (left) or explicit (right):

- 1. Ultimately, there is a price to pay: If you attack our soldiers, you're putting yourself at risk.
  - 2. But addicted health care workers need not be physicians to put patients at risk.
  - 3. While obviously no airline or company deliberately puts people at risk, 'sometimes new risks are identified and steps have to be taken,' Mr. Koch said.
- 1. The auction houses deny that they are trimming profits with givebacks or putting themselves at financial risk.
  - 2. Rather, such tax status is generally put at risk when groups stray from their mission.
  - 3. They had handled her body, putting them at serious risk of infection.

That said, we also noted that there seems to be some evidence for lessening agency in recent *risk running* processes. Compare 1963 (left) and 2014 (right) results:

- 1. However, if adults decide to run a risk, this is up to them, and anyway, Switzerland adequately handles American affairs in Havana.
  - 2. In Washington at the weekend it was pretty well agreed that the MIG incident was not deliberate provocation; the feeling was that, even with the Russian presence, Castro would not wilfully run the risk of American retaliation.
  - 3. If he sticks to the more-or-less official Republican position against off-track betting, he runs the risk of losing thousands of New York City votes, which he needs.
- 1. Fans see this revolving door of injuries with so much regularity that they run the risk of becoming desensitized
  - 2. 'One runs the risk of falling for a voice.'
  - 3. 'I would run the risk of having two boys,' she said.
  - 4. On the other hand, if Argentina does default, it runs the risk of more lawsuits, said Siobhan Morden, head of Latin America strategy at Jefferies.
  - 5. And, like an overdressed beachgoer, a classic cocktail served straight up runs a high risk of wilting in the sunshine.

Overall, the shift in both the semantics of risk running and the increasing preference for *putting at risk* can be seen as evidence for decreasing agency in risk, as well as an increasing implicitness of the potential harm. This finding is especially significant, given that the existing descriptions of risk (Fillmore & Atkins, 1992), as well as the current FrameNet database, include accounts of *running risk* as a frame, but not *putting at risk*.

#### Summary: types of risk processes

Both *pose risk* and *put at risk* have overtaken *run risk* in frequency. Use of the prototypical risk process, *to risk* is declining. Finally, there is some evidence for reduced agency the *run risk* process.

## 7. When risk is a process, what participants are involved?

Clauses containing risk processes are a rich site for analysis, as the semantic roles of participants are determined by their placement with respect to the process. In frame semantic terms, experiential subjects

of risk processes can often be mapped to *actors*.<sup>16</sup> Experiential objects are either *valued objects* or *harm* (*they risked their lives/death*). Table 5.7 lists the most common subject and object participants of risk processes. Also of interest are clauses embedded within risk processes (e.g. *she risks hurting herself/losing her life*). Table 5.8 lists the (lemmatised) top twenty subordinated processes in the corpus.

Risker	Risked thing/ potential harm	Embedded process	Total
person	life	lose	1260
company	injury	be	1095
state	loss	alienate	379
woman	everything	have	347
man	death	become	285
investor	money	get	184
bush	wound	make	166
player	war	turn	119
government	career	go	113
worker	arrest	offend	110
republican	health	take	86
clinton	damage	look	85
bank	reputation	undermine	82
democrat	fine	anger	79
anyone	capital	fall	78
obama	future	create	76
child	confrontation	put	74
move	job	miss	73
firm	backlash	give	73
administration	failure	damage	62

Table 5.7: Riskers and risked things and/or potential harms

Table 5.8: Most common embedded processes in risk processes

Riskers are most typically powerful institutions or individuals. Risked things and potential harms are generally serious and grave. A mismatch occurs here: *Bush* and *Obama* do not likely risk *wounds*, *arrest* or *death*. In terms of subordinated processes, notable is the appearance of processes that are fairly uncommon: *alienating*, *offending*, *undermining* and *angering* and are three key examples, ranking amongst expected processes like *being*, *having*, *getting*, *making* and *going*. Without considering longitudinal change, we can see from this that the embedded processes are often related to more powerful social actors: states, political parties and politicians risk alienating electorates; diplomats risk offending one another. Even embedded processes lacking explicit connotations of power are typically deployed in the contexts of government, industry or society. Table 5.8 shows concordance results for *risk alienating* in 2013, which appears 14 times.

There is some evidence everyday people are less commonly riskers in later editions: if we sort the ‘riskers’ (Figure 5.9) by those that are decreasing at the fastest rate over the course of our dataset, *man/men*, *woman/women* and *person/people* are all in the top seven. Conversely, when sorting by those on the most upward trajectory, the lemmas *bank*, *company*, *firm* and *agency* are in the top seven (Figure 5.10). Further findings in this vein are presented in more depth in Zinn & McDonald, 2015.

stoked further concerns that unemployment risked franchise, the stage scene could have risked with locally, or else the Vatican offices risk on which the experience depends - or risk restart growth, warning that the euro area risked If left unaddressed, such practices risk without serious savings in this area, we risk Switzerland risks What was the exception before now risks the pope's new remarks that the church risked hailed the step as significant, it risks Rather than race the clock to Bed-Stuy and risk increasingly turning to what, strangely, risked and currency crisis in the European Union risks

becoming endemic and could eventually cause social upheaval  
becoming an embarrassment for the brand, but Mr. Timbers' institutions of censorship  
becoming irrelevant to future generations, Mr. Staggs said  
becoming mired in the same kind of economic stagnation that  
becoming more and more entrenched, Ann Harrison of  
becoming an unbalanced force, one that is well compensated  
becoming one of the most restrictive places for management  
becoming the standard practice  
becoming a 'small chapel' overly fixated on sexual  
becoming the latest of many tentative moves toward talks  
becoming an early bike-share casualty, I stopped at a  
becoming the most marginalized group of all: the bosses  
becoming a crisis of liberal democracy itself

Table 5.9: *To risk becoming* in 2013 subcorpus

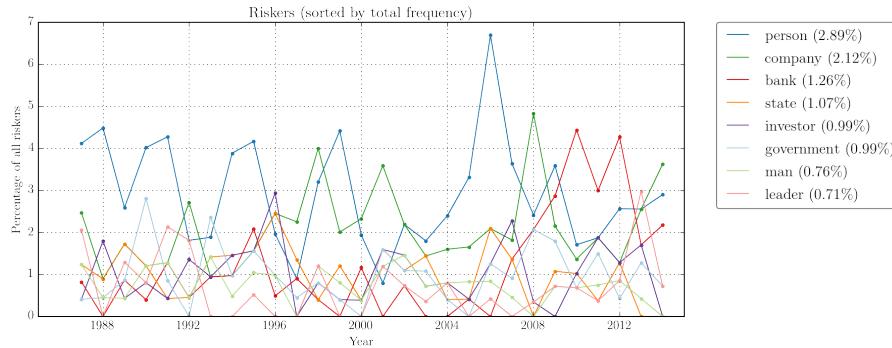


Figure 5.9: Relative frequencies of common riskers

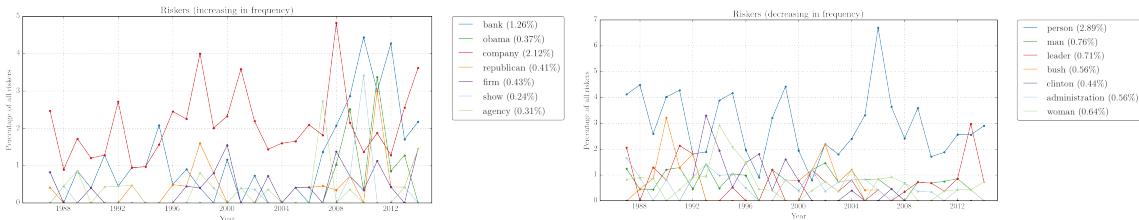


Figure 5.10: Riskers, sorted by most increasing (left) and most decreasing (right)

Summary: participants in risk processes

When risk is a process, risked things/potential harms often pertain to individual health (*to risk life, death, health, etc.*). This contrasts with processes as potential harm, which generally relate to people in positions of power (*to risk alienating voters*, for example).

8. When risk is a modifier, what are the most common forms?

There are many different kinds of risk as modifier (see Table 5.10 for a non-exhaustive list of examples). Our first interest was in gauging the prevalence of the different forms. From this query, we noted that pre-head nominal modifiers are increasing in frequency. A good example is *risk factor* (see Figure 5.12, Table 5.11), which typically occurs within fields related to health.

Modifier risks are unique for their variety and diversity: through compounding, comprehensible new

Modifier type	Example
Adjectival pre-head	<i>a risky move</i>
Post-head	<i>A person at risk</i>
pre-head nominal	<i>risk management</i>
Adverbial	<i>to riskily act</i>

Table 5.10: Types of risk-as-modifier

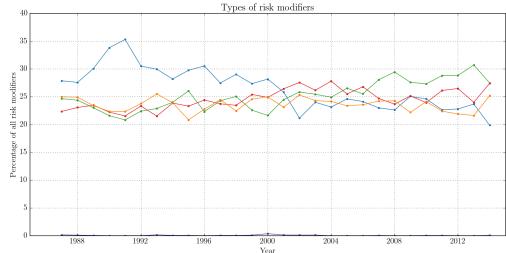


Figure 5.11: Types of risk modifier

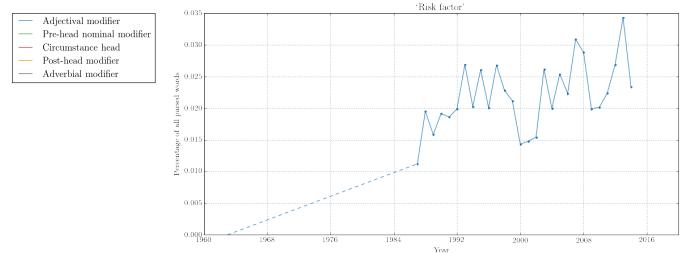


Figure 5.12: Relative frequency of *risk factor*

risk words and phrases can easily be created. The entire corpus contained 327 unique adjectival risk words, including *non-risk*, *de-risk*, *once-risky*, *take-no-risks*, *risk-swapping*, *risk-abhorrent*, *price-for-risk*, *post-risky*, *pooled-risk*, *personal-risk*, *optimum-risk*, *one-risk-factor*, *one-pitch-can-end-his-career-risk* and *low-risk-to-society*. That said, most of these occur no more than a handful of times. By far the most common were *risky/riskier/riskiest* (15588 occurrences), *high-risk* (5533), *low-risk* (1086), *at-risk* (902), *risk-free* (883) and *risk-taking* (789). Of these, four exhibited trajectory shifts (see Figure 5.13). The basic adjectival forms (*risky*, *riskier*, *riskiest*) are dominant in the 1963 sample, then decrease, and re-emerge in 2000. *High-risk* though very rare (two instances) in 1963, has become more common, and stabilised in trajectory. *Low-risk* and *at-risk* are on a consistent inbound trajectory. The prevalence of

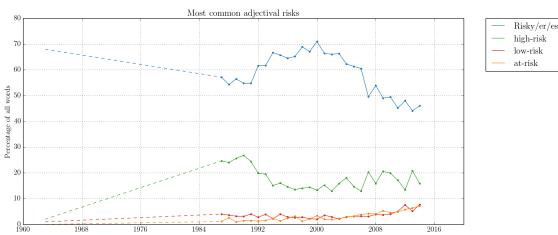


Figure 5.13: Common adjectival risk words as percentage of all adjectival risks

*high-risk* in the 1980s is largely due to the AIDS epidemic: concordancing reveals that certain populations (gays, African Americans, Haitians) are at high-risk of being infected by HIV. *At-risk* is rare in earlier

0	and many had no obvious	risk factors
1	states have periodontitis , and it is a known	risk factor for atherosclerosis , the buildup of plaque
2	large sugary drinks are not the main	risk factor for obesity
3	it makes sense , she said , to treat this	risk factor as early as possible , even if not everyone
4	smoking and drinking were considered the dominant	risk factors for cancers of the throat
5	inflammation leads to atherosclerosis , a known	risk factor for stroke and dementia
6	bones after age 50 or those with significant	risk factors for fracture
7	about capitalization or operations , no '	risk factors ' - the sort of thing one typically
8	selling stock to make some disclosures about	risk factors and debt that were not explicitly required
9	is dementia in his family , and cardiovascular	risk factors are also risk factors for dementia

Table 5.11: Randomised concordance lines for *risk factor* in 2013

editions, but increases in prevalence steadily. This shift in risk modifier is an important one. *Low-, moderate- and high-risk* comprises a gradient, or scale, while *at-risk* is a binary. As with the shift toward *potential risk*, this indicates both an increasing pervasiveness and a decreasing calculability of risk.

#### Summary: frequencies of modifier risk

Common risk modifiers (*risky, riskier, riskiest*) are gradually being displaced by a number of less common constructions (e.g. *low-risk, at-risk, risk-averse, risk-free*). This reflects increasing nuance and complexity in the way risk is used to modify participants in discourse.

## 9. When risk is a modifier, what is being modified?

Risk as a modifier can be placed either before or after the noun it modifies (*an at-risk person/a person at risk*). These two constructions are collapsed in Tables 5.12 and 5.13, which respectively list the participants most frequently modified by any risk modifier, and the participants most frequently modified by *at-risk/at risk*. Note that while risk-modified participants generally are financial and economic in nature (*investment, business, loan, asset*), the at-risk subset is mainly comprised of vulnerable populations of people (*women, children, students*). In contrast, as can be seen in the concordance lines presented in Table 5.14, risk modifiers attaching to financial participants are generally either bare adjectival forms (*risky, riskier, riskiest*), or quantified variants (*low-, high-, higher-risk*).

Risk-modified participant	Total
investment	696
business	515
behavior	508
group	466
loan	421
asset	388
strategy	377
bond	346
area	307
venture	301
security	287
patient	265
pool	239
bet	214
move	204
activity	201
proposition	199
child	170
woman	161
student	158

Table 5.12: Most common risk-modified participants in the corpus

At-risk participant	Total
person	439
child	368
woman	209
student	179
nation	135
patient	110
youngster	93
group	91
population	64
family	58
kid	50
youth	48
money	48
worker	45
life	41
job	41
man	40
area	35
teenager	32
other	32

Table 5.13: Most common at-risk participants in the corpus

In need of further research is whether or not the list of entities that can sensibly be modified by *at-risk* is beginning to grow: since the U.S. subprime mortgage crisis (beginning in 2007), references to

0	the big banks to take on riskier and riskier	business	that could end up destabilizing the financial
1	that banks internalize the costs of their risky	business	rather than have them borne by the rest of society
2	any such risks , broadway being a risky enough	business	as it is
3	facing pressure from lawmakers to discourage risky	behavior	by bankers that might fuel another financial
4	global markets , driving money toward less risky	investments	like treasury securities
5	investors are feeling cautious and want low-risk	investments	that produce steady income
6	's long-stated intention to shrink its riskier	businesses	in favor of the steadier , and more consistently
7	adolescents are more likely to engage in risky	behavior	when in groups
8		investments	relatively unpalatable
9	returns , a pension fund that is full of risky	investments	will swing heavily , soaring in value when the
10	mr. kane said bailouts should be viewed as equity	businesses	whose risks deserve a return to taxpayers of at
11	regulators to reduce their involvement in riskier	business	and to have more capital on hand to weather
12	-quarter profit rose 7 percent as it reshaped its	behavior	to reduce risk and better navigate future
13	families to put their money into more risky	business	like real estate , stocks and lightly regulated
14	the prevalence of anxiety disorders and risky	business	-lrb- both of which reflect this developmental
15	the masks can fog up , making a risky	business	of , say , inserting an intravenous line or
16	the campaign behind the new report , called risky	business	, is funded largely by three wealthy financiers
17	and children have become a high-profit , low-risk	business	for mexican narcotics cartel bosses who , chief
18	population that most often engages in high-risk	behaviors	like driving fast
19	have not banned banks from engaging in higher-risk	businesses	like money transfers to certain countries , they

Table 5.14: Randomised instances of *investment(s)*, *business(es)* and *behavior(s)* modified by *risk* in 2014

*at-risk homeowners* appear to be on the rise. Results from 2011, for example, show that *nations* and even *economic sectors* are being modified with *at-risk*:

1. Mr. Obama asked for \$400 million for the World Bank's clean technology fund, \$95 million for the bank's program to prevent deforestation and \$90 million for its program to help at-risk nations cope with the effects of a warming planet by, for instance, developing drought-resistant crops.
2. The most at-risk sectors included auto components and automobile companies, which generate nearly 30 percent of their sales in Europe, as well as food and tobacco firms.

Note that it is difficult to reconcile the semantic meaning of *at-risk* constructions with the semantic frame of risk provided by Fillmore and Atkins (1992). Though elements of both the VICTIM and VALUED OBJECT appear to be at work, neither provides an adequate label for *at-risk people*, *children*, *homeowners* or *nations*. Rather than being an oversight during the articulation of the risk frame (recall Figure 4.4), in light of the increased use of these kinds of constructions since the mid 1990s, we hypothesise that *at-risk* constructions (as well as *to put at risk*) are demonstrative of a broader shift in risk discourse toward general clusters of negative outcomes, rather than specific and measurable potential harms. Connection between this shift and sociological theory is made in the following chapter.

#### Summary: participants modified by risk

While risk as a modifier is often used in the context of finance/commerce, *at-risk* typically attaches to vulnerable human demographics.

## 10. How arguable is risk?

As noted earlier, our central concern with the Mood system is the degree of arguability associated with the concept of risk. Risk in Subject, Finite and Predicator positions is the most arguable. Risk words within Complements and Adjuncts are less arguable.

Based on the kinds of parsing provided by Stanford CoreNLP, it was possible to measure arguability in two ways. First, we can map dependency relationships to the systemic-functional notion of arguability. A dependency grammar locates the predicate of a clause and assigns it a position of zero. A ‘1’ is then assigned to its most immediate dependent (other components in the verbal group, if present, or the head of the Subject, if not). This process continues until no lexical items are unattached, or ‘ungoverned’. In effect, the higher the number attached to a word, the further it is semantically from being an important component in the meaning, and thus, in systemic functional terms, the less arguable the word. Figure

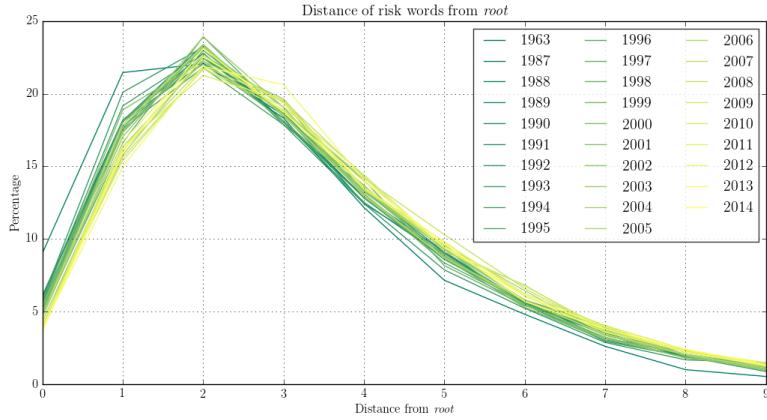


Figure 5.14: Distance from *root* of risk words by year

5.14 shows that in early samples, risk occupies core roles within the dependency hierarchy, and thus sits closer to the core part of the meaning being exchanged within the clause. In later samples, risk more commonly occurs later in the dependency structure, in less focal positions. As explained earlier, though this experimental method is not a perfectly reliable indicators of arguability, it does indicate an increasing preference to position risk as non-core, ancillary information, rather than as the main thing which is under discussion (See Table 5.15).

The second thing we can use dependency output for is identifying the functional roles of risk words. This is more accurate than using the dependency ranking, but creates a long list of functional roles. Of key interest, however, are risk words at the head of each major component of the Mood system—Subject, Finite/Predicate, Complement and Adjunct (CoreNLP parses unfortunately do not distinguish between Finite and Predictor in a reliable way, so the categories are collapsed here). From Figure 5.15, we can see that risk is shifting from Subject and Finite/Predictor to Complement and Adjunct roles. This is an important result: risk words in more arguable roles are steadily decreasing, while risk in less arguable roles are becoming more common. Like earlier findings, this suggests an increasing implicitness of risk in NYT discourse, with less talk actually *about* risk, but more talk where the relationship between risk and the subjects of the talk is assumed to be more or less common knowledge.

#### Summary: risk and arguability

Longitudinally, risk words are shifting to less focal parts of clauses. We can approximate these changes using both indices or semantic function information within dependency parses.

---

Dist. Example  
from  
root

---

- 0 By failing to get on board with social networking sooner, Google **risked** being left behind.
  - 0 John Paul **risked** his life attending an underground seminary as priests he admired were killed with the Jews.
  - 0 In such cases, the woman **risks** a prison sentence of up to two years.
  - 0 The release of high-level Taliban leaders from Guantanamo would certainly **risk** a political backlash in an election year.
  - 0 Doctors who use the word 'obese' in their notes may **risk** alienating patients.
  - 1 'Generally all vehicles have some **risk** of fire in the event of a serious crash.'
  - 1 It may do so again despite its misgivings, because the alternative of an uncontrolled default is too **risky**.
  - 1 There is **risk**, because Montero, for all his defensive questions, could be a star.
  - 1 But with all the amenities that modern N.F.L. sidelines have these days, the **risk** of frostbite for players is minimal.
  - 1 But Latino political leaders say the **risk** in changing the questions could create confusion and lead some Latinos not to mark their ethnicity, shrinking the overall Hispanic numbers.
  - 11 The use of air power has changed markedly during the long Afghan conflict, reflecting the political costs and sensitivities of civilian casualties caused by errant or indiscriminate strikes and the increasing use of aerial drones, which can watch over potential targets for extended periods with no **risk** to pilots or more expensive aircraft.
  - 12 An article on Saturday about a moratorium on research involving a highly contagious form of the H5N1 avian flu virus misstated the professional affiliation of Dr. Anthony Fauci, who said the scientific community needed to clearly explain the benefits of such research and the measures taken to minimize its possible **risks**.
  - 13 They are even at odds with Pope Benedict XVI, who has approved the use of condoms 'in the intention of reducing the **risk** of infection.'
  - 14 The United Nations Convention Against Torture prohibits the transfer of a detained person to the custody of a state where there are substantial grounds for believing that the detainee is at **risk** of torture.
  - 15 The trading blowup that followed has now become a flash point in the fierce debate over the Volcker Rule, which would ban banks from trading with their own money in an effort to prevent them from placing **risky** wagers while enjoying government backing.
- 

Table 5.15: Examples of risk words near to and far from *root* in 2014

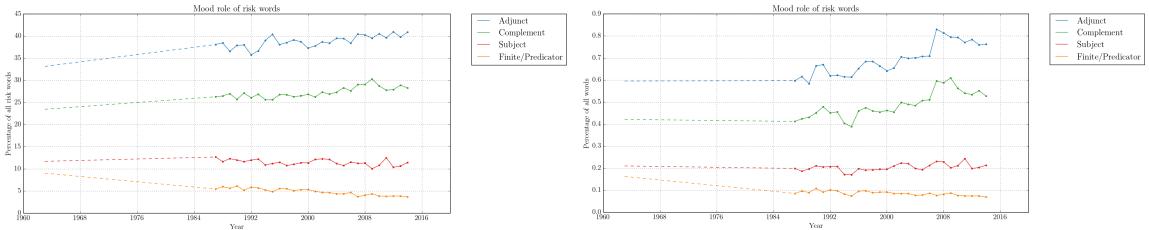


Figure 5.15: Frequency of risk words for each Mood component as percentage of all risk words/all parsed data

## 11. Risk words and proper nouns

We searched for proper noun groups in parse trees containing a risk word. This is a departure from many of our earlier queries, as here we are looking only at which entities co-occur with risk words, rather than determining how risk words and non-risk words relate to other another lexicogrammatically. The result of this query was 68891 unique proper noun groups. We took the 200 most common results, and merged any that denoted the same entity: *F.D.A./Food and Drug Administration*, or *Federal Reserve and Fed*. We then grouped results into thematic categories: *People*, *Nations*, *Geopolitical entities*, *Companies*, *Organisations* and *Medical themes*. The results were then plotted (see Figure 5.16).

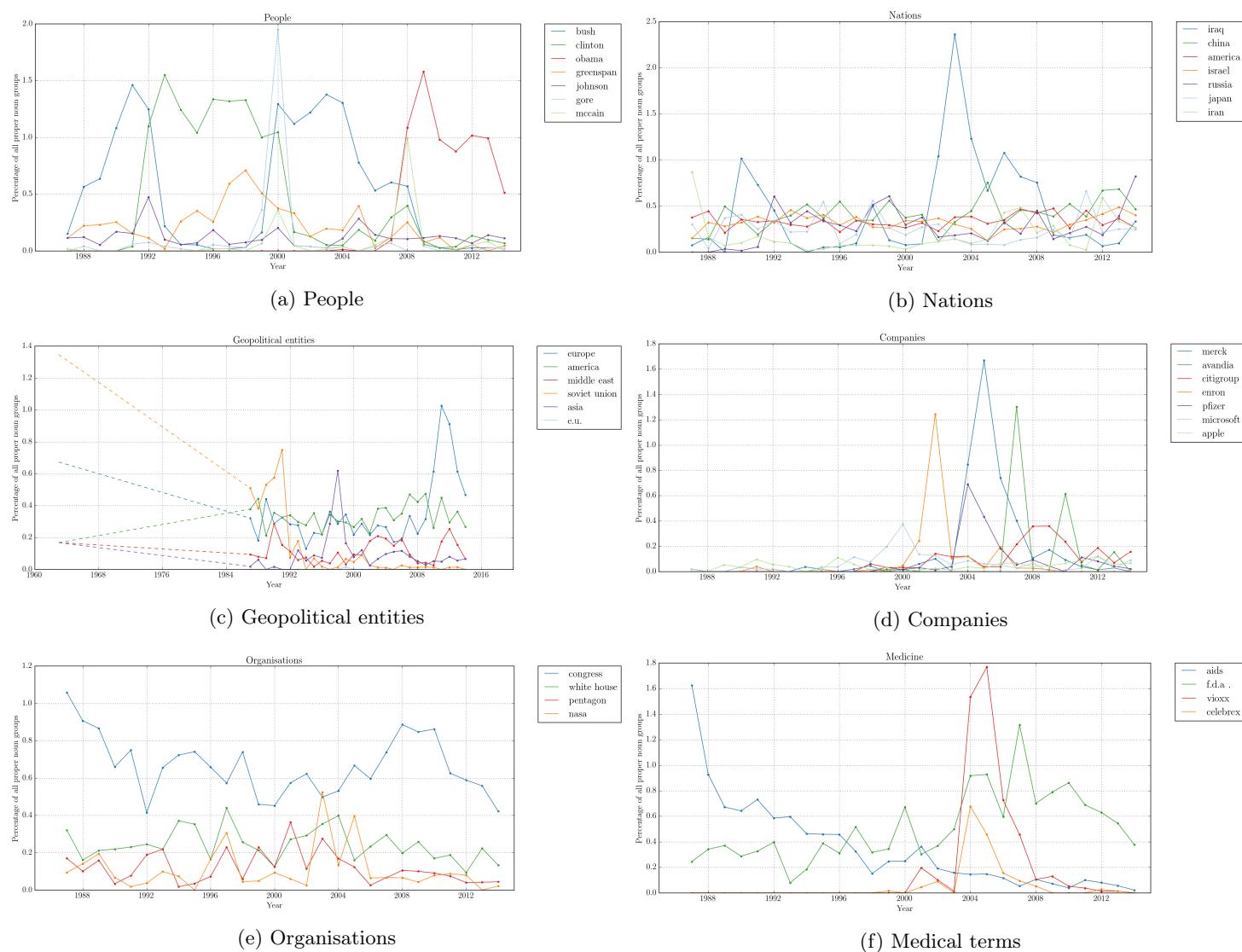


Figure 5.16: Proper noun groups co-occurring with risk

A number of historical events were easily recognisable within the peaks and troughs of these charts. Key events represented through these interrogations include:

1. US presidents and presidential candidates<sup>17</sup> (Figure 5.16a)
2. The First Persian Gulf War (Figure 5.16b)
3. The Iraq Wars (Figure 5.16b)
4. September 11 and the War in Afghanistan (Figure 5.16b)
5. The beginning of the 2014 Crimean crisis (Figure 5.16b)
6. The Asian financial crisis (Figure 5.16c)
7. The breakup of the Soviet Union (Figure 5.16c)
8. The Eurozone crisis (Figure 5.16c)
9. The Space Shuttle Columbia Disaster (Figure 5.16d)
10. The collapse of Enron (Figure 5.16e)
11. The U.S. subprime mortgage crisis (Figure 5.16e)
12. The U.S. outbreak of HIV and the AIDS crisis (Figure 5.16f)
13. The recall of Vioxx (Figure 5.16f)

This area of our investigation is perhaps the most promising as a means of connecting risk language to particular people and events.

Spatial considerations have precluded a full treatment of the charting of risk language to specific events, despite the fact that enough data exists for detailed analyses of any number of potential foci. Future research that centres on detailed exploration of health domains (including the Vioxx recall) is planned.

#### Summary: risk and proper nouns

We can use proper nouns to see which people, places and things co-occur with discussion of risk.

## 12. Summary of key findings

We found that the behaviour of risk words has changed longitudinally in a number of key respects:

1. Risk words appear to be increasing in relative frequency, with modest increases in the number of unique risk words per year.
2. Risk as a process is declining in use, and has been overtaken in frequency by risk as a participant.
3. Risk is more often an experiential object than an experiential subject. The gap has widened considerably over time.
4. *Calculated risk* has been overtaken by *potential risk* in overall frequency. *High-risk* spikes in frequency in references to H5N1.
5. When risk is a participant, quantification is often at the centre of the experiential meaning. The high proportion of mental processes highlights a portrayal of risks as perceived.

6. Both *pose risk* and *put at risk* have overtaken *run risk* in frequency. Use of the prototypical risk process, *to risk* is declining. Finally, there is some evidence for reduced agency the *run risk* process.
7. When risk is a process, risked things/potential harms often pertain to individual health. This contrasts with processes as potential harm, which generally relate to people in positions of power.
8. Common risk modifiers (*risky*, *riskier*, *riskiest*) are gradually being displaced by a number of less common constructions (e.g. *low-risk*, *at-risk*, *risk-averse*, *risk-free*)
9. While risk as a modifier is often used in the context of finance/commerce, *at-risk* typically attaches to vulnerable human demographics.
10. Longitudinally, risk words are shifting to less focal parts of clauses. We can approximate these changes using both indices or semantic function information within dependency parses.
11. Proper nouns co-occurring with risk words highlight the close relationship between risk and health discourse.

As will be discussed in Chapter 7, many of these shifts appear to be a part of a broader discourse-semantic trend of implicitness and inarguability of risk.

# Chapter 6

## *Risk in health articles in the NYT*

Forthcoming chapter

This chapter of our report is taken from a forthcoming book chapter:

Zinn, J. O. & McDonald, D. (2015). *Changing Discourses of Risk and Health-Risk: a corpus analysis of the usage of risk language in The New York Times*. Chamberlain, M. (ed.) 2015/6: Medicine, Discourse, Power and Risk. Routledge.

### Abstract

In recent decades the increasing digitisation of newspaper archives has opened new opportunities for the social sciences to examine social change. This is of particular interest for the sociology of risk and uncertainty, where different approaches compete to explain historical social transformations. This chapter reports results from an ongoing research project that examines longitudinal changes in risk reporting in print news media by the example of The New York Times (NYT). It has two major purposes. Firstly, we aim to demonstrate the usefulness of techniques from corpus and computational linguistics as means of examining how social change may be reflected in print news media. Secondly, we aim to examine a number of hypotheses from common sociological theories. Here, we show that there is good evidence for the increasing institutionalisation of risk practices in a growing number of social domains. Analysing language use in approximately 150,000 articles spanning the past 28 years, we find empirical support for the individualisation of risk, for a growing probabilistic approach to risk, and for decreasing agency in risk discourses. Focussing specifically on health-related articles, we uncover evidence for the growing salience of non-infectious diseases, and for an increase in the frequency with which health, risk and science and technology discourses co-occur. We conclude with perspectives for further research.

## 1. Introduction

In recent decades, with the development of social media, mobile devices and advancements in the digitisation and storage of text, Big Data are offering new opportunities for social science research. It is not only the production of new data in the present, but the digitisation of old data such as (historical) newspaper archives, which open unprecedented opportunities for sociologists to examine long-term social change. This is of particular interest for the sociology of risk and uncertainty, where different approaches compete to explain social change towards risk. Though the cultural approach (Douglas 1990, 1992; Douglas & Wildavsky 1982), the risk society perspective (Beck 1992, 2009; Giddens 1990, 2000), governmentality (Ewald 1986; Dean 1999; Rose 1999; O’Malley 2004), and modern systems theory (Luhmann 1989, 1993) have all made significant contributions describing social risk phenomena, there have been few attempts to examine the relative explanatory power of different approaches for an overall shift towards risk in public debates or how different social domains and events have contributed to the dynamics of societal risk discourse.

This is surprising, given that the media have been identified as crucial for social risk awareness. Many risks are only experienced through the reporting in the media. They might happen at different places or require research to be identified. Therefore, the media shape societal risk awareness. At the same time, the media report on issues considered relevant and thereby reflect typical social issues at the time and how they are understood. Language is a key element in this process. How a risk is reported, which words and grammatical constructions are used reflect a deeper social reality, expresses a particular *Zeitgeist*, institutional set up and socio-cultural context.

Our study capitalises on the increased availability of digitised newspaper archives, in order to examine discursive changes in the meaning and use of risk, focussing on data from *The New York Times* (NYT) between 1987—2014. In contrast to most risk studies, we do not examine a particular risk but how the risk semantic—or more concretely—how risk as a lexical item occurs, in which forms and in which contexts. We make use of a combination of corpus linguistic methods and systemic-functional linguistic theory (Halliday & Matthiessen, 2004) to analyse the lexical and grammatical patterns in clauses containing a risk word, identifying key areas of change.

This chapter has two purposes. Firstly, we aim to demonstrate the viability of corpus linguistic methods as a means of empirically observing longitudinal change in risk discourse. Secondly, we test some key hypotheses in risk research.

We begin our contribution with the proposition that examining the use of the term risk in media coverage can be a useful approach to understand long-term social change and the explanatory power of different social science approaches to risk. Next, we outline a number of key hypotheses from risk theories more generally, and for the health domain in particular, considering how these hypotheses might manifest in language. We then outline the methodological foundations of our study, which utilises systemic functional linguistics and frame semantics’ conceptualisation of the ‘risk frame’ as a theoretical framework, and practices from corpus and computational linguistics as an approach to data analysis. In the results, we show that the growing institutionalisation of risk practices can be clearly found in changing linguistic forms. Among other findings, we demonstrate that there is a clear trend towards the negative side of risk, and, increasingly, a representation of risk as uncertain rather than controlled. Everyday people are increasingly presented as bearers of risk, while powerful institutions and actors remain the most common risk takers. Furthermore, we highlight the strong relationship of risk and health-related news in particular. This is evidenced by very high peaks in the co-occurrence of risk and

single health-related events and/or ongoing health issues such as chronic illnesses or cancer. Also within the area of health risks, we find an increase in reference to scientific research and experts. We finish with concluding remarks highlighting some key issues and perspectives for further research.

## 2. State of research and some key questions

Mainstream social science theories conceptualise ‘risk’ relatively independent of empirical linguistic evidence. For example, Douglas does not emphasise the difference of a risk discourse compared to danger or threat. Instead she outlines the functional equivalence of earlier notions of sin and taboo compared to the modern notion of risk. From this perspective, risk becomes synonymous with danger; more risk would equate to more danger (Douglas 1990, Lupton 1999). She argues that risk and danger respectively were transformed through socio-cultural worldviews into challenges for a particular institutional set up of a social unit.

In the governmentality perspective, risk has often been associated with calculative technologies. In many studies, reference is made to the application of technical or formal techniques such as probability analysis and statistics, which usually use risk as a technical or jargon term, rather than threat or possible harm or danger. Ewald suggested when discussing insurance that a risk becomes only a risk through being part of a statistic probabilistic calculation (Ewald 1991). Bernstein (1997) has shown that risk as a concept is linked to the development and application of statistics in different areas of society, as Hacking (1990, 1991) has argued, risk has been central in new ways of governing populations. At the same time, scholars emphasise the importance of the normative contexts, which determines how calculative technologies are set up and used in social practice. Scholars in the governmentality perspective often emphasise the influence of neoliberalism for the pervasiveness of risk discourse (Dean 1999; Rose 1999; Kelly 2006). More generally Kemshall (2002) observed an increased responsibilisation of the individual in institutional practices in the UK while Hacker (2006) stated The Great Risk Shift from social institutions to the individual in the US.

In contrast to the partly rather ‘technical’ understanding of risk in the governmentality perspective, Luhmann, in his analysis of social structure and semantics, has claimed, that the risk semantic stands for a historical new social experience that required a new expression (1993: 10/1):

Certain advantages are to be gained only if something is at stake. ... It is a matter of a decision that, as can be foreseen, will be subsequently regretted if a loss that one had hoped to avert occurs.

However, Luhmann’s argument mainly refers to the shift from stratified differentiation in the Middle Ages to functional differentiation in modern industrialised societies. Beck, instead, claims that the more recent increase of risk communication would be a result of a shift within modernisation in particular after WW2.

According to Beck, the significant increase of risk in public debates would be the result of the unexpected side effects of modernisation that had produced new risks, uncertainties and new unknown spheres in contrast to the modern myth of increasing control and predictability (e.g. Weber 1948). As a result of difficulties in controlling and predicting events in the natural and social world (even the distinction between both becomes questionable) the modern myth of increased rationality has been challenged. However, the erosion of scientific authority caused by the lacking ability to solve social conflicts through the provision of true knowledge has not lead to a loss of importance of scientific expertise. Instead, Beck

claims that science has become even more significant to strengthen one's argument (1992). Scientific expertise is still a crucial resource in social claims making processes and is still one of the most trustworthy sources in particular the media rely on.

In Beck's view, the increasing worries about risk and uncertainty would be caused by the quality of new risks and mega-risks (Beck 1992, 2009) but also processes of institutional individualism linked to de-traditionalisation (Beck 1992, Beck & Beck-Gernsheim 2002). The assumption is that traditions and old institutions would lose their power to guide decision-making and to protect against risks. Individuals would increasingly have to make decisions and to reinvent themselves in a context of decreasing control and predictability. The freedoms we gain from detraditionalisation would be replaced by risks and uncertainties to be dealt with individually. Late or reflexive modernity would be characterised by the risky freedoms, which expose individuals to new decision making situations. Some scholars claim that in particular people in powerful positions and the privileged middle class is among the individualisation winners while many are among the individualisation losers being mainly made responsible for what happens to them without much opportunity to plan their life (Beck & Beck-Gernsheim 2002: 47).

While there is a plethora of empirical risk studies addressing a large number of risk issues, there is comparatively little work which reconstructs particular risk issues in a long term perspective such as the introduction of social insurance in France (Ewald 1986), the introduction of life insurance in the US (Zelizer 1983), the development of environmental risk debates (Strydom 2002), or the shift from danger to risk in psychiatry (Castel 1991).

There is also little research that systematically examines how different areas relate to each other or to what extent particular social domains contribute to the general risk awareness and/or public discourses. Many media studies refer to particular risk issues or relatively short periods of attention cycles in media coverage when examining the dynamics of risk discourses in the media (Grundmann et al. 2013; Holland et al. 2012). They often refer to a particular risk such as climate change, infectious disease or a new technology and distinguish positive from negative or supportive and critical discourses or reconstruct dynamics of risk reporting (Grundmann & Krishnamurthy 2010; Grundmann & Scott 2014, Holland et al. 2012).

There is very little work in the vein of Mairal (2011), who examines more generally how past experiences with risk influence and structure the ways in which we think about unknown and uncertain risks of the future. A good example is how the so called swine flu (H1N1) in 2009 was perceived against the background of the deadly Spanish flu pandemic from 1918 to 1920, which killed more than estimated 50 million people worldwide.

Mairal's research also developed an interesting argument about the development of a particular genre in journalism that places risk in its centre. He used Defoe's work on the Plague in London in 1665 as a case study to show how an emerging practice of evidence-based reporting developed into a new 'narrative matrix' that remains dominant in the reporting of risk in mass media today.

If risk is part of a particular new genre of journalism, Skolbekken's observation of a risk epidemic in scholarly articles in medical journals in the US, Britain and Scandinavia from 1967 to 1991 might be crucial for understanding increased usage of the risk semantic in the health area. He suggests that the shift towards risk cannot be explained by a change in terminology only and hypothesises that the shift results from a particular social culture that developed historically and is linked to the development of probability statistics, focus on risk management and health promotion and computer technology. However, he does not provide evidence how the risk epidemic connects to public discourse.

Coming from a discourse studies perspective, in recent decades, applied linguists have become interested in incorporating sociological dimensions into the study of language (e.g. Van Dijk 1997, Wodak

& Meyer 2001). To date, however, this stream of research has contributed little to the reconstruction of the historical development of discourses (Brinton 2001; Harding 2006; Carabine 2001) although many linguists are interesting in examining long-term semantic changes (e.g. Nerlich & Clarke 1988, 1992, 2000; Traugott & Dasher 2002).

Regarding risk, corpus linguists have shown that sociologists' assumptions about the usage of risk are often informed by everyday life knowledge rather than systematic empirical analysis of how the term risk is actually used (Hamilton et al. 2007). Frame Semantics (Fillmore & Atkins 1992) has provided a detailed analysis of the available risk-frames; but neither approach examines historical changes of the usage and notion of risk.

### **3. Towards a usage-driven account of risk**

It is not clear what the relationship between linguistic changes in the media and broader institutional and socio-structural changes are. In media studies, there is vast research on agenda-setting studies (grounded in the traditional media effects tradition) that explores the relationships between the media and the public agendas (e.g. McCombs & Shaw 1972; McCombs 2004). Yet there are very few studies which systematically examine what forces set the media agenda (one exception: Collistra 2012) and how the media agenda is influenced by broader societal developments or how more general historical ideas (Koselleck 1989) influence and change media coverage.

Conceptualisations of language change within linguistics and history have tended to focus more on broader social movements than on the role played by single events. The recent emergence of large, well-structured digital datasets, as well as tools and methods capable of analysing them, however, makes such studies possible, both on the scale of evolution of jargon terms within a single online community (Danescu-Niculescu-Mizil, West, Jurafsky, Leskovec, & Potts, 2013) to research utilising Google's database of millions of digitised books, chronologically arranged (Michel et al., 2011).

In a discourse analytic perspective, a contrasting argument would emphasise that we can only change a future in a particular way when we can imagine that the future is different from the past. Or, we could say that a society always produces discourses about more possible futures than can be realised (Luhmann 1980). This implies that thinking and talking about possible futures might change discursive practices even before institutional changes manifest.

### **4. Significant increase of the usage of risk in the NYT after WW2**

Previous research (Zinn 2010) has proven that the increasing usage of the term risk in media coverage of NYT is one of the most outstanding developments compared to similar phrases after WW2. Figure 6.1 shows the number of articles where risk and other related words such as threat or danger were mentioned at least once. Danger has significantly decreased after WW2 while threat became common during the Great Depression and since then remained on a relatively stable level. Only recently, after September 11 and the Iraq War, the number of articles using threat again increased in usage. Risk had a turbulent trajectory after WW2 with no clear direction but with the late 1960s and early 1970s the trajectory is a steep increase where major disasters as Chernobyl and the terror attack of September 11 were preceded by an increase in risk communication in the NYT.

The preceding increase of articles using risk language shows that already before these iconic events happened, social risk communication had increased, which might imply a heightened social sensitivity for risk issues before these disasters took place. We take this as a first indication how the analysis of large collections of digitised text might be able to discover unexpected insights into risk. That said, we can draw only limited conclusions from this kind of data, as it provides little possibility of discovering the co-text and context in which risk and related words appear.

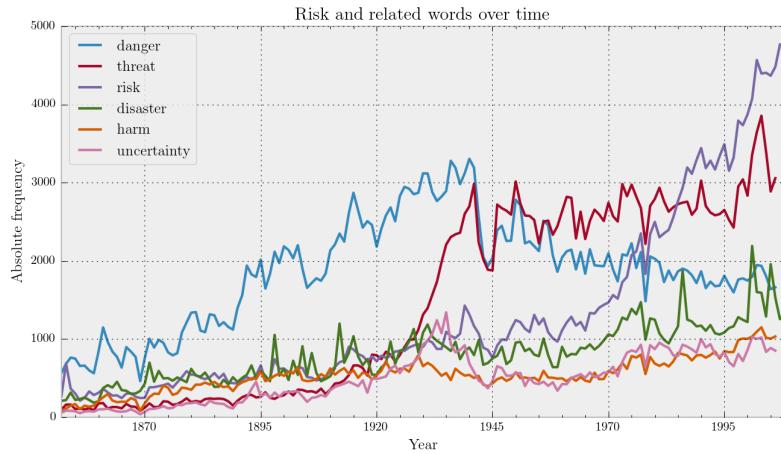


Figure 6.1: Number of articles in The New York Times with at least one risk token, 1852–2008 (source: Zinn 2010)

## 5. Hypotheses: general trend towards risk

Many scholars claim that there is a strong tendency towards negative connotations of risk, and an increasing synonymy with words denoting negative outcomes, such as danger or harm (Douglas 1992; Lupton 1999). Risk less and less refers to the risk taking process, which involves opportunities as well as possible negative outcomes. Public debates about risk would increasingly focus on the negative side only, the possible dangers and threats. Linguistically, evidence for increasing synonymy of risk and negative outcomes could be observed by looking at the functional role of risk words: when risk is a participant in discourse ('The risk was real'), synonymy with negative outcomes is greater than when risk is a process ('They risked their safety'). This can be demonstrated by contrasting risk in both roles with explicit positive outcomes:

1. The risks outweighed the rewards; the risk/benefit ratio
2. He risked alienating voters, but it paid off
3. The risks had rewards

Note that in process-range configurations, though risk is nominal, it conforms semantically to the role of process, rather than participant:

1. They ran/took the risk and were rewarded

For example, Beck (1992) has claimed that risk would increasingly escape individual control. They cannot be calculated. Instead, we now have to deal with the experience of possible risks—the general worry that things go wrong or what might happen to us—rather than with the notion of calculated risks indicating that risks are under control. Reporting that has an increasingly possibilistic approach to risk would support his claim of increased concerns about risk. Linguistically, calculatedness of risk could be examined by locating the kinds of modifiers of nominal risks ('A calculated/potential risk').

At the same time different approaches in risk studies (e.g. Beck 1992, Dean 1999) have in different ways emphasised a shift towards greater responsibility of the individual reflecting other US scholars who have criticised growing individualism in the USA (Slater 1970; Putnam 2000), which has also manifested in a recent institutional risk shift of responsibility in public and social policy towards the individual (Hacker 2006). We expect that such a shift would be detectable in the NYT through, for example, a stronger mentioning of everyday life people rather than social institutions and organisation in relation to risk.

## 6. The centrality of the health sector in driving public risk debates

When risk research developed within sociology in the 1980s the focus was mainly on new technologies and in particular nuclear power (Douglas & Wildavsky 1982, Perrow 1984, Luhmann 1989, Beck 1992). However, there had also been indications that risk thinking is entering society on different levels and in different areas. In particular, Skolbekken had indicated a shift towards risk in health in his article about a risk epidemic in medical science journals though not examining to what extent the scientific debates have entered public debates and news media.

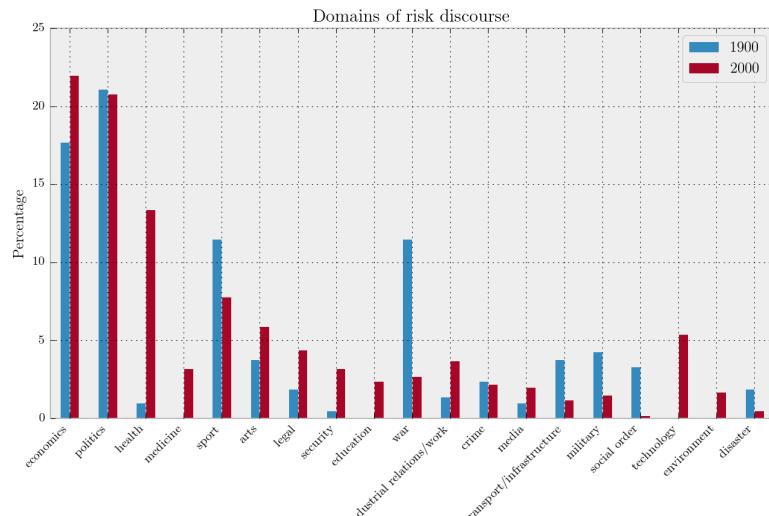


Figure 6.2: Number of articles in The New York Times containing at least one risk token by topic/domain, 1900 versus 2000 (source: Zinn 2011)

In order to get a better feeling for the relative relevance of risk in different social domains Zinn (2011) conducted an explorative study in which he compared the news coverage in the volume 1900 with 2000 of the New York Times to see to what extent reporting using the risk semantic has changed historically. The

study took samples from the 1900 volume ( $n=209$ ;  $N=622$ ) and the 2000 volume ( $n=409$ ;  $N=5188$ ). The areas were thematically coded regarding the domains they are referring to. For example, technological risks referred to risks which were caused by at the time relatively new technologies. Health refers to health issues more generally while medicine refers to organised/institutionalised medicine. Similarly reporting on war is distinguished from reports on the military as an organisation (Zinn 2011). Assuming that what is newsworthy reflects to a large extent the reality of a society at a particular time and not only a specific mode of news production seems supported by the areas connected to risk in the earlier volume compared with the later (e.g. the stronger prominence of war, the military, transport/infrastructure, social order, and disaster; compare Figure 6.2). It supports the recent occurrence of risk in the context of new technologies and the environment but it also shows the outstanding importance of health and medicine as sectors of risk discourses in the media. It indicates that the risk semantic entered increasingly a broader range of different social domains in the more recent volume and draws attention to often-neglected areas in societal risk debates, such as sport and arts. If confirmed by more rigorous research, the picture drawn by this exploration suggests placing health related issues more centrally in theorising on a recent shift towards a risk society.

## 7. Hypotheses: health domain

There are a number of assumptions about developments in the area of health and illness that have not yet been examined empirically. There is a well-known general trend of civilisation illnesses and chronic illnesses becoming more dominant in health and illness while infectious diseases lose relative importance but do not disappear (e.g. Kuryłowicz & Kopczyński 1986). Our interest is in how such trends are reflected in the usage of the risk semantic in the health domain.

A number of scholars have claimed scientific research entering news reporting (Mairal 2011), the importance of research for claims making (Beck 1992) while Skolbekken (1995) has found a risk epidemic in health journals in the US medical journals, among others. Therefore we sought to determine whether the increasing usage of the risk semantic in news coverage is indeed increasingly referring to scientific studies and experts.

We also wanted to test whether the trend towards individualism (Beck 1992; Putnam 2000) manifests in issues reported in the health domain. It was of interest, for example, what role common terms for people in everyday life (woman, man, person, child, etc.) played in the landscape of risk, and how this differed from the role played by institutions or influential people.

## 8. Methodology and methods

There is no doubt that the media and newspaper coverage is an important part of social reality, constituting an arena for social discourses and influencing individual comprehension (e.g. Pidgeon et al. 2003; Flynn et al. 2001; Gamson 1989; Stuart et al. 2000). This happens simultaneously on the content plane of discourse-semantics, and on the expression plane of lexis and grammar. For example, functional linguistic theories such as frame semantics and systemic functional linguistics support the view that social changes and language changes are connected and assume that meaning can be made only with reference to a structured background of experience, beliefs, or practices (Fillmore & Atkins 1992, Halliday & Matthiessen, 2004).

Since media coverage relies on the social knowledge and language of a society, it contributes to and

reflects changes in social symbols, norms, values and institutions. Thus, media coverage can be used to examine social change, although there are some restrictions. The media follows a specific logic of news-production and risk-management strategies. Changes in the readership, the ideological stance and the specific socially stratified audience may influence results (Kitzinger 1999; Boyne 2003, p. 23-41) and have to be carefully controlled by analysis of changes in the organisational context of the NYT (e.g. changes in leadership, publisher and editors, corporate identity) and its position in the history of US journalism.

The Glasgow approach in media studies has emphasised the need to research the media production process in much more detail. However, the study approaches the risk semantic from a different perspective. It is informed by the sociology of risk, sociological analysis of historical social change, discourse analysis and corpus linguistics.

From a media studies perspective, the argument supported by Fürsich (2009) for text-focused analysis of media discourses comes closest to our approach. This perspective interprets the text as a structure produced in complex processes, which involve a range of players, including journalists, readerships and media moguls, and open a number of different, but not arbitrary, interpretations. It is unlikely that the power struggle in a newspaper's management or a shift in journalism can fully determine the usage of a specific semantic, even in democratic countries with a relatively independent press (Tulloch & Zinn 2011). Far more reasonable is the assumption that the instantiation of particular discourses in news plays a role in both the construction and reflection of more general social changes. Considering these concerns an explorative examination of possible differences in news coverage of the NYT and the Washington Post supports this assumption (Zinn 2010, p. 115). Only relatively minor differences in the number of articles using 'risk' but very similar long-term developments were found. Thus we assumed that the long-term historical changes are sufficiently general (Koselleck 2002; Luhmann 1980) that they can be traced even through a single newspaper.

In the following we outline the risk-frames identified by Fillmore and Atkins (1992, p. 76f.) we use as a starting point for understanding the kinds of participant roles in the process of risking. We then outline our use of systemic functional linguistics for our analyses.

## 8.1. Risk in Frame Semantics

Frame semantics can serve as a general blueprint to understand the common risk frame in use. Developed through the analysis of a large text corpus it is claimed to represent the complete structure of the risk frame. This includes an actor, a valued object, a goal, a deed, possible harm and a victim, which may not necessarily be the actor (see Figure 4.4).

Hamilton et al. (2007) use a frame semantics approach to understand the behaviour of risk in two corpora: the 56 million word *Collins WordbanksOnline Corpus* and the five million word CANCODE. They find that risk is commonly nominal in contemporary language use, and that risk co-occurs with negative semantic prosody. Further, they find that health risks are a more salient semantic domain than has been commonly understood in risk research.

We depart from their methods in a number of respects, however. First, they use general corpora, while we used a specialised corpus of NYT articles. Second, our study is diachronic, while theirs is largely monochronic. Third, we differ dramatically in the number of risk words analysed (approx. 300 vs. 240,082). Fourth, they relied on collocation, while we parsed the data for linguistic structure and performed specific queries of the lexicogrammar of clauses containing risk words. Finally, we augment the frame-semantic approach to risk with core tenets of systemic-functional grammar. Though the

components of the risk frame are semantically clear, they are often difficult to automatically extract from corpora, even when the corpus has been annotated for grammatical structure: even in prototypical risk processes, whether or not the valued object or the possible harm is often grammatically unmarked (I risked my life/I risked death). When risk is a modifier, or a participant, things become less clear still, with fewer of the components of the frame being mentioned overtly at all. Furthermore, when risk is not the process or participant, the extent to which the risk frame is being instantiated is difficult to assess:

1. In 1999, we sold the company, and the next year, we moved to the United States with our two children--a third was born in 2003--so I could pursue my idea of helping low-income, at-risk youth.
2. Mr. Escobedo said that Vioxx was especially dangerous to Mr. Garza because of his other risk factors and that he should never have been prescribed the drug.

## 8.2. Systemic functional linguistics and the systemic-functional grammar

We utilise systemic functional linguistics as both an English grammar and a means of connecting lexical and grammatical phenomena to their meaning and function in news discourse. Unlike frame semantics, it is not a cognitive-semantic theory, instead prioritising lexis and grammar as delicate meaning-making resources, and arguing that context is often embedded within the linguistic choices made in a text (Eggins, 2004). These ideas are particularly helpful affordances in analyses of texts within a one-way medium such as print news, especially in diachronic contexts, where access to writers and readers for follow-up interviews is extremely limited.

In systemic functional linguistics, the transitivity system is considered the means through which experiential meanings are made—that is, meanings designed to represent events and happenings in the social world (as opposed to the Mood system, which is responsible for the negotiation of interpersonal meanings). It is here that we situate our analysis of risk (though forthcoming work provides a treatment of risk according to Mood choices too).

Within the transitivity system, the three main functional roles are participant, process and circumstance. These roles pattern to some extent with formal word classes. Verbs and verb phrases congruently represent processes. Nouns and noun phrases typically represent participants, and prepositional phrases and adverbs typically represent circumstances. The example shown in Figure 4.2 shows a basic transitivity analysis of a clause from our data with the heads of the participants and process in bold.

Using these categories, we divide risk semantically into risk-as-participant (where risk is the head of an argument of the verb), risk-as-process (where risk is the semantic ‘head’ of the main verbal group), and risk-as-modifier (where risk is an adjective modifying a participant, within a circumstance, etc.).

Adding complexity to the systemic functional grammar (and, therefore, any potential analysis of language use) is the fact that meanings are often made in incongruent ways: nominalisation (decline → declination), as well as the ability for similar meanings to be made at different levels ('the risk was big' vs. 'the big risk'). A key distinction between our work and that of both Fillmore & Atkins (1992) and Hamilton et al. (2007) is a heightened sensitivity to incongruent forms of risk words: while the earlier studies investigate differences in the function of risk words according to the grammatical form, we instead focus on a functional definition. A key example of this difference is in our treatment of run risk and take risk as kinds of risk processes, despite the risk word itself being nominal, due to (e.g.) closer synonymy with verbal risk and relatively empty semantic content of the verb.

## 9. Research strategy

The New York Times (NYT) was selected as case study because of the central role of the US in the world and the prestige and clout of the NYT. The NYT is a historically central institution of media coverage (Chapman 2005) with a continuously high status and standard of coverage. It is a worldwide influential, highly circulated and publicly acknowledged news media. It contains extensive coverage of both national and international developments, and its digital archive covers all years since WW2 and it is relatively easy to access. A detailed analysis of available newspapers archives found that, in the US, only the Washington Post provides a comparable archive while access and data management has proven easier and more reliable with the NYT.

Our approach is three-pronged. Following on from earlier work, we simply begin by counting the number of articles containing risk words. Second, we use Stanford CoreNLP’s parsers (see Manning et al, 2014) to annotate paragraphs containing a risk word between 1987–mid 2014 with grammatical information, and use this information to perform nuanced querying of clauses containing risk words, in order to look for lexical and grammatical sites of change.

For these analyses we built a text corpus (general) and a sub-corpus (health domain) of digitised texts from NYT editions between 1987–2014. These texts (defined here as individual, complete chunks of content) are predominantly news articles, but depending on archiving practices, also included in our corpus is text-based advertising, box scores, lists, classifieds, letters to the editor, and so on. More specifically, we were interested in any containing at least one ‘risk word’—any lexical item whose root is risk (risking, risky, riskers, etc.) or any adjective or adverb containing this root (e.g. at-risk, risk-laden, no-risk). We relied on two sources for our data. The New York Times Annotated Corpus (Sandhaus 2008) was used as the source for all articles published between 1987 and 2006. ProQuest was used to search for and download articles containing a risk word from 2007–2014, alongside some metadata, in HTML format (Zinn & McDonald 2015).

A particular focus is on determining common actors/agents of risk in health articles, and using linear regression to sort these results by their longitudinal trajectory. By comparing these results with frequency counts for noun phrases in our corpus, we can observe trends toward general involvement in risk discourse and involvement in risk discourse as the agent behind the process of risk. Using thematic categorisation, we abstract the significance of these results, uncovering the general kinds of social actors (humans, institutions, illnesses, research, etc.) increasingly or decreasingly are agents and/or experiencers of risk.

## 10. Results

For a better understanding of the recent shifts in the utilisation of risk words in the NYT we analysed the lexical and grammatical features surrounding all risk words used in NYT articles between 1987 and mid-2014. This allowed us a more fine-grained window into the behaviour of risk words.

Due to limitations of space, we cannot always provide lengthy contextualised examples of the lexical or grammatical phenomena under investigation, or being plotted. Researchers can, however, navigate to <https://www.github.com/interrogator/risk>, which functions as the main repository for the code and findings generated by our investigation. At this address, we have both static documents that present key findings in more detail, as well as a Python-based toolkit that can be used to manipulate and visualise the NYT corpus itself.

## 10.1. General changes in the behaviour of risk words

Most generally, we found evidence for an increasingly rich and nuanced behaviour of risk , as well as divergence from the prototypical risk scenario, and the associated ‘risk frame’.

As a starting point, we used part-of-speech annotation to determine the distribution of adjectival, nominal and verbal risk words over time (Figure 5.2. We noted increased usage of risk as a noun. In order to determine whether or not nominalisation is a general trend in the NYT over our sampling period, we calculated the percentage of each of the four word classes in each year that are risk words (Figure 5.3. This confirmed that the nominalisation of risk is not simply a part of a more general trend.

As discussed earlier, nominal risks are often synonymous with negative outcomes, while verbal risks typically denote the entire process (an agent making the process occur, the change for negative or positive outcomes, etc.). Accordingly, trends toward nominalisation can be seen as evidence for the argument that risk more and more resembles only the negative components of the risk frame.

Formal word class categories are not necessarily reliable means of determining which kind of risk semantic is being instantiated, however. Risk is nominal in ‘risk management’, but is serving a modifier function. Risk is also nominal in ‘to take a risk’, but is really a part of the process, as in ‘to take a break’ or ‘to have a shower’. Accordingly, we used Stanford CoreNLP’s dependency parser to categorise risk words by experiential function, rather than grammatical form.

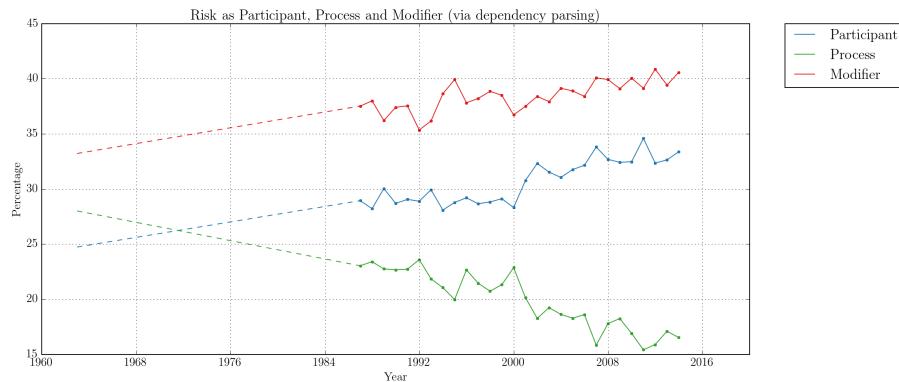


Figure 6.3: Risk as Participant, Process and Modifier (general corpus)

We find here a more accurate picture of the increasing synonymy of risk and negative outcomes, the shift away from the standard risk frame, and finally, a greater implicitness of risk. In SFL, the process is the central part of experiential meaning. The process and participants coupled together form the nucleus of the clause—they are what is effectively being discussed. Modifiers and circumstances, on the other hand, provide ancillary information, describing these participants, or the manner in which the process occurred. Shifts toward modifier forms thus suggest an increased implicitness of risk within the texts, where risk permeates discussion of an ever-growing set of domains, but less and less forms the propositional nub of what is being focally represented in the discourse.

## 10.2. Shifts within risk words as participants, processes and modifiers

To understand more precisely how risk discourse is changing, we can subdivide the experiential roles of participant, process and modifier.

First, we can divide participants into those that occur as experiential subjects and experiential objects,

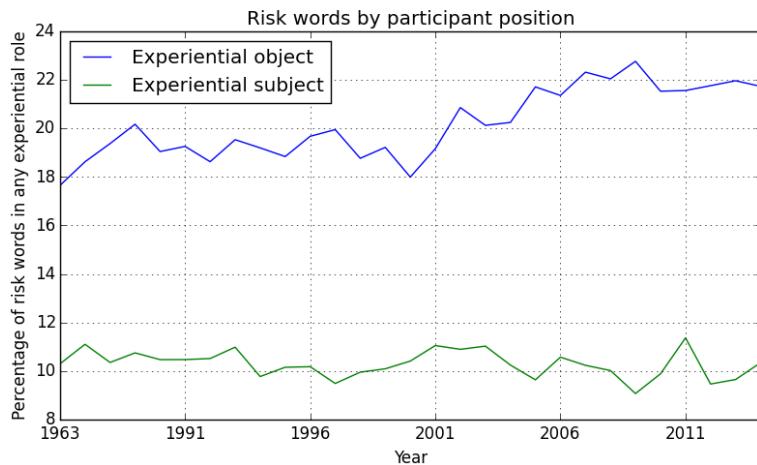


Figure 6.4: Risk as experiential subject/object (general corpus)

with experiential subjects being more likely to be active agents, and more focal in the discourse. Consider the examples below (from 2010), with risk as experiential subject in Example 1 and experiential object in Example 2:

1. This risk, however, is minimal when compared to oil coating and ingestion.
2. Earlier studies found that running shoes could increase the risk for plantar fasciitis and ankle sprains.

Given the steady rise in risk as an experiential object, it is reasonable to suggest that not only is risk increasingly synonymous with negative outcomes, but that it is also more implicit in meanings made about the world.

### 10.3. From calculated to probabilistic risk

We can also look at the kinds of adjectives modifying risk-as-participants in order to better understand the ways in which risks are judged or appraised in the NYT. As Max Weber has stated, rationalisation as a core characteristic of the modernisation process goes along with the belief that things should be rationally managed. Exactly this modern dream has been set under pressure in Late Modernity. As Beck has emphasised the modern techniques such as insurance would fail when dealing with new mega risks. Unexpected side-effects, high complexity and contradictory knowledge might create an unexpected feeling of being exposed to all kinds of risks without the ability to calculate and control them. It might be difficult to pin such a complex shift down easily. With this conceptualisation in mind, we examined the modifiers of risk used in the volumes of the NYT. Very dominant was the expression ‘high risk’ with a clear peak during the H5N1 Asian Flu outbreak. It is interesting that we could find a clear trend in the last 25 years away from using risk in the context of the calculability of risk towards a general potentiality of risk.

### 10.4. Decreasing agency in risk processes (technocratic risk talk)

Subdividing risk processes (Figure 6.6), we can see that the ‘base’ risk-process is declining steadily in frequency, with newer risk processes such as put at risk and pose risk overtaking running risk in frequency.

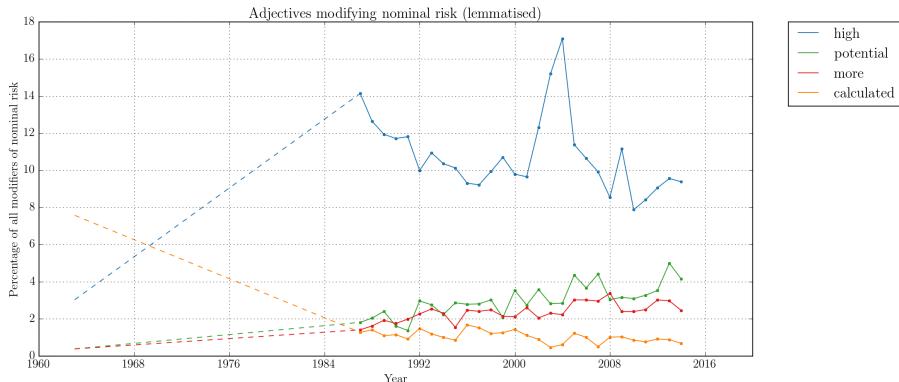


Figure 6.5: Adjectives modifying nominal risk (general corpus)

Like the trend toward risk-as-participant, the changing climate of risk-as-process points to movement away from the standard risk frame.

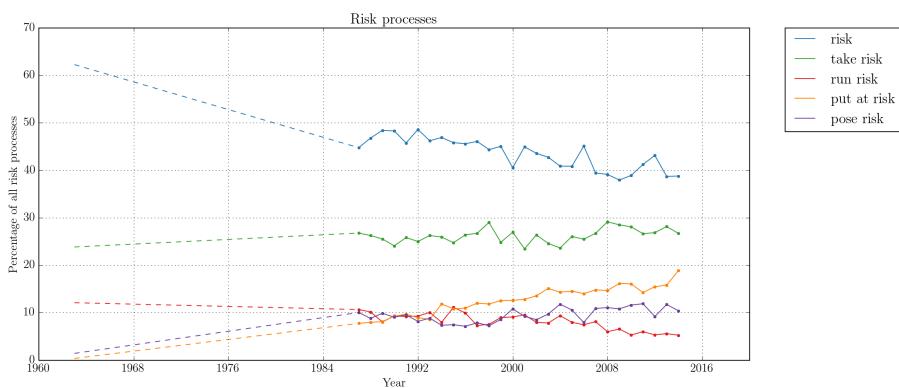


Figure 6.6: Risk processes (general corpus)

While risking, taking risks and running risks all conform more or less to the semantic frames mapped out by Fillmore & Atkins (1992), with a risker, and positive and negative outcomes, this is not the case with posing and putting at risk. In neither of these constructions does the actor take the role of the risker. In the pose risk construction, the risker here is optionally encoded in a circumstance beginning with the preposition ‘to’. From 2006:

1. The industry has also denied that electromagnetic emissions from overhead power lines pose any health risks.
2. But if the newer antidepressants posed a significant suicide risk, suicide attempts would probably rise, not fall, after treatment began, Dr. Simon said.
3. Those deemed by a judge to pose a greater risk to themselves or others are housed at the Bergen County Jail in Hackensack.
4. The ministry said the workers posed no risk to others and had the A (H5N2) virus, a milder strain than A (H5N1) which has killed more than 70 people.
5. Finance ministers from the world’s richest countries and Russia said Saturday that ‘high and volatile’ energy prices posed a risk to global economic growth that otherwise appeared solid.

This same distinction is even clearer in *put at risk*, whose actor tends to be an inanimate or abstract noun, and whose experiential object is generally a broad group of everyday people, such as women, children, or citizens. The following examples are from NYT articles on health topics from 2012:

1. Pharmacists also overlooked or approved cases in which medications were prescribed at questionable levels or in unsafe combinations that could put patients at risk of seizures, accidents or even death, according to the public health department.
2. It also cited studies showing that women with unintended pregnancies are more likely to be depressed and to smoke, drink and delay or skip prenatal care, potentially harming fetuses and putting babies at increased risk of being born prematurely and having low birth weight.
3. Last September, Qualitest Pharmaceuticals, a unit of Endo Pharmaceuticals, voluntarily recalled ‘multiple lots’ of contraceptive pills - also because of a ‘packaging error’ that could put women at risk for pregnancy.
4. Representative Chris Smith, a New Jersey Republican and leader of the House anti-abortion forces, said the latest announcement demonstrated that the president ‘will use force, coercion and ruinous fines that put faith-based charities, hospitals and schools at risk of closure, harming millions of kids, as well as the poor, sick and disabled that they serve, in order to force obedience to Obama’s will.’
5. The Japanese government’s failure to warn citizens about radioactive danger put the entire city of Tokyo at health risk - and the rest of us as well.

These results support the hypothesis of degreasing agency in risk reporting.

### 10.5. The institutionalisation of risk practices

Risk-as-modifier is very common because they encompass a number of diverse sub-categories: risk may be (among other things) an adjectival modifier (a risky decision), an adverbial modifier (he riskily chose), a nominal modifier (risk management) or the head of a nominal group inside a prepositional phrase, serving the role of modifying the main verb of the clause (They were appalled by the risk).

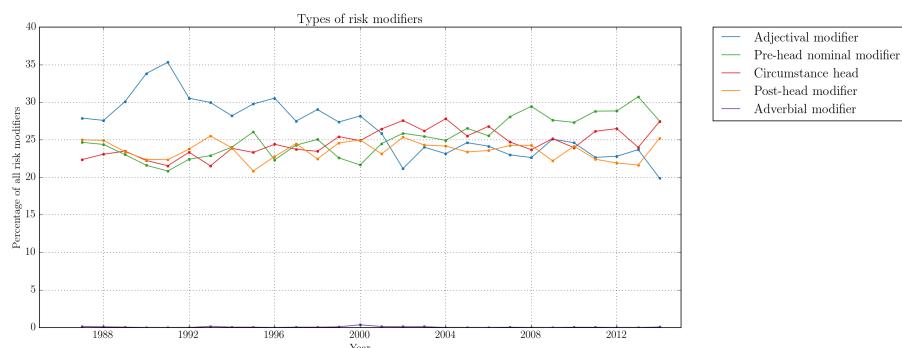


Figure 6.7: Types of risk modifiers (general corpus)

By charting these different forms, an interesting picture emerges: adjectival modifiers decline gradually in frequency, while nominal modifiers (examples from 2012 below) rise.

1. ‘That’s why more companies are turning to certified financial risk managers,’ the ad continues.

2. Many clients asked Teresa Leigh, owner of Household Risk Management, a North Carolina-based advisory service for wealthy households, to explain just what all the headlines are about.
3. Rather than downsizing their lifestyles, ‘they’re spending more money on protecting their homes,’ said Paul M. Viollis Sr., the chief executive of Risk Control Strategies, a security advisory firm based in New York City, whose clients have an average net worth of more than \$100 million.
4. A recent survey by the Spectrem Group found that ‘while somewhat more moderate in risk tolerance than in 2009, investors remain more interested in protecting principal than growing their assets.’
5. Mr. Munson suggested a more enlightened view that looks at ‘risk budgeting,’ or gauging how much risk you can take, and design a portfolio that tracks your tolerance - or intolerance - for stock market exposure.

Foremost, this supports the idea that institutions increasingly devote special attention to risk. Importantly, adjectives attach to nouns very freely, but nominal modification of nouns requires some kind of codification within the culture: a novel situation may be described as a risky one, but risk arbitrage is an activity created explicitly to handle the phenomenon of risk. As such, nominal modifiers are an important signifier that risk has taken on a more and more central and tangible role within institutions.

### 10.6. Risk takers and risk bearers

We have seen that expressions of active risk taking are in decrease while more ‘technocratic’ expressions (to pose/put at risk) express that less agency expressions are on the rise. This is surprising, considering hypothesis of governmentality or individualisation theorists that institutions would increasingly expect that individuals manage risks themselves. If this is expected, we would at least expect that terms such as person, man and woman are addressed in risk reporting even when they are not in power but exposed to risk. Individualisation processes would then be reflected in the news coverage of the NYT in reporting the opposite of what is desirable, the exposure to risk of the vulnerable.

Grammatical annotation can be used to look for the subjects of risk processes whose subject is the agent behind the risk (to risk, to run risk, to take risk, to put at risk). By focussing on the most common grammatical riskers, we can see that person/people, companies, banks, states, investors, governments, man/men and leaders are leading the riskers overall in the NYT. The list thus contains both powerful institutions and terms often used for everyday people.

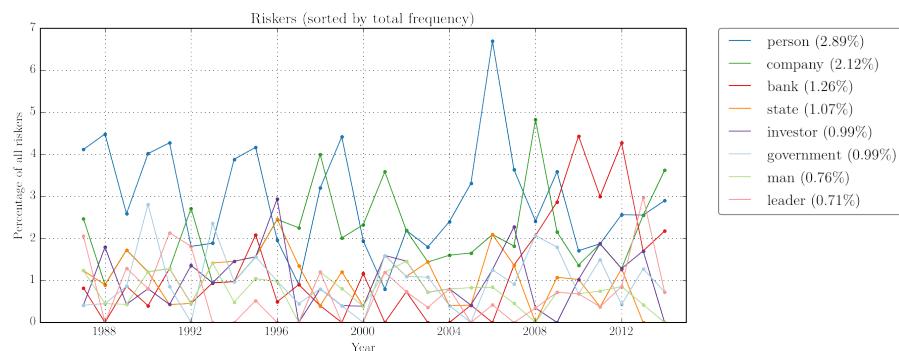


Figure 6.8: Riskers (general corpus)

To examine the role of risker more closely, we created a list of all heads of nominal groups in the corpus, and determined the percentage of the time that noun occurs as the actor in a risk process. This involves determining a sensible threshold for the minimum number of total occurrences, lest the top results be simply words that only appeared once, as a risker, in the dataset. Thus, words appearing fewer than 750 times in the corpus were excluded.

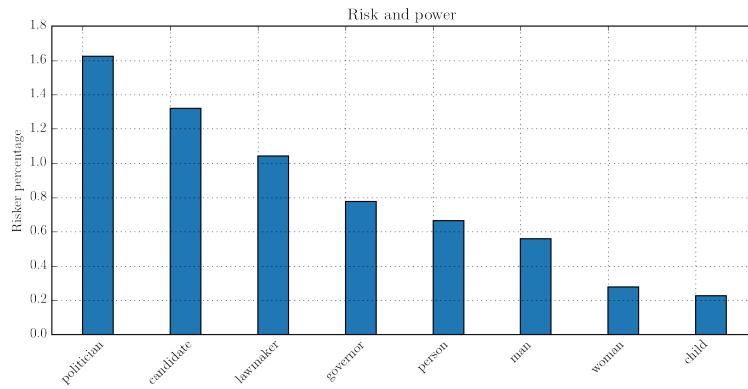


Figure 6.9: Percentage of common participants that are in the role of risker (general corpus)

The division between powerful people in government and law, compared to everyday terms for average people, is startling:

1. Today, George W. Bush, with his dauphin's presumption that the Presidency is his for the taking and his cocky refusal to depart from his canned stump speech, may risk repeating Dewey's error and give his opponents the sentimental underdog's advantage.
  2. After months of giving President Fox the cold shoulder, Mr. Bush's action on immigration may foretell an end to the tensions, particularly since Mr. Bush is taking a political risk by angering anti-immigration Republicans.
  3. By raising the question of his role in the Iran arms-for-hostages deal, even to decry those questions as part of a 'Democrat-run' witchhunt, Mr. Bush risked appearing defensive and risked prolonging news coverage of a six-year-old scandal that has already eaten up one of his last four days of campaigning.
  4. Longtime Washington observers question if Mr. Obama would risk a battle over his secretary of state
  5. Ignoring the fact that it's her beloved Tea Party dragging the country to ruin, Palin suggested on Facebook that if the country defaults on its debt, Obama is risking impeachment.
- 
1. Perfectly normal men and women were risking prison by making a pass at someone.
  2. 'Some people will clearly risk death to reach Europe,' said Israel Díaz Aragón, who captains one of the boats of Spain's maritime rescue services.
  3. Even those women who become cam models of their own free will take on serious risks associated with sex work
  4. People who were lactose intolerant could have risked losing water from diarrhea, Dr. Tishkoff said.
  5. The humiliating result, six workers said in separate interviews, was that men were sometimes forced to urinate in their pants or risk heat exhaustion.

of a crucial clinical trial of the painkiller he questioned her about the details of data about popular painkillers like Pfizer's Celebrex or heart attacks

Vioxx  
Vioxx's  
Merck's

Yet the United States and  
There is a risk over time that democracy will lead  
In addition,

Europe  
Europe  
Europe

to play down its heart risks  
risks of causing heart attacks  
Vioxx increased the risk of  
face the risk that their problems will feed on  
to splinter  
is ailing, there is a risk that oil prices will

Thus, not only are everyday people increasingly lacking agency in the risk process. Contextualised instances of different kinds of riskers reveals that the kinds of things that are risked are less abstract, and often with little balance between the possible positive and negative outcomes.

We will see later on when examining health articles that women, person, man, child, consumer and baby all occur regularly as participants but as we have seen here with less agency when powerful institutional actors while it is the banks, companies, firms and agencies which are increasingly reported as riskers while person, man and woman are on an upwards slope (compare Zinn & McDonald 2015).

## 10.7. The risk semantic in health discourse

Findings from an earlier investigation have shown that health plays a larger role in risk discourse in 2000 than it did in 1900. We were interested in both whether we can confirm the significance of health through linguistic analysis, and whether a richer picture of the relationship between risk and health could be provided. Given the attention paid by Beck to the status of science and research in reflexive modernity, a particular focus was on the ways in which risk, health and research co-occur.

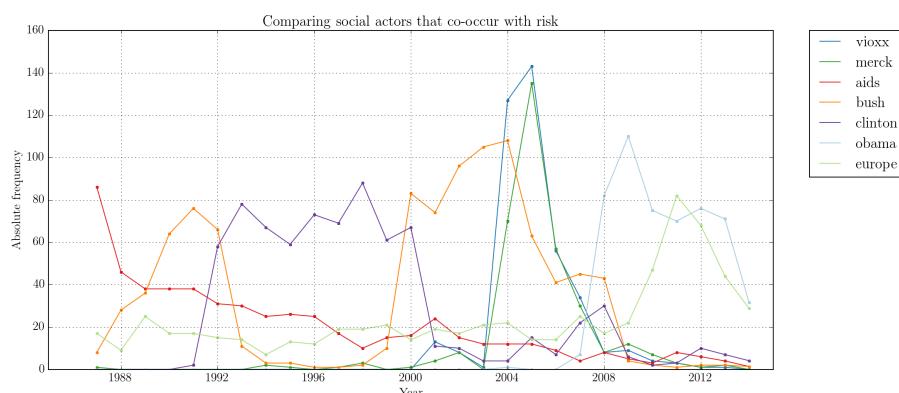


Figure 6.10: Comparing social actors that co-occur with risk

The salience of health topics is clear: in their most prominent years, AIDS, Vioxx and Merck comprise over 1.6 per cent of all proper nouns that co-occur with a risk word. This is higher than Clinton, Bush or Obama at their peaks, as well as Soviet Union in 1987 or Europe during the Eurozone crisis in 2011.

Further evidence for the salience of health topics when compared to others was found by searching for nominal modification of risk-as-participant (e.g. the cancer risk/the risk of cancer) to uncover more explicit marking of the negative outcomes in the corpus of all risk tokens.

Concordancing these examples revealed the sharp rise in 'risk of attack' has very little to do with war or terrorism, but instead, is almost always referring to the increased risk of heart attack discovered in those who take Vioxx. From 2004, for example:

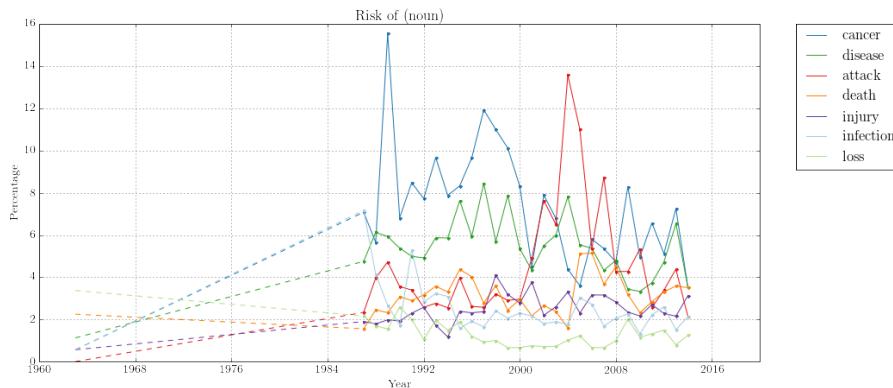


Figure 6.11: Risk of (noun) (general corpus)

1. It reported that both drugs appeared to increase the risk of heart attack and stroke, but that the danger from Vioxx appeared higher.
2. In an April 2004 study in the journal Circulation, researchers from Harvard Medical School found that Vioxx raised the risk of heart attacks relative to Celebrex; two months later, several of the same researchers reported in another journal that Vioxx increased the risk of hypertension.

## 10.8. The shift towards individualism in health discourse

By locating all participants in the health subcorpus, and sorting by those on increasing and decreasing paths, we can see broad shifts in the climate of health risks that are responsive to both events and broader social change: heightened discussion of health insurance in the USA in the early 1990s is related to the Clinton Healthcare Plan (1993), for example. That said, despite the more recent U.S. healthcare reform (beginning with the Affordable Care Act of 2009), insurance-related participants do not re-emerge in the later samples of the corpus, potentially indicating broader shifts in health/risk discourse that require further attention.

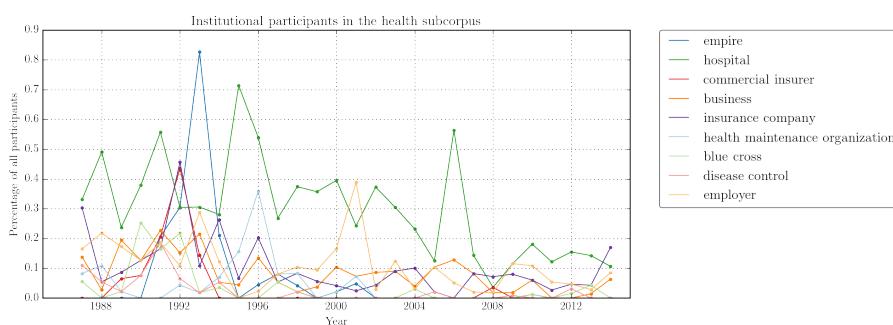


Figure 6.12: Institutional participants (health subcorpus)

1. The bill, which became law on April 1, forces commercial insurance companies to accept any small-business applicant and to charge uniform rates, regardless of risk of illness, as Empire does.

**2. Empire used the false data in its successful lobbying campaign last year for changes in state insurance law intended to force competitors to accept some high-risk customers.**

In contrast, most of the everyday participants in the health subcorpus are on the rise. That means that the trends in the health subcorpus might in some respects differ from the overall trend. Risk is increasingly communicated with vulnerable social groups such as women, children and babies but also with persons more generally, men and consumers.

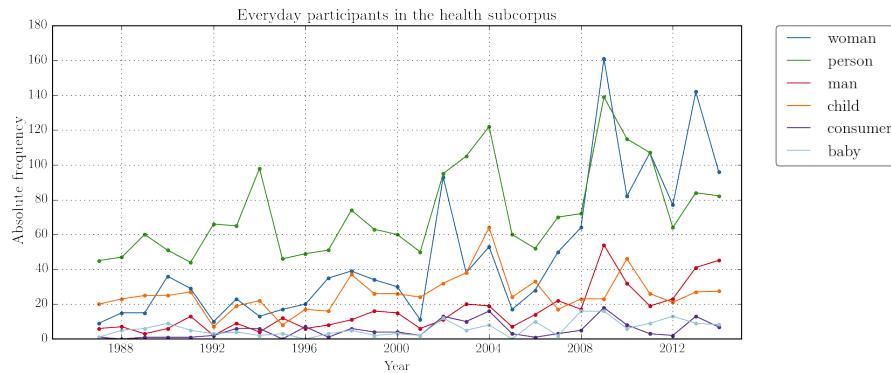


Figure 6.13: Everyday participants (health subcorpus)

Our analysis of n-grams (recurring combination of two-word combinations from open word classes) showed that a number of civilisation illnesses and related health issues such as heart disease, heart attack, prostate cancer, ovarian cancer, lung cancer, blood clots and mental health, giving evidence of the prominence of cancer, heart disease and mental health issues in media coverage of recent debates. At the same time debates about health insurance, health plan, commercial insurer and insurance company decrease, indicating (as with the analysis of participants in the health corpus) that these debates they exist no longer reference to risk as a significant concept. The use of the risk semantic in the health sector is increasingly used in relation to everyday life people presented as vulnerable groups and decreasingly in the context of organisations.

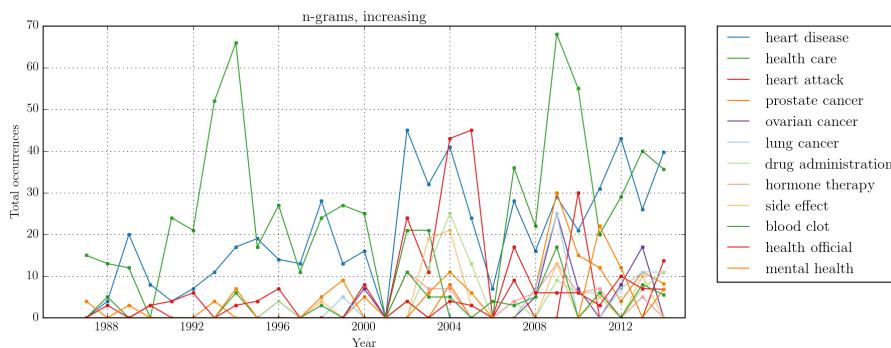


Figure 6.14: n-grams, increasing (health subcorpus)

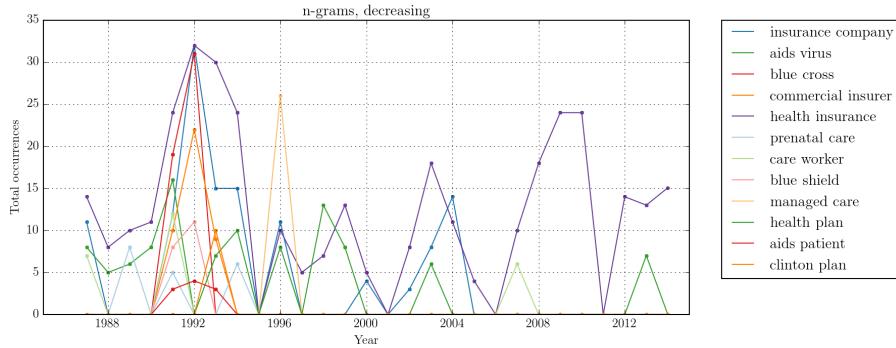


Figure 6.15: n-grams, decreasing (health subcorpus)

### 10.9. Health discourse is driven by increasing reference to scientific expertise

There is large support from different scholars that risk reporting is driven by journalism that refers to scientific experts and empirical evidence. While Mairal (2011) claimed that this is characteristic for a particular genre of journalism that developed in journalism during modernisation. Also, Beck's claim that the loss of scientific expertise does not lead to a decrease but increase of importance of scientific evidence supported the view that we should expect more reference to scientific expertise whether to research, scientific evidence or experts. Skolbekken's study on the risk epidemic in medical journals has shown that at least for scientific journals the increase in risk communication has manifested but the question remained to what extent this shift towards risk has also affected reporting in news media.

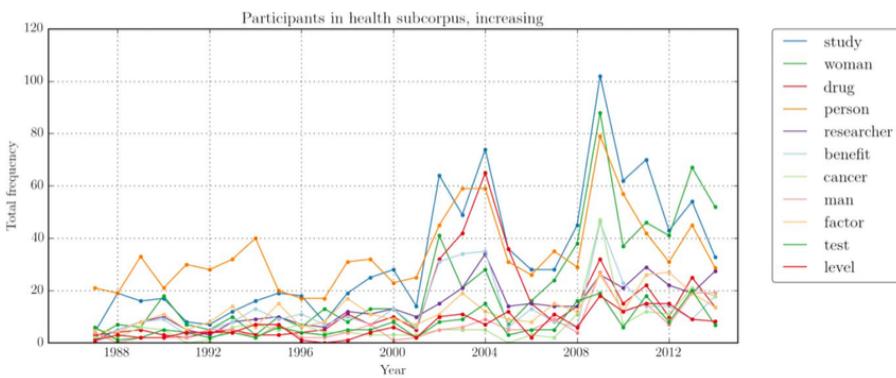


Figure 6.16: Participants, increasing (health subcorpus)

Our analysis of participants in the health subcorpus supports the assumption that research-related participants in the discourses have increased over last decades. Of the top 11 increasing participants, two are explicitly associated with science and research (study, researcher), while other terms can be concordanced to reveal strong associations with this topic (factor, test, level).

In summary of the overall trends in the health subcorpus we have grouped the different infectious diseases (*aids*, *aids virus*, *aids patient*, *transmission*, *flu*, *influenza*), everyday people (*person*, *man*, *woman*, *child*, *baby*, *consumer*), institutions (*empire*, *hospital*, *commercial*, *business*, *insurance company*, *HMO/health maintenance organisation*, *blue cross*, *disease control*, *employer*, *insurer*, *health insurance*

*association, insurance industry, office) and non-infectious diseases (breast cancer, cancer, heart disease, diabetes, heart attack, prostate cancer, stroke, ovarian cancer, obesity) as well as science and research (study, researcher, finding, new study, author, university, expert).*

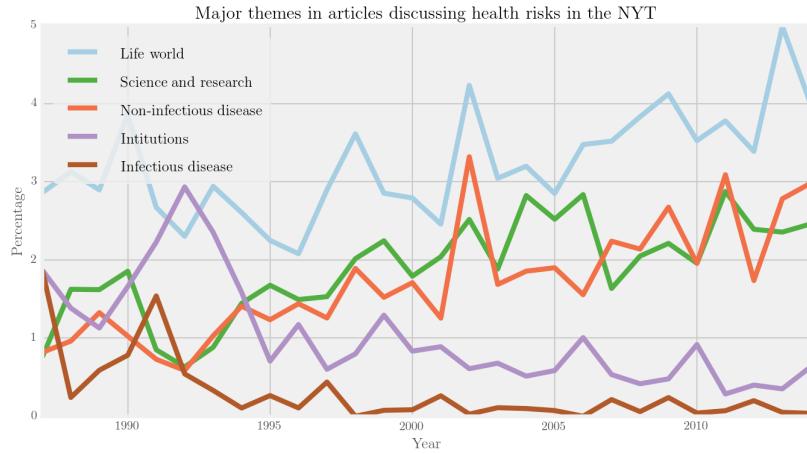


Figure 6.17: Major themes (health subcorpus)

The overview shows the clear trend of decreasing reporting on infectious diseases and institutions related to the risk semantic in New York Times coverage. It also shows the risk of everyday life people referred to when using the risk semantic, the importance of science and research for driving the usage of the risk semantic as well as the non-infectious diseases such as cancer and life style diseases.

## 11. Concluding remarks

The analyses have shown a number of clear linguistic trends in media discourses utilising the risk semantic which indicate the growing institutionalisation of risk practices but can also be used to examine and test hypotheses from risk studies.

Our data show an interesting ambivalence in the reporting of the NYT, similar to what was suggested in Beck's individualisation thesis (1992): A culture of institutional individualism takes place at a time when individuals can increasingly less control decision making outcomes. As a result we find a shift towards greater emphasis on everyday life social groups (e.g. women, men, children) in stories, but, at the same time, less agency in the linguistic expressions related to everyday people. Concurrently, the notion of risk calculation decreases, in favour of a general sense of exposure to risk. These results altogether support the assumption that in advanced modern societies all the advancement in science and technology—including medical technologies—has not supported discursive forms of control but discourses of uncertainty and potential risk. However, presentations differ regarding social groups. The emphasis on everyday life people in news coverage is increasing while it is mainly powerful people and organisations which are presented as decision makers. Everyday life people are usually presented as risk bearers in news reporting of the NYT.

There is also good evidence that risk words increasingly occur in the context of scientific studies as a technical term. This shows that the general trend Skolbekken (1995) observed in the 1980s and 1990s

towards risk studies in medical sciences has found its way into media coverage. It also supports the view of Mairal (2011) that risk enters the media as part of a new, evidence-based genre of news reporting.

We also found evidence that risk as a semantic process is in consistent decline, becoming steadily displaced by risk as a participant in discourse, or risk as a modifier of other kinds of processes and participants. In part, this is an expression of the institutionalisation of risk practices in social institutions, the kind of modifier on the sharpest upward trajectory is pre-head nominal modification—a form closely associated with occupations (e.g. *financial risk managers*), organisations (e.g. *risk budgeting*) or practices (e.g. *risk arbitrage*).

We were also able to show a number of clear trends in the health sector. Reporting of infectious diseases decreased after the AIDS crisis in the USA, while non-infectious diseases gain prominence alongside greater focus on terms for everyday people. This mainly reflects ongoing issues such as different forms of cancer and how to deal with it and the so called civilisation illnesses which tend to occupy more space in news coverage over decades.

Our research is only the beginning, at this point intended to determine whether we can find compelling linguistic evidence for institutional change in print news archives. Though our present analysis appears to have demonstrated that this is methodologically feasible, we have yet to triangulate our results with sustained, contextualised interpretation of individual texts within the corpus.

Accordingly, further research should focus on detailed qualitative institutional analysis, examining how discursive shifts in prototypical articles across the corpus are linked to specific institutional and socio-cultural changes. The increasing use of the *at-risk* modifier, or the strong increase of the notion of the *risk factor* (Zinn & McDonald 2015), seems in different ways linked to broader social changes of the organisational regulation of the social. To re-construct this connection would allow a more fundamental understanding of how social and linguistic changes are connected.

We faced a number of difficulties. To begin with, the challenge of translating and connecting sociological thinking with corpus linguistic research strategies and elaborate functional grammars is by no means a simple task. Corpus linguistics, in seeking to distil the content of very large collections of text, may be at odds with a sociological tradition of sustained analysis of smaller, well-contextualised samples. Though the goal within the emerging field of corpus-assisted discourse studies is to use quantitative and qualitative methods as a methodological synergy (Baker et al, 2008), such a goal is difficult to operationalise when working with a very large corpus comprised of many subcorpora. Furthermore, shortcomings in the availability of digital tools for doing quantitative functional linguistic research mean that the accuracy and/or usefulness of software used to automatically annotate data remains a serious issue. CoreNLP's existing dependency parser, for example, does not distinguish grammatically between process-range configurations (She took a risk) and transitive processes (She took an apple), despite important differences in meaning. This limits what can be automatically located, or adds considerable complexity to the process of querying the corpus and manipulating the results.

Finally, systemic functional linguistics encompasses a theory of the relationship between text and context that in many respects clashes with mainstream sociological theory: the notion that context is in text is hard to reconcile with sociological analyses of texts that centre on highlighting relationships between texts and the broader social changes that may inform the production of texts, while leaving little trace in the lexical and grammatical choices made therein.

Though the analyses show results that are certainly an expression of broader social changes, there are a number of potential future avenues we hope to explore: comparison of newspapers by location, political orientation or language is indeed possible using the methods developed for this project, and may prove insightful Having more data available will also allow us to conduct more fine-grained analysis

of developments in different social domains such as politics, economics, health, sports, and life world. On this basis we will start with comparative international analysis.

We are also particularly keen to engage with the question of how related terms such as danger, threat, chance and security relate to the identified shifts in health risk discourse. Sustained focus on particular kinds of health risks, such as cancer or obesity, could do much to elucidate longitudinal transitions toward or from risk.

# Chapter 7

## Discourse-semantics of *risk* in the NYT

In SFL, the sum total of lexicogrammar, abstracted, realises the discourse-semantics of texts. Accounting for discourse-semantic meaning involves sensitivity to realised lexicogrammatical forms, but also to the ways in which incongruence and grammatical metaphor can create similar meanings through differing grammatical constructions: as noted earlier, *potential harms* may be realised as a participant in a process of risk (*Bush risked losing the election*), or as a modifier of a risk participant (*the cancer risk/the risk of cancer*).<sup>18</sup> Given the diversity of roles in which risk words can appear, the delineation of risk by roles within mood and transitivity systems in the previous section was thus a methodological necessity, but one with heavy ramifications for analysis. At the level of discourse-semantics, it becomes necessary to discuss risk word behaviour more fluidly, with reference to both experiential and interpersonal meanings, and with distinctions between risk as participant, process and modifier largely collapsed. This is perhaps especially so in our case, as risk is an example of a lexical item that may be congruently realised as either participant and process, straddling the semantic space between entity and event.

The first part of this discussion provides a description of risk in the NYT absent longitudinal considerations—something akin to the descriptions provided by Hamilton et al. (2007) and Fillmore and Atkins (1992), but from a systemic-functional, rather than frame-semantic purview. The second part is concerned with accounting for shifting discourse-semantics of risk, via the lexicogrammatical findings presented in the previous section. In the final section, longitudinal shifts are discussed in the context of specific events, broader social change, and sociological theory.

### 1. A monochronic description of risk

Before turning our attention to the behaviour of risk words over time, it is useful to provide a short description of the way risk words are generally used in the NYT.

Foremost, striking is the ability of risk to function within all open word classes (noun, adjective, verb, adverb), as well as the sheer diversity of risk words. 507 unique lexical items containing risk were found<sup>19</sup>, including many (albeit very rare) words lacking existing lexicographical description: examples such as *risk-shy*, *risk-addicted*, *risk-elimination*, *species-at-risk* and *risk-happy* demonstrate the overall salience of risk and the nuance with which it is instantiated in news discourse. Further testament to this salience are the nuanced distinctions in riskers' awareness of potential harm in *risking*, *putting at risk*, *taking* and *running* risks.

In many respects, our findings agree with those of other monochronic descriptions of risk language.

First, we can see the usefulness of the frame-semantic categorisation of the kinds of participants/social actors that occur within the risk frame (i.e. Fillmore & Atkins, 1992): we often found it useful to divide corpus interrogation results into categories of *risker*, *potential harm*, *risked thing*, and the like. Promising is the fact that in many cases, we can use the grammatical structure of the clause to automatically return lists of each kind of participant. In cases where the grammar alone cannot tell us the participant role (*I risked my death*, *I risked my life*), manual sorting is not difficult, as there is little ambiguity. If we insert the *losing* participle (*I risk losing my life*, but *\*I risk losing my death*), we can quickly determine if a result is a *potential harm* or a *risked thing*. This is especially so when risk is the *process*, rather than a participant or modifier. With this in mind, focussing more exclusively on risk as process in very large parsed datasets may prove elucidating.

Our findings also agree with a key claim made by Hamilton et al. (2007): health and illness risks were surprisingly prominent within our data (See Zinn & McDonald, 2015). As will be discussed below, however, this does not appear to be a purely static phenomenon: our longitudinal analysis points toward health risks as being far more common in contemporary language than in the language of our 1963 dataset.

A second point on which we agree is with their contention that risk words behave differently in different social situations (i.e *registers*) and different genres, and that comparison of genres is worthy of further study (though here we rely on not on our dataset but on a long history of research in support of this contention within SFL):

We find in these discourse environments that the focus of the semantic prosody and the semantic preference changes according to the context in which they occur. While this may be something that some (but not all) sociologists of risk may have intuitively sensed in the past, there are empirical data from corpus linguistics to suggest now that the semantic prosodies can and do change slightly from one context to another (2007, p. 177).

Their dataset included transcribed spoken conversations. This register is remarkably different to that of NYT articles, and examples of risk in these contexts demonstrate this quite clearly (e.g. *Don't don't risk it eh*; *Cos there isn't a risk of going of there*). The key characteristics of these examples (informal lexis, unrecoverable deictic references, low lexical density, etc.) contrast starkly with our examples.

Due to the composition of our dataset, we can have little to add to descriptions of risk in casual spoken language, aside from recognising that spoken risk talk is likely to point toward very different, and interesting, results. Though we believe our results may be generalisable to the behaviour of risk in relatively formal written contexts, extended investigation of risk in spoken corpora remains needed.

A key finding that received little attention in this earlier linguistic research of risk language is the notion of participants' *agency in risk*. Consider the following two sets of examples. The first, from 2012, shows examples of the embedded process as negative outcome.

1. Some Democrats are saying the White House set itself up for the charges by making a vow that was bound to be difficult to keep and that would **risk alienating** its business supporters.
2. Some speculated that this partnership **risked alienating** other big retailers, like 7-Eleven, by giving Starbucks influence over how Square's payment system was developed.
3. And campaigning on behalf of members of Congress could **risk alienating** swing voters, many of whom seem to prefer bipartisan government and dislike one-party rule.

The second contains grammatical subjects modified by *at-risk* (from 2008):

1. He secured nearly \$100,000 for a program at the Sephardic Community Center in Brooklyn that seeks to help ‘at-risk immigrant youth successfully acculturate’ into American society
2. Through the years, he said, more than 1,000 at-risk young people have arrived at his doors.
3. The document signed off on a \$1.5 million grant to World Vision, a group that hires only Christians, for salaries of staff members running a program that helps ‘at-risk youth’ avoid gangs.

Readily apparent when risk is process is that the kinds of people who risk are typically institutions or humans in positions of power and influence. Actors of risk processes are often states, politicians, or political parties. The *potential harm* being risked is often an abstract concern: *alienating or offending electorates or allies*. In these cases, risk is a process engaged in purposively by Actors who stand to gain something equally abstract. In contrast, when risk functions as a modifier of a participant, the participant is far less powerful: women and children are at-risk of sickness; workers are at risk of injury or death. Here, risk is a quality ascribed to the self. Risky behaviour is not often mentioned. For these people, the potential harm is often recoverable from context, but not outlined within the clause. This distribution was largely consistent throughout our dataset, and will be unpacked through sociological analysis in the following chapter.

## 2. Shifting discourse-semantics of risk in the NYT

Some lexicogrammatical and discourse-semantic phenomena have demonstrated consistent shifts over our sampling period. We turn our attention to them now.

### 2.1. Word class and experiential role of risk words

First, we must consider the trend toward nominal risk words (recall Section 1; Figures 5.2 & 5.3). There is a major functional-semantic difference between risk as a participant and risk as a process, to which this shift congruently corresponds.<sup>20</sup> As a process, when the direct object is the valuable object, *risk* may be nearly synonymous with *jeopardise* (*I risk my life*). When the direct object is the negative outcome, risk as a process means ‘may potentially face/incur/suffer’, with a negative connotation. As in Filmore and Atkins’ frame, the end result of a risk process is either the goal/benefit or the harm/negative outcome. When risk is a participant, however, it generally stands in for only the harm/negative outcome: in a clause like *the risk was outweighed by the benefit*, the negative outcome is realised by the risk word:

1. An array of new techniques, each with its own risks and potential benefits, makes for bewildering options for women.

*Risk/reward ratio* is another example seen commonly in the NYT data: again, in this case, risk *is* the potential harm:

1. Coughlin did not care to defend his decision or to discuss the risk/reward calculation of leaving a talented and highly paid leader in a game in which athletes sometimes are injured.
2. So the franchise made the ultimate risk-reward play this summer.
3. addressing these concerns does not impede the fiduciary responsibility because in today’s marketplace, there are many alternative investments with similar risk-reward profiles.

When risk is a process, however, *benefit* and *reward* do not behave in a similar way. Instead, *benefit* refers to specific institutional schemes:

1. The Kaziyevs were told they had 10 months to become citizens or risk losing Medicaid benefits.
2. Once the marriage ban in New York State is lifted, domestic-partner couples, both gay and straight, will risk losing access to health care and other benefits if their employers treat marriage as the only ticket for entitlement to these benefits, which are increasingly expensive.

Because of this difference, a shift toward nominal forms is in itself a shift toward a semantic conceptualisation of risk as more interchangeable with harm itself. Risk as a process can contain within its adjuncts (or, less likely, within a complement) the goal, or positive outcome. Risk as a participant cannot. When it co-occurs with the goal, the relationship between them is through coordinated conjunction.

First, though we noted above that risk as a process involves a different set of participants to risk as a modifier, there are still longitudinal changes within this area. When looking at the *risk of loss*, for example, we can see a general trend toward individual losers, rather than institutional losers. In the 1963 data, the things at risk of loss are macro-level and abstract: *athletic funding, market share, vital technology, sympathy in the west*, and the like. Later, risked things are more individual assets—*life and injury* being the two most common. We link this conceptually to neoliberalism

## 2.2. Domains of risk discourse

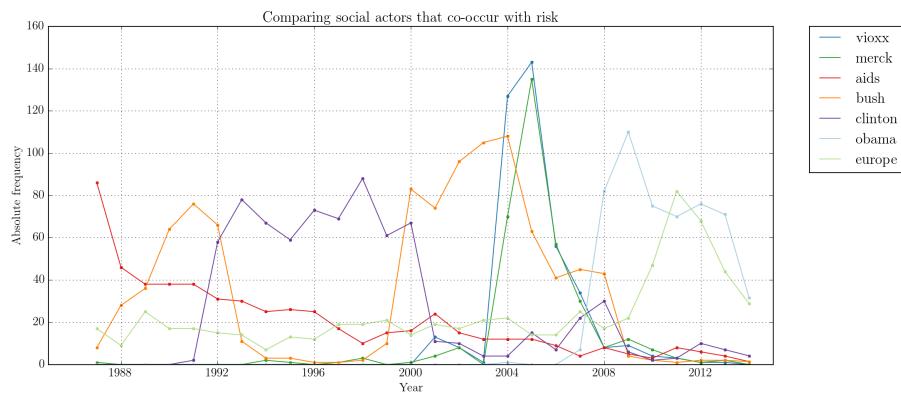


Figure 7.1: Comparing social actors that co-occur with risk

In terms of the topics in which risk words are deployed, we saw that health risks are very prominent in the more contemporary data samples. Our comparison of *Risk of terror\* attack* and *risk of heart attack* demonstrates this preference clearly. This change is indeed a longitudinal one: in 1963 editions, a number of constructions evidence that risk was commonly instantiated with regard to diplomacy, war, international relations, and the like. In their most prominent years, AIDS, Vioxx and Merck comprise over 1.6 per cent of all proper nouns that co-occur with a risk word. This is higher than Clinton, Bush or Obama at their peaks, as well as Soviet Union in 1963/1987 or Europe during the Eurozone crisis in 2011 (See Figure 7.1). Moreover, in the years following the AIDS crisis, health risk have increasingly related not to infectious diseases (which require institutional responses), but to kinds of illnesses where the responsibility for prevention falls upon everyday citizens through lifestyle choices, rather than politicians, hospitals, or the FDA. Even in the case of Vioxx, where the risk was created by the premature FDA approval, risk language surrounding Vioxx remained geared toward the risks faced by everyday people. Though Merck and the FDA may be blamed, risk remains a more appropriate frame for discussing the

potential for heart attack than it does for discussing the potential harm caused by improper clinical trials or financial interests causing the FDA to approve the medication prematurely.<sup>21</sup> In hundreds of co-occurrences of risk words, Vioxx and Merck, we uncovered a mere handful where the potential harm was to the manufacturer. Though we found one solid example in the 2006 subcorpus ('*The verdict highlights the risks that Merck faces as the number of lawsuits over Vioxx continues to grow.*'), this same article contained four other risk words, each of which positions the consumer as being subject to potential negative outcomes:

1. Mr. Escobedo said that Vioxx was especially dangerous to Mr. Garza because of his other **risk** factors and that he should never have been prescribed the drug.
2. 'Mr. Garza was the last person in the world that should have been taking Vioxx,' said Mr. Escobedo, who told the jury that Merck had known since 2000 that the drug posed heart **risks** but continued selling it for four years.
3. About 20 million Americans took Vioxx from 1999 to 2004, when Merck withdrew the drug after a clinical trial showed that it increased the **risk** of heart attacks and strokes compared with a placebo. Earlier clinical trials had also shown that Vioxx appeared to be much riskier to the heart than naproxen, an older painkiller.
4. But recently the tide has seemed to turn abruptly against the company, as its lawyers struggle to explain a raft of documents that show its scientists were concerned about Vioxx's heart **risks** several years before Merck stopped selling the drug in 2004.

As Widdowson (2000) suggests, corpus linguistics often reveals things that are contrary to intuition, and this is certainly the case here. Our expectation of new risk meanings related to terrorism after 9/11 was for the most part not met. Rather than a limitation, this can be treated as an insight in itself: the events and topics that come to mind when we think of risk may not necessarily correspond to the reality of risk language generally. Such is the benefit of corpus linguistic investigation of risk, when compared with previous methodologies employed within the humanities and social sciences to better understand risk.

### 2.3. Implicitness of risk

The most salient theme from the longitudinal mapping of risk is that of implicitness: increasingly common are grammatical constructions where potential harms and risked things are recoverable only from context. Below are three further examples of the *at-risk* construction:

1. In 1999, we sold the company, and the next year, we moved to the United States with our two children--a third was born in 2003--so I could pursue my idea of helping low-income, **at-risk youth**.
2. Some of the proceeds from tickets sales for the event [...] will go to support local arts programs in Washington Heights and the Broadway League's Family First Nights, which the League describes as 'a nationwide program specifically designed to encourage **at-risk families** to attend theater on a regular basis.'
3. Mr. Tepfer noted that Mr. Douglas, who was in the neighborhood when the body was found and was interviewed by the police at the time, 'preyed on **at-risk women**, on prostitutes, and he engaged in sex and strangled them to death.'

In these cases, what the participant is at-risk *of* is not a specific negative outcome, but an interrelated set of negative outcomes that are more likely to happen to less powerful people in society. Evoked within

this cluster is *poverty, drug use, disease, homelessness, abuse, fatherlessness, dropout, gang activity*, and the like. In many cases, *at-risk* takes on a euphemistic quality, most obviously as a substitute for *lower-class, non-white or poor*. Also interesting here is the muddying of the semantic frame: it is both difficult to determine the exact potential harm, and to classify the participant as a *risker*, which seems to imply some agency or comprehension of the risk. More accurately, these participants are *put at risk*—a risk process that itself is on an upward trajectory within our dataset.<sup>22</sup>

This aligns with the decreasing arguability of risk. Risk in predicator or subject position is increasingly rare, as risk becomes less the nub of propositional meanings. Thus, less and less often is risk a fundamental component in *meaning as exchange*: in its role within complements and adjuncts, it now more typically plays a supporting role in the provision of information. A ramification of this is that risk becomes an inherent quality of participants in the field of discourse, rather than a process in which participants knowingly or by their own choice choose to engage. This shift is exemplified by the outbound trajectory of *calculated risk*, and its displacement by an uncalculated *potential risk*. Below are examples of *calculated risk* in 1963, contrasted with *potential risk* in 2008.

1. It is, of course, a **calculated risk** that Mr. Kaye is taking.
  2. Kennedy has taken a **calculated risk** here.
  3. A spokesman for the group acknowledged that granting a 10 per cent discount before a study in depth had been made was a calculated risk.
- 
1. One was to make health care providers and caregivers of infected children aware of the **potential risk** of pre-chewing.
  2. At issue were the **potential risks** of having government-run funds in China and other foreign countries make big investments in American businesses.
  3. Rat pups exposed to BPA, through injection or food, showed changes in mammary and prostate tissue, suggesting a **potential cancer risk**.

In the former, the existence of the risk itself has been acknowledged, and the potential harm/reward have been weighed. In the latter, though the situation can be identified as having potentially negative outcomes, these are formless and immeasurable. This aligns with the idea that risk (sociological reference) has come to be simply *threat*.

## 2.4. Low-risk, moderate-risk, high-risk

1. Hemophiliacs, at **high risk** of AIDS, have been hard hit by the disease.
2. Another 25 percent are **at moderate risk**.
3. But why on this isolated campus, where no AIDS cases have been reported among students at **low risk** of catching the disease, are students so concerned?

During the first years of the U.S. spread of HIV, people could be classed according to low, moderate and high-risk groups. Here we have basic quantification of levels of risk. This stands in contrast to the *at-risk* construction discussed above. Of these modifiers, only *low-risk* emerges as an increasingly frequent form. This is also interesting, as it points to a broadening of the semantic scope of risk to include situations where risk remains present: *low-resolution image* does not point toward the increased prominence of low resolution images, but more to the prominence of resolution as thing that meanings are made about. In the same way, the inward trajectory of *low-risk things* does not point toward a culture of less risk, but

toward a culture where even things that do not have risk are characterised by their nature to it. We could not locate existing literature supporting a claim that the salience of a concept may be evidenced not only through *extreme case formulations* the *riskiest, high-risk, very risky*, but through minimisation. Nonetheless, our analysis points to the idea that the increased salience of risk as a concept is in part demonstrated through its instantiation in situations where its significance is claimed to be negligible or banal.

## 2.5. Risk as modifier

1. At JPMorgan Chase, the **risk models** hid--and were used to hide--risks from the traders and top executives.
2. After a rogue trader cost MF Global \$141 million, Promontory came in to bolster certain areas of the firm's **risk controls**.
3. He was a total **risk junkie**.
4. The programs are all based on the concept of **risk management**, rather than the unattainable goal of total **risk elimination**.

Risk occurs within many different modifier positions (see Table 5.10). Of these, pre-head nominal types are rising, and adjectival pre-head types are falling. From these shifts, we can surmise some sociological insight related to arguability (as conceptualised by SFL). In the increasing frequency of pre-head nominal modifiers (*risk management, risk arbitrage, risk factor, risk insurance*—more examples above), we can see increased social significance of risk as a concept through the evolution of specific jobs whose central concern is risk (see Section 8 for discussion of the emergence of *risk factor* in particular). Pre-head nominal modification reflects the codification of a concept: such constructions must be culturally recognised constellations of meaning. In comparison, adjectives attach to head nouns relatively freely in English. Cultural recognition of the adjective-noun combination (*a risky move, the riskiest option*) is not a prerequisite for meaning to be understood.

Increasing nominalisation and ‘participantification’ of risk are also indicative of decreased arguability. The key affordance of nominalisation is that it reduces the need to make meanings through constellations of Participants and Processes: instead,

Using other tests, such as counting the dependency parse indices of risk words, longitudinal change in the arguability of risk words is consistent. In earlier editions, risk words more commonly occupy the more arguable positions of Subject and Finite. In later editions, risk more commonly occurs in heavily dependent, ancillary positions. Thus, less often does a risk word form the central component being discussed; more and more often, it is used as a modifier of one of these components, or as a part of a supporting, subordinate clause.

Given that Processes in the Transitivity system pattern with the Finite/Predicator in the Mood system, nominalisation facilitates clauses with larger amounts of less arguable information. This discursive function of nominalisation is well-acknowledged both within SFL and outside of it. The increased experiential information density is paid for with ‘the interpersonal price of decreasing negotiability’ (Halliday & Martin, 1993, p. 41). At the same time, nominalisation ‘allows the writer to give the required flavor of objectivity to his or her statements and claims’ (Holes 1995, p. 260). Nominalisation disengages the speaker/writer from commitment to the truth of his/her statements by allowing him/her to make ‘unattributable claims’ (Quirk et al, 1985: p. 1289); it also has the capacity to blur/mystify agency, thus ‘masking real intentions’ (Hatim, 1997: p. 114).

We are limited, however in our ability to interpret our approximation of arguability through dependency indices. Little has been written about the relationship between dependency grammars and SFL. As dependencies are inherently functional-semantic, rather than generative-grammatical, dependency is perhaps the most useful<sup>23</sup> mainstream grammar for learning about the semantic behaviour of a given word. That said, though functional categories provided by Stanford CoreNLP's dependency parser overlap in many respects with categories in the Mood system of SFL, there are still mismatches, or shortcomings. Most critically, dependency grammar conflates interpersonal, experiential and textual systems, while SFL demands three separate parses. As discussed earlier, the systemic-functional conceptualisation of subjecthood is threefold, whereas CoreNLP simply nominates the interpersonal subject.

Due to the availability of nuanced querying languages for phrase structure grammar annotation, our investigation leaned toward grammatical structure annotation over dependency grammar. This is despite a problematic relationship between functional and phrase structure grammars. Given that interesting preliminary findings were unearthed by querying dependency information, we conclude that further exploitation of dependency annotation for the purpose of risk language analysis appears to be a promising area for further analysis.<sup>24</sup>

### 3. People and risk

A particular strength of our approach is that it is possible to understand nuanced distinctions in the ways in which social actors are related to risk. Looking specifically at words pertaining to normal, everyday people (*person/people, man/men, woman/women, child/children*, etc.), we can see that everyday people are associated more and more with risk discourse: this class of nouns is becoming more frequent, overtaking words related to institutions. When looking specifically at who is the actor in risk processes, however, a different picture emerges: banks, agencies and companies are becoming more frequent, while everyday people become steadily less prominent. This finding paints a rich image of the changing discourse-semantics of risk, whereby risks are created through the actions of powerful people and institutions, but, increasingly, suffered and endured by people. This aligns with neoliberal sociological conceptualisations of the distinction between late and reflexive modernities.

### 4. Sociological perspectives

#### Routinisation and institutionalisation of risk practices

There is little doubt that risk has become an increasingly common part of our life in recent decades (e.g. Beck 1992, 2009, Giddens 2002). This can be documented by a number of changes in the language used in The New York Times news coverage. For example, our analysis of the pre-head modifiers shows that there is a clear tendency to speak about risk as part of institutionalised routines, practices or roles rather than unique experiences or activities. For example, we no longer assess, manage or regulate risk but do risk assessment, risk management and risk regulation. There are also increasingly more roles which stay for the institutionalisation of new jobs and positions primarily concerned with risk issues such as the risk assessor, risk manager or risk regulator. Risk is not just what we are dealing with. Instead societies such as the US have institutionalised social roles and practices which primarily deal with risk issues.

That risk has become a much more routinely used term characterising common experiences of our times is also supported by more complex linguistic analysis. Using an SFL framework our research showed decreasing arguability and growing implicitness of risk which indicates that risk is no longer the major

activity in a clause but a well-established and not questioned practice. The term risk is increasingly used but it is no longer what is actually debated it has moves to the ancillary parts of a sentence.

### **The shift to the negative side of risk**

It is difficult to automatically identify positive and negative portrayals of risk through querying or concordancing, as much of this sentiment may be carried in the clauses preceding or following a risk word. That said, we can nonetheless note a number of findings which point toward a reduced agency in participation within risk scenarios which is accompanied by a shift towards the negative meaning of risk. For example, newspapers are characterised by a growing nominalisation of reporting. In the nominal form risk usually only refers to the negative side in the risk frame while the positive side of risk is contained in the verbal form where risk taking may have both positive or negative outcomes (Fillmore & Atkins, 1992). On this most general level the nominalisation of risk in news coverage may serve as a hint for the tendency towards the negative meaning of risk in public discourse. The tendency still holds even against the general trend of nominalisation in news reporting. This finding supports Douglas (1990, 3) claim that risk nowadays would mainly mean danger and a lot of risk would stand for a lot of danger. However, though the proportion of the verbal use of risk is shrinking, it is still a common social experience and it remains an important question who has agency in which social domains.

### **From risk taking to exposure to risk**

The linguistic analyses of processes have shown a clear trend away from processes where people are active riskers or risk-takers to processes with less agency (e.g. running risk) and finally to processes of no agency when people mainly experience exposure to risk (put at risk). In the at-risk constructions there are rarely any examples which express that people or things are put at risk due to a conscious choice. Especially notable is that many constructions that are rising in relative frequency exist without any explicit, or even imaginable, potential goal/positive outcome in the risk scenario. Those at risk of disease are not taking a gamble that has any potential pay-off. Considering the trend towards individual decision-making and responsibility, whether institutionally expected or individually desired (Beck 1993, Dean 1999), this is an important result. If the result is not only caused by a shifting style in media coverage but social change more generally, it supports the suggestion of Beck that the expectation of more individual agency takes place at a time when everyday life experiences are characterised by growing exposure to risks beyond individual control.

### **Expected risk taking but lacking control**

Beck's hypotheses of both growing individualisation and the increasing pervasion of everyday life through science are ambivalent processes. The expectation of individual planning and decision making and science providing expert knowledge to make well-informed decisions is not reflected in the reporting as a process of control. Even though scientific knowledge on risk factors increases is provided, media coverage in The New York Times mainly highlights the scandal of being exposed to risk beyond individual control. The data showed that everyday life people characterised by phrases such as women, man or youth are increasingly connected to risk but not as self-confident riskers or risk takers but as groups being exposed to risk or being an 'at-risk' group more generally. This is particularly the case in the health area where scientific studies inform about all kinds of risk factors which accompany common life style choices. At

the same time many health risks are linguistically presented as being beyond individual control such as genetic illnesses.

On a more general level, when we compared the notion of calculated risk with the pure possibility of a risk we found that the notion of control decreased while a probabilistic understanding of risk increased which only refers to all kinds of issues which could go wrong without indicating further knowledge or controllability. Since the analysis based on a limited set of expressions further analysis are necessary to strengthen this result.

### **The increasing salience of at-risk status in risk reporting**

Sociologically the institutionalisation of formalised practices to deal with social problems has produced a formalised, quantified and scientized notion of the social. Criminologists (O’Malley 2004; Garland 2001), social work scholars (Webb 2006) and social policy researchers (Kemshall 2002) among others have highlighted how risk as a technical term has entered professional practice in terms of risk factors identifying risky and at-risk groups or people. Even though it is difficult to find good grammatical evidence for this process we found indications in reporting. A growing mentioning of research related phrases such as evidence, study or researcher, the increasing use of the term ‘risk factor’ and the phrase ‘at-risk’ to describe the vulnerable social groups.

It is an interesting question what it means for a society, social practices and individual identity when people or social groups are increasingly perceived as being defined by probabilistic categories as risky or as part of a group which is identified as an at-risk group. To what extent changes the perception of a group when it is no longer perceived as a proven quality through particular behaviour but an intrinsic quality described to a particular set of factors or even a single indicator. Another layer of social interpretation is covering social reality by rational calculation. It is this kind of rationalised bureaucratic calculation which Max Weber (1948) might have had in mind when speaking about rationalisation and the iron cage of modernisation.

### **Individualisation winners and losers—*risk-takers* versus *at-risk groups***

The process of individualisation after WW2 has been described by Beck and Beck-Gernsheim (2002) as deeply ambivalent, providing new freedoms from traditional norms but at the same time new risks. Scholarly debates have highlighted that opportunities and risks of the individualisation process are unevenly distributed across social groups. As we have seen in our analysis, this seems reflected in the news coverage of The New York Times. Mainly particular groups are presented as vulnerable, being at risk and lacking agency. Powerful people such as politicians or large enterprises are more likely to be presented as riskers or risk-takers. But even when the less powerful are presented as risk-takers, the risks they take are usually much more substantial, such as life/death or serious injury compared to the risks of the powerful which are usually more social such as alienating the electorate or offending representatives of other nations. These results may not surprise considering the topics the NYT reports about and the audience it addresses. What is more interesting is the tendency in reporting that even in a historical relatively short period news coverage has shifted even more towards the division between powerful riskers and powerless vulnerable groups exposed to risks. It would be interesting to examine to what extent this is part of a general tendency in news media coverage or whether it is the result of a social shift which increasingly more addresses vulnerable and ‘at-risk’ groups, e.g. as part of an increasingly more targeted policy approach. If Hacker (2006) is right with his claim of a great risk shift to individuals even in an

already highly individualised policy environment as in the US, the shift in media coverage might reflect this further shift towards an individualised culture.

# Chapter 8

## Limitations and future directions

Broadly, our project synthesised **corpus assisted discourse studies** as a methodology, **systemic functional linguistics** as a theory of language, and **sociological theories about long term social change** as a source to derive hypothesis about risk. Our overarching aim was to combine the theories and methods of these areas to provide an empirical account of the ways in the discourse-semantics of risk have undergone longitudinal change, determining in the process which kinds of methods are suitable for further corpus-driven research into risk.

Methodologically, our study has demonstrated the potential for large annotated corpora from a single source to provide empirical evidence for key claims in sociological literature. Though ours is not the first study of discourse using linguistic corpora, it is novel in two key respects. First, by creating a corpus comprised of annual subcorpora, and by interrogating each subcorpus in turn, we can learn not only about how language is used to communicate risk, but also how risk language has changed longitudinally. Second, our study takes advantage of major developments within computational linguistics/natural language processing. Most obvious is the use of constituency and dependency parsing, but also in this category is the development of an IPython interface for manipulating the corpus and visualising the output of queries. These characteristics both allow far more nuanced kinds of investigation than the practices generally seen in CADS (keywording, collocation, concordancing, etc.), and assist in creating reproducible, transparent, open-source humanities/social science research.

### 1. Limitations of scope

In order to fulfill these aims, we necessarily limited our investigation's scope. The first main issue of scope was our choice of print news data from a single publication. The advantages of this kind of text are many: the NYT is a widely read, well-known, and influential publication. The homogeneity of its language and its consistent structure in many ways facilitate longitudinal and quantitative analysis. The drawback of this kind of data, however, is that we can say little about how risk language works within other kinds of communication. Accordingly, we have made no effort to measure the importance or weight of print journalism against other text types in which risk language occurs, such as film and television, various online media or casual spoken/written conversation.

There were also import constraints imposed both by our chosen theory of language. Though SFL has proven useful as a framework for analysing how language is drawn upon as a resource for making particular kinds of meanings, it is also a theory which has little to say about language and cognition,

for example. This was suitable for our particular investigation, as we cannot possibly determine either the authors' intent behind, nor the readers' interpretations of, the thousands of articles being analysed. Accordingly, we did not attempt to draw links between risk language in the NYT and the ways in which risk is cognitively understood by writers or readers. We suggest that the various strengths of different functional accounts of language can work in tandem, however, and thus welcome future insights from cognitive approaches to risk.

A third and final constraint is our selection of linguistic phenomena for detailed analysis. Primarily, we focus on the experiential and interpersonal dimensions of risk language. The third key component of language is its textual dimension: how language is reflexively organised into meaningful, coherent units. Though our decisions here were guided by the fact that risk as a word does not tend to play important roles in building cohesion and coherence in narratives, we readily admit that more detailed analysis of the role of risk within this dimension may yield important insights that we have not uncovered. Tracking whether risk words shift longitudinally within the textual dimension (between given and new information within a clause, for example) may also be able to show us the extent to which people are acquainted with the notion of risk itself.

## 2. Shortcomings in natural language processing tools

A major issue in our study relates to the performance and epistemological consequences of digital tools used during the investigation. In short, available digital tools may not perform as desired. Parsers remain far from perfect, and innumerable mistakes in parsing are present in our dataset. What was missing in our results as a result of parsing problems or query design likely went unnoticed amongst the streams of text. By the conclusion of the interrogation, millions of clauses had been manipulated, and millions of features extracted and counted. Accordingly, oversights and mistakes are unfortunately bound to remain.

A related issue is that the parser used here—*Stanford CoreNLP*—relies on phrase structure and dependency grammars, rather than systemic functional grammar (for which fewer computational resources are presently available). We were thus left with the task of translating systemic-functional concepts into phrase structure grammar and dependency grammar. This process was often time-consuming and counter-intuitive, laden with currently unsolvable ambiguities, as well as theoretically difficult to reconcile.

The second major issue unearthed during the investigation concerned the size of the dataset, which, aside from being simply computationally intensive, was also so large that it constrained the kinds of analytical methods available to us. With 29 annual subcorpora, as well as three topic subcorpora, we struggled to simultaneously maintain a focus on minute changes in lexicogrammar and to connect change generally to events of interest to sociologists. Indeed, though instantiations of risk words may react to current events, further subdivision of the corpus into weekly/monthly subcorpora proved too unwieldy. A similar investigation could be carried out on one subcorpus alone, divided into weeks or months, in order to better assess the influence of individual events. The richness of the data also prevented direct comparison of more risk fields, with only a basic treatment of health risks given here.

### 3. The limits of lexicogrammatical querying

A major issue we faced during our investigation, and have yet to deal with directly, is the potential for similar discourse-semantic meanings to be made via a number of different kinds of lexicogrammatical arrangements. Consider the following invented examples:

1. They risked their money.
2. Risked money was lost.
3. They risked their savings.
4. The risk of money loss was there.
5. She took her money from her purse and risked it.
6. The money, which they risked, was lost.
7. They had money. They risked it.

Each of these examples communicates the same kind of semantic meaning—that money was risked—but through different grammatical strategies, ranging from the group level (Ex. 1) to the clause-complex (Ex. 7). Our analyses typically dealt with the most common, or *congruent*, kinds of realisations, but at the expense of meanings made incongruently, or above the level of the clause. With great difficulty, we could perhaps construct a query that matches every one of these results, or merge the results of a number of separate queries. As the queries grow in complexity, however, undesirable results may creep in: a query matching *money* in the above cases would also likely match *death* in *They risked death*, despite the fact that one is the risked object and one is the potential harm. Determining the proper functional role in the cases above is very simple for human coders, but the number of results in need of categorisation is often far from trivial. Limited by both the ability of current parsers and by constraints of scope, we found ourselves largely unable to devise methods for accounting for incongruence in risk language during automated querying. As a result, our analysis was restricted for the most part to meanings that were being made in the most probable, normative ways. It is left to future research to determine how to both automatically locate and meaningfully discuss incongruent lexicogrammatical instantiations of similar semantic meanings made in text corpora.

The second major issue is the exact converse scenario: counted together in many our automatic queries are many examples with contradictory semantic meanings. Continuing our example of money loss, consider the following:

1. They would have risked their money.
2. They didn't risk their money.
3. Risking money was a terrible idea, so they didn't do it.
4. Don't risk their money.

In each of these cases, money was not necessarily lost. Lexicogrammatical querying, however, would simply count *money* as the *risked/lost thing*. Though we were careful not to conflate our abstracted results with occurrences of particular events (money loss), we did not attempt to determine whether certain things were more often either hypothetically or really risked. Our approach is not unique in its lack of engagement with incongruent meanings, hypotheticals, and the like: few corpus-based studies of discourse have attempted to distinguish between these meanings automatically. Indeed, querying of these kinds of features could uncover disparities between real and imagined sites of risk in news discourse: do

politicians risk more than everyday people, or do they only *potentially* risk more? Given the extensive work on meanings made by mood and modality systems in English, as well as the accuracy of automatic annotation for these kinds of lexicogrammatical features, we suggest that more constrained studies of mood features of risk could plausibly be undertaken using tools and methods developed here.

Finally, it must also be noted that any study of text corpora necessarily involves removing text from the actuality in which it was produced. Though we can be attuned to the nature of written news journalism, we have not been able to account for meanings made multimodally (through adjacent images, advertisements, etc.). Though perhaps not a critical issue in studies of print news corpora (in comparison to television advertisements, casual conversation, etc.), it is nonetheless important to acknowledge that in some sense we have been studying *text*, rather than *texts*. Synthesis of corpus findings with in-depth analyses of individual articles, or of the influence of the media production process, would no doubt improve our ability to generalise our results. Indeed, future research incorporating these perspectives is planned.

## 4. Research agenda

The tools and methods here could easily be operationalised with new datasets, allowing for research into changes in risk semantics at different points in time, or into regional/multilingual differences. Of course, further studies need not be limited to *risk*: though we limited our analysis to risk words and their co-text, resources such as *The New York Times Annotated Corpus* (Sandhaus, 2008) present the possibility of analysis of any other lexical items and/or grammatical structures. Sociological hypotheses concerning the relationship between risk and close synonyms, such as danger or threat, or between risk and key events, such as terrorism, could be studied with a great deal of specificity with a larger corpus. Such a resource could also serve as a more authoritative reference corpus.

Theoretically, there are far more avenues worthy of exploration: key sociological claims need to be addressed in detail, with sustained description and analysis. As just one example, though the increasing synonymy of risk and threat cannot be accurately measured in a corpus constructed of risk words and their co-text, examination of this link would be readily observable with a different corpus. A number of metrics exist for determining the extent to which two words are interchangeable (functionality provided by both *NLTK* and *Sketch Engine*)—this could be another fruitful method for uncovering shifting discourse-semantics of risk.

Important questions have to be tested regarding the basis of the analysis. Is a newspaper such as the NYT enough to observe broader and long term changes in language? We are currently broadening the empirical basis of our study by adding a variety of US newspapers such as the *Washington Post*, the *Wall Street Journal*, *USA Today*, the *Chicago Tribune* and the *Tampa Bay Times* to our corpus that will multiply the size of our corpus significantly.

An obvious further line of inquiry is the comparison with newspaper coverage of other Anglophone countries such as the UK and Australia to allow examining similarities and differences of linguistic developments in the context of differing institutional and sociocultural contexts. Explorative comparisons of the London Times and the New York Times have already indicated systematic differences in the semantic space (Zinn 2011).

We have only started to link linguistic observations to general societal changes. Much more detailed institutional analyses and impact of particular events on news reporting are now required. We have already seen the impact of single events compared to longer term changes which might follow their own

rational of change. Case studies on single events such as the H5N1 avian flu and its outstanding impact as well as the roots of the long term changes towards the at-risk construct require intense and detailed analyses we are planning to undertake.

## 5. Conclusions

We have both provided empirical support for a number of major sociological hypotheses concerning risk, and demonstrated that novel combinations of interdisciplinary methods can offer new ideas and new kinds of evidence about risk. A number of key findings aligned with theories of institutional individualism, neoliberalism and reflexive modernity, but at the same time, key claims within this body of literature were problematised: while we saw a dramatic increase in the extent to which science and research terms co-occur with risk, we saw little evidence that the science and research were being actively contested within the NYT reporting. This supports the result of other studies that science is still one of the most trusted news sources (Grundmann & Scott 2014; Porter 1995, p.3). Contestation of science might not be easily traceable with our instrument or it might be less common in news coverage. In everyday journalism science writing might be a cost-effective means of generating authoritative news content while controversial scientific debates might be rather the exception linked to particular cases such as climate change or genetic engineering.

Though our study has perhaps raised more questions than it has answered, it has also demonstrated the feasibility of quantitatively and empirically observing key sites of sociological change and offered exciting new avenues for examining how long term social change is connected to institutional changes and significant historical events.

# Notes

1. Efforts are underway to digitise all risk words in 1963 additions, as well as editions from years between 1963 and 1987.
2. As a part of an ongoing Australian Digital Humanities initiative, since the beginning of our analysis, we have been allocated resources for creating and cloud-hosting a much larger corpus. All 1.8 million articles from the *New York Times Annotated Corpus* are currently being turned into an identically structured, though dramatically larger, cloud-hosted corpus. In planned future research, interrogation of this corpus will be used to determine whether trends in the behaviour of risk words were localised to the word itself, or to general stylistic/language change in the *New York Times*. More details on this project are to be presented in Zinn and McDonald, forthcoming.
3. We tried a number of strategies for collecting topic subcorpora, such as exploiting topic modeller and keyword metadata. Ultimately, however, we relied on the hand-classification. A limitation of the selected approach is that—an article collected in the health subcorpus was tagged with ‘Livestock health’, for example. Similarly, article categories may be lacking: Figure 3.1 is tagged only with MENINGITIS, and thus is not included in our health subcorpus. More obviously, 1963 articles had not been classified this way, and thus do not feature in the three topic subcorpora.
4. A key cause of incorrect parsing is non-standard language (perhaps regional, colloquial, etc.). Examples of this kind of language in news publications are interesting in their own right, but due to misannotation, are likely to go unfound during corpus interrogation, and thus unanalysed. In our case, this problem was exacerbated by the fact that time constraints precluded a manual scoring of parser accuracy.
5. The mode dimension, responsible for reflexively organising language into comprehensible sequences, remains largely static between print news micro-genres, though mode features are likely to be at risk when news is transmitted via different media
6. Though role relationships between journalists and their readership have undergone significant shifts (especially since the popularisation of online news), charting these changes falls largely outside the scope of this project.
7. The corpus contained too few modalised risk predicates for analysis of longitudinal change in modalisation.
8. Though we are focussed on corpus-assisted investigation at present, indeed the dataset under investigation is of size and scope as to be of interest to corpus-driven researchers, language and media specialists, etc., and indeed, such projects are forthcoming.
9. Lemmatisation is the process of counting the base forms of tokens, rather than the token itself. *Taken* would be classified under *take*, for example. While lemmatisation is not *always* the best option, as it can collapse different parts of speech, tense information, etc., it is certainly appropriate when determining the most common predicates, etc.
10. We need only to look at the number of lines of code needed to develop an accurate tokeniser and an accurate grammatical structure parser to understand the reasons why lexis appears as the de-facto centre of CL/CADS today
11. Modification through embedded clauses (*the children who were at risk*) has been left out for reasons of scope.
12. 1963 is excluded from analysis here, as poor quality OCR created a number of non-word results such as *risks-wnrk*, *risks.North* and *risks.With*.
13. These are not particularly meaningful distinctions in SFL, as the role of participants depends on the process type. Though process type identification is becoming more and more feasible (see O’Donnell, 2008), at the time of our investigation, we lacked resources to automatically distinguish between process types, and thus relied on borrowed notions of experiential subject- and objecthood.
14. *Take* and *run* are removed from the object column here, as *take risk* and *run risk* are considered risk processes.
15. Further research devoting more time to which examples constitute risk processes and which constitute experiential objects of other processes seems timely.
16. A limitation of frame semantics is its ability to deal with other kinds of risk processes: in *The site posed risks*, *pose* is the experiential subject, but not the actor or risker.
17. Though the filtering out of titles and given names collapses the distinction between Bushes and Clintons, we can still reasonably infer which was being spoken about at which, and doubt can be eliminated by concordancing

18. A key issue in CADS is the ability to systematically account for rank-shifted meanings (See McDonald, Forthcoming).
19. This naturally depends on your definition of a word/token. If we removed hyphenates or tokens containing a slash (*risk/reward*), the list would be dramatically reduced in size. Lemmatisation would compress this list even more.
20. Though SFL practitioners will remind us that nominal does not equal participant, this does not change the importance of the congruent realisation, especially when using very large datasets.
21. Our forthcoming chapter presents this discussion in more depth.
22. Indeed, this is aligned with recent changes to the frame semantic conceptualisation of risk. At the time of writing the FrameNet entry for *run risk* included the following caveat: '*NOTE: This Frame is currently in the process of being changed so that some instances of at risk.n will be moved to the Being\_at\_risk frame, and some will be moved to the Risky\_situation frame. In the Being\_at\_risk frame, risk is almost always supported with at, and its external argument is the Asset*' (see Baker, Fillmore, & Lowe, 1998).
23. Current systems for automatic systemic functional annotation tend to rely on dependencies generated with *Stanford CoreNLP*
24. Newer releases of `corpkit` are oriented more toward dependency than constituency parses.

# References

- Baker, C. F., Fillmore, C. J., & Lowe, J. B. (1998). The Berkeley framenet project. In *Proceedings of the 17th international conference on Computational linguistics-Volume 1* (pp. 86–90). Association for Computational Linguistics. Retrieved 2014-02-04, from <http://dl.acm.org/citation.cfm?id=980860>
- Baker, P. (2004). Querying Keywords Questions of Difference, Frequency, and Sense in Keywords Analysis. *Journal of English Linguistics*, 32(4), 346–359. (00071)
- Baker, P., Gabrielatos, C., Khosravinik, M., Krzy\.zowski, M., McEnery, T., & Wodak, R. (2008). A useful methodological synergy? Combining critical discourse analysis and corpus linguistics to examine discourses of refugees and asylum seekers in the UK press. *Discourse & Society*, 19(3), 273–306.
- Beck, U. (1992). *Risk society: Towards a new modernity*. Sage.
- Beck, U. (2009). *World at risk*. Polity.
- Beck, U., & Beck-Gernsheim, E. (2002). *Individualization*. London: Sage.
- Bernstein, P. L. (1996). *Against the gods: The remarkable story of risk*. Wiley New York.
- Black, J. (2005). The emergence of risk-based regulation and the new public management in the United Kingdom. *Public law*, 2005(Autumn), 512–549.
- Bonß, W. (1995). *Vom Risiko: Unsicherheit und Ungewißheit in der Moderne*. Hamburg Edition.
- boyd, d., & Crawford, K. (2012). Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. *Information, Communication & Society*, 15(5), 662–679. (Cited by 0034)
- Brinton, L. J. (2001). Historical Discourse Analysis. In D. Schiffrin & Tannen (Eds.), *The handbook of discourse analysis* (Vol. 18, pp. 138–160). Malden, MA.: Blackwell Publishing.
- Carabine, J. (2001). Unmarried motherhood 1830-1990: A genealogical analysis. *Discourse as data: A guide for analysis*, 267–310.
- Carson, R. (1994). *Silent Spring*. Cambridge, Mass.: Houghton-Mifflin.
- Chapman, J. (2005). *Comparative media history: an introduction: 1789 to the present*. Polity.
- Chen, K.-J., Huang, C.-R., Chang, L.-P., & Hsu, H.-L. (1996). Sinica corpus: Design methodology for balanced corpora. *Language*, 167, 176.
- Christie, F., & Martin, J. R. (2005). *Genre and Institutions: Social Processes in the Workplace and School*. Continuum.
- Cottle, S. (1998). Ulrich Beck, Risk Society'and the Media A Catastrophic View? *European Journal of Communication*, 13(1), 5–32.
- Danescu-Niculescu-Mizil, C., West, R., Jurafsky, D., Leskovec, J., & Potts, C. (2013). No country for old members: user lifecycle and linguistic change in online communities. In *Proceedings of the 22nd international conference on World Wide Web* (pp. 307–318). International World Wide Web Conferences Steering Committee. (00007)
- Dean, M. (2010). *Governmentality: Power and rule in modern society*. SAGE Publications, Inc.
- Douglas, M. (1986). *Risk acceptability according to the social sciences*. Russell Sage Foundation.
- Douglas, M. (1990). Risk as a forensic resource. *Daedalus*, 1–16.
- Douglas, M. (2013). *Risk and blame*. Routledge.
- Douglas, M., & Wildavsky, A. (1983). *Risk and culture: An essay on the selection of technological and environmental dangers*. Univ of California Press.
- Duguid, A. (2010, November). Newspaper discourse formalisation: a diachronic comparison from keywords. *Corpora*, 5(2), 109–138.

- Eggins, S. (2004). *Introduction to systemic functional linguistics*. Continuum International Publishing Group.
- Eggins, S., & Slade, D. (2004). *Analysing: Casual Conversation*. Equinox Publishing Ltd. (01138)
- Ewald, F. (1991). Insurance and risk. *The Foucault effect: Studies in governmentality*, 197, 202.
- Fillmore, C. J., & Atkins, B. T. (1992). Toward a frame-based lexicon: The semantics of RISK and its neighbors. *Frames, fields, and contrasts: New essays in semantic and lexical organization*, 103.
- Freake, R., & Mary, Q. (2012). A cross-linguistic corpus-assisted discourse study of language ideologies in Canadian newspapers. In *Proceedings of the 2011 Corpus Linguistics Conference*. Birmingham University. Retrieved from <http://www.birmingham.ac.uk/documents/college-artslaw/corpus/conference-archives/2011/Paper-17.pdf> (Cited by 0001)
- Gamson, W. A., & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American journal of sociology*, 1–37.
- Garland, D. (2003). The Risk of Risk. In R. Ericson & A. Doyle (Eds.), *Risk and Morality* (pp. 48–86). Toronto, Buffalo, London: University of Toronto Press.
- Giddens, A. (1990). *The consequences of modernity*. John Wiley & Sons.
- Giddens, A. (2002). *Runaway world: How globalisation is reshaping our lives*. Profile books.
- Grundmann, R., & Scott, M. (2012). Disputed climate science in the media: Do countries matter? *Public Understanding of Science*, 0963662512467732.
- Hacker, J. S. (2006). *The Great Risk Shift: The Assault on American Jobs, Families, Health Care, and Retirement*. New York: Oxford University Press.
- Halliday, M., & Matthiessen, C. (2004). *An Introduction to Functional Grammar*. Routledge.
- Halliday, M. A. K. (1991). Corpus studies and probabilistic grammar. In K. Ajmer & B. Altenberg (Eds.), *English Corpus Linguistics: studies in honour of Jan Svartvik* (pp. 30–43). New York: Longman.
- Hamilton, C., Adolphs, S., & Nerlich, B. (2007, March). The meanings of ‘risk’: a view from corpus linguistics. *Discourse & Society*, 18(2), 163–181. doi: 10.1177/0957926507073374
- Harding, R. (2006). Historical representations of aboriginal people in the Canadian news media. *Discourse & Society*, 17(2), 205–235.
- Hasan, R. (1987). The grammarian’s dream: Lexis as most delicate grammar. In M. A. K. Halliday & R. P. Fawcett (Eds.), *New Developments in Systemic Linguistics* (pp. 184–211). New York: Pinter Publishers.
- Hood, C. (2001). New Public Management. In N. J. Smelser, J. Wright, & P. T. Baltes (Eds.), *International Encyclopedia of the Social & Behavioural Sciences* (pp. 12553–12556). Amsterdam; Oxford: Oxford University Press.
- Hunston, S. (2013). Systemic functional linguistics, corpus linguistics, and the ideology of science. *Text & Talk*, 33, 617. (00000) doi: 10.1515/text-2013-0028
- Jensen, J. D., Scherr, C. L., Brown, N., Jones, C., Christy, K., & Hurley, R. J. (2014). Public estimates of cancer frequency: cancer incidence perceptions mirror distorted media depictions. *Journal of health communication*, 19(5), 609–624.
- Johnson, S., & Suhr, S. (2003). From ‘Political Correctness’ to ‘Politische Korrektheit’: Discourses of ‘PC’ in the German Newspaper, Die Welt. *Discourse and Society*, 14(1), 49–68.
- Kemshall, H. (2002). *Risk, social policy and welfare*. Philadelphia: Open University Press: Buckingham.
- Kitzinger, J. (1999). Researching risk and the media. *Health, Risk & Society*, 1(1), 55–69.
- Kitzinger, J., & Reilly, J. (1997). The Rise and Fall of Risk Reporting Media Coverage of Human Genetics Research, False Memory Syndrome and ‘Mad Cow Disease’. *European Journal of Communication*, 12(3), 319–350.
- Lois, J. (2003). *Heroic efforts: The emotional culture of search and rescue volunteers*. NYU Press.
- Luhmann, N. (1993). *Risk: A Sociological Theory*. New York: Walter de Gruyter.
- Lupton, D., & Tulloch, J. (2002). ‘Life would be pretty dull without risk’: voluntary risk-taking and its pleasures. *Health, risk & society*, 4(2), 113–124.
- Lyng, S. (1990). Edgework: A social psychological analysis of voluntary risk taking. *American journal of sociology*, 851–886.
- Lyng, S. (2005). Edgework and the risk-taking experience. In *Edgework: The sociology of risk-taking* (pp. 3–16).
- Manning, C. D., Surdeanu, M., Bauer, J., Finkel, J., Bethard, S. J., & McClosky, D. (2014). The Stanford CoreNLP Natural Language Processing Toolkit. In *Proceedings of 52nd Annual Meeting*

- of the Association for Computational Linguistics: System Demonstrations* (pp. 55–60). Retrieved from <http://www.aclweb.org/anthology/P/P14/P14-5010>
- Martin, J. R. (1984). Language, register and genre. In F. Christie (Ed.), *Children writing: reader* (Vol. 1, pp. 21–29). Geelong, Victoria, Australia: Deakin University Press.
- Martin, J. R., & White, P. R. R. (2005). *The language of evaluation: appraisal in English*. New York: Palgrave Macmillan.
- Matthiessen, C. (2002). Combining clauses into clause complexes: A multi-faceted view. In J. Bybee & M. Noonan (Eds.), *Complex Sentences in Grammar and Discourse. Essays in honor of Sandra A. Thompson* (pp. 235–319). Amsterdam: Benjamins. Retrieved from [http://books.google.com.au/books?hl=en&lr=&id=\\_CA9AAAAQBAJ&oi=fnd&pg=PA235&dq=%22cline+of+arguability%22&ots=EmVZ29HG-U&sig=06AQs9awRnhT01RSblkLNq2Ac8&redir\\_esc=y#v=onepage&q=%22cline%20of%20arguability%22&f=false](http://books.google.com.au/books?hl=en&lr=&id=_CA9AAAAQBAJ&oi=fnd&pg=PA235&dq=%22cline+of+arguability%22&ots=EmVZ29HG-U&sig=06AQs9awRnhT01RSblkLNq2Ac8&redir_esc=y#v=onepage&q=%22cline%20of%20arguability%22&f=false)
- Matthiessen, C. M. (1995). *Lexicogrammatical cartography: English systems*. International Language Science.
- Matthiessen, C. M. (2013). Applying systemic functional linguistics in healthcare contexts. *Text & Talk*, 33(4-5), 437–466.
- Mautner, G. (2005). Time to get wired: Using web-based corpora in critical discourse analysis. *Discourse & Society*, 16(6), 809–828.
- McCallum, A. K. (2002). *MALLET: A Machine Learning for Language Toolkit*. Retrieved from <http://mallet.cs.umass.edu>
- McKinney, W. (2012). *Python for data analysis: Data wrangling with Pandas, NumPy, and IPython*. O'Reilly Media, Inc.
- Michel, J.-B., Shen, Y. K., Aiden, A. P., Veres, A., Gray, M. K., Pickett, J. P., ... Orwant, J. (2011). Quantitative analysis of culture using millions of digitized books. *science*, 331(6014), 176–182.
- O'Donnell, M. (2008). The UAM CorpusTool: Software for corpus annotation and exploration. In *Proceedings of the XXVI Congreso de AESLA*.
- O'Malley, P. (2012). *Risk, uncertainty and government*. Routledge.
- Partington, A. (2010). Modern Diachronic Corpus-Assisted Discourse Studies (MD-CADS) on UK newspapers: an overview of the project. *Corpora*, 5(2), 83–108.
- Perrow, C. (2011). *Normal accidents: Living with high risk technologies*. Princeton University Press.
- Porter, T. M. (1995). *Trust in numbers: The pursuit of objectivity in science and public life*. Princeton, NJ.: Princeton University Press.
- Power, M. (1999). *The audit society: Rituals of verification*. Oxford: Oxford University Press.
- Power, M. (2004). *The risk management of everything: Rethinking the politics of uncertainty*. London: DEMOS.
- Puerto, S. G. (2012). *SPINDEL Automatic Keyword Generation: Step by Step*. Retrieved from <http://blogs.it.ox.ac.uk/openspires/2012/09/12/spindle-automatic-keyword-generation-step-by-step/>
- Rose, N. (1999). *Powers of freedom: Reframing political thought*. Cambridge: Cambridge University Press.
- Roth, S. (2015). Aid work as edgework—voluntary risk-taking and security in humanitarian assistance, development and human rights work. *Journal of Risk Research*, 18(2), 139–155.
- Sandhaus, E. (2008). *The New York Times Annotated Corpus LDC2008T19*. Linguistic Data Consortium.
- Simon-Vandenbergen, A. M., Ravelli, L., & Taverniers, M. (Eds.). (2003). *Grammatical metaphor : views from systemic functional linguistics* (No. Series IV). Amsterdam: Benjamins Publishing. Co.
- Skolbekken, J.-A. (1995). The risk epidemic in medical journals. *Social Science & Medicine*, 40(3), 291–305.
- Strydom, P. (2002). *Risk, Environment and Society Ongoing Debates, Current Issues and Future Prospects* (Vol. 192). Buckingham: Open University Press.
- Traugott, E. C., & Dasher, R. B. (2001). *Regularity in semantic change* (Vol. 97). Cambridge University Press.
- Weber, M. (1946). Science as a Vocation. In H. H. Gerth & W. C. Mills (Eds.), *Weber, Max: essays in sociology* (pp. 129–156). London: Routledge & Kegan Paul.
- Widdowson, H. G. (2000). On the limitations of linguistics applied. *Applied linguistics*, 21(1), 3–25.

- Widdowson, H. G. (2008). *Text, Context, Pretext: Critical Issues in Discourse Analysis* (Vol. 12). Wiley. com.
- Zinn, J. O., & Taylor-Gooby, P. (2006). Risk as an interdisciplinary research area. In P. Taylor-Gooby & J. O. Zinn (Eds.), *Risk in Social Science* (pp. 20–53). Oxford: Oxford University Press.