Polluted online information? Surfing Italian websites dealing with the topic of waste and health

2011 Environ. Res. Lett. 6 044019

(http://iopscience.iop.org/1748-9326/6/4/044019)

Environ. Res. Lett. **6** (2011) 044019 (7pp) doi:10.1088/1748-9326/6/4/044019

Polluted online information? Surfing Italian websites dealing with the topic of waste and health

G Orizio[1], M K Locatelli[2], L Caimi[3] and U Gelatti[1]

[1] Section of Hygiene Epidemiology and Public Health, Department of Experimental and Applied Medicine, University of Brescia, Viale Europa 11, 25123 Brescia, Italy
[2] Department of Medical Prevention, Local Health Authority of Bergamo, Cremona, Italy
[3] 'Quality and Technology Assessment, Governance and Communication Strategies in Health Systems' Study and Research Centre, University of Brescia, Viale Europa 11, 25123 Brescia, Italy

E-mail: gelatti@med.unibs.it

Received 17 June 2011
Accepted for publication 2 November 2011
Published 23 November 2011
Online at stacks.iop.org/ERL/6/044019

Abstract
In the field of health communication, a particularly critical issue is communication to the public of environmental risks, especially on topics for which there is still a high degree of scientific uncertainty regarding risk estimates. One such topic is undoubtedly the impact of waste on people's health. The aim of this study was to evaluate the presence and characteristics of Italian websites dealing with the topic of waste and health. The keywords 'waste' and 'health' were entered in 2010 in the three most commonly used search engines, and the first five pages were analysed. The selected websites were coded according to the content analysis method. For websites of interest we evaluated the 'page rank'. Out of the 150 occurrences analysed, the number of websites found to deal with this subject was only 19, four of which were of an institutional nature. The majority of websites gave a message of increased health risk associated with the three kinds of waste disposal tackled. As regards visibility, only one of the four institutional websites maintained its position on the first page of the three search engines. We found that institutional health websites have low visibility, despite extensive media coverage of waste and health issues in Italy as a result of the Naples case, which was debated globally. This indicates that public health institutions' web strategies are basically unable to meet people's health information requirements, which could strengthen rival health information providers.

Keywords: internet, public health, health communication, risk perception, waste, pollution, environment

1. Introduction

There is an ancient motto in Italy that goes: 'see Naples and then die', which should mean that Naples is such an amazing city that after you have seen it nothing else is worth doing. But more recently the global media have put out a new (more or less implicit and more or less correct) message: 'live in Naples and then die', meaning that the city and the surrounding area have reached such a high level of pollution due to the irresponsible waste disposal behaviour that the health of the people who live there has been put at serious risk.

In the field of health communication, a particularly critical issue is communication to the public of environmental risks, especially regarding topics for which it is difficult to obtain scientific evidence of risk estimates, and there is still a high degree of uncertainty. One of these topics is undoubtedly the impact of waste on people's health, as waste production is increasing and different methods of disposal are currently

used, such as landfills and incinerators, and—in a context like Naples—even rubbish piled up along the streets.

When it comes to tackling the emotional element included in risk perception by the general public, scientists usually refer to the concept of 'perceived risk'. Is perception reality? Without losing ourselves in ontological speculations, we can agree about the fact that people's behaviours are influenced by perceived risks, and this perception is a complex process which can lead to conclusions often very far from the scientific evidence characterized by a quantitative approach (Elliot *et al* 1999, Slovic 1987). Furthermore, it has been suggested that the 'quantitative approach to risk assessment fails to take into account the wider health and social implications associated to any particular situation, which go beyond any statistical interpretation of unwanted events and the economical acceptability of consequences' (Stewart *et al* 2010).

Taking for granted the importance of risk perception in understanding the needs and expectations of a population exposed to a local environmental hazard, it is valuable to understand how this perception is shaped and by whom. Information on the presumed environmental and health risks is transmitted via numerous channels, ranging from media reports, public meetings with institutional representatives, communications from scientific groups, to familiar and peer groups (Bianco *et al* 2008). With the dissemination and increase of internet use, websites have become a convenient and quick method of research, often replacing paper-based literature research. In both the US and Europe it has been shown that health themes are among the most searched-for on the web (Andreassen *et al* 2007, Hesse *et al* 2005, 2010). However, the existence of a large number of websites that deal with this topic, because of the vast amounts of information being made available, can create confusion for the user and difficulty in gathering the desired data.

In order to evaluate one of the channels that is likely to shape risk perception regarding the effect of waste on health, we evaluated the presence of websites in Italian dealing with the topic using three search engines. We pretended to be an ordinary Internet user interested in the matter, who would be likely to use the keywords 'waste' and 'health'. We analysed the pertinent websites found and assessed their visibility in the page rank.

2. Methods

The study involved two stages: website selection and website coding.

2.1. Website selection

The keywords 'waste and health' ('Rifiuti e Salute' in Italian) were entered in the most commonly used search engines, Google©, Yahoo© and Bing© (Seoconsultants 2010), and the first five pages (50 top websites for each search engine, as a page usually contains 10 occurrences) were analysed, giving a total of 150 occurrences. This triple website search was carried out on 27th July 2010 and the results were stored immediately. We included in the sample the occurrences that led us to websites dealing with the theme of waste and its relations with health issues. We took into account only 'proper websites', excluding documents such as pdf, newspaper articles, videos, conference leaflets, and online discussion places such as forums and blogs, which do not have the structure of a defined website where the contents are fairly fixed, even if continually updated.

2.2. Website coding

The selected websites were then coded according to the content analysis method (Riffe *et al* 2005), elaborating an ad hoc Codebook—a checklist of items to investigate. In designing the Codebook, significant elements that emerged from previous studies (Eysenbach *et al* 2002, Minerva 2005) and attributes concerning website user orientation were taken into account. The Codebook consisted of 36 items divided into four sections, focusing on different contents.

(1) General information: name, web address, extension, geographical location (if declared), associated institution, sponsorships, links to commercial stakeholders, direct selling area, 'contact us' area.
(2) Technical characteristics: accessibility tools, including the presence of a site map and internal search engine, date of last update, access counter, suggestion box for website improvement, and quality certifications (presence and type).
(3) Web 2.0 tools: presence of a health-related forum, use of FEED RSS, availability of an advisory service, possibility to report specific situations.
(4) Information about the contents related to waste and health: presence on the home page, issues tackled (general, general about the environment, only waste-related, case studies, waste-disposal-related only, health effects of waste disposal, waste recycling, environmental sustainability, environmental policies), coverage of 'incinerator' or 'landfill' or 'rubbish pile' issues and presence of a risk assessment regarding each type of waste disposal; specifically we classified the provided information in messages of 'zero risk' if it was stated that type of waste disposal does not have any impact on human health, of 'uncertain risk' if it was reported that there is no clear evidence about the possible impact on health of that waste disposal, and of 'certain risk' if a message was given of a risk to human health associated with that form of waste disposal. In addition, we evaluated the presence of bibliographic references supporting the information provided, type of bibliographic references, availability of downloadable material, and type of available material.

2.3. Page rank analysis

For websites of interest we also evaluated the 'page rank', namely the position of the page itself in the search results, in order to assess user visibility of these websites.

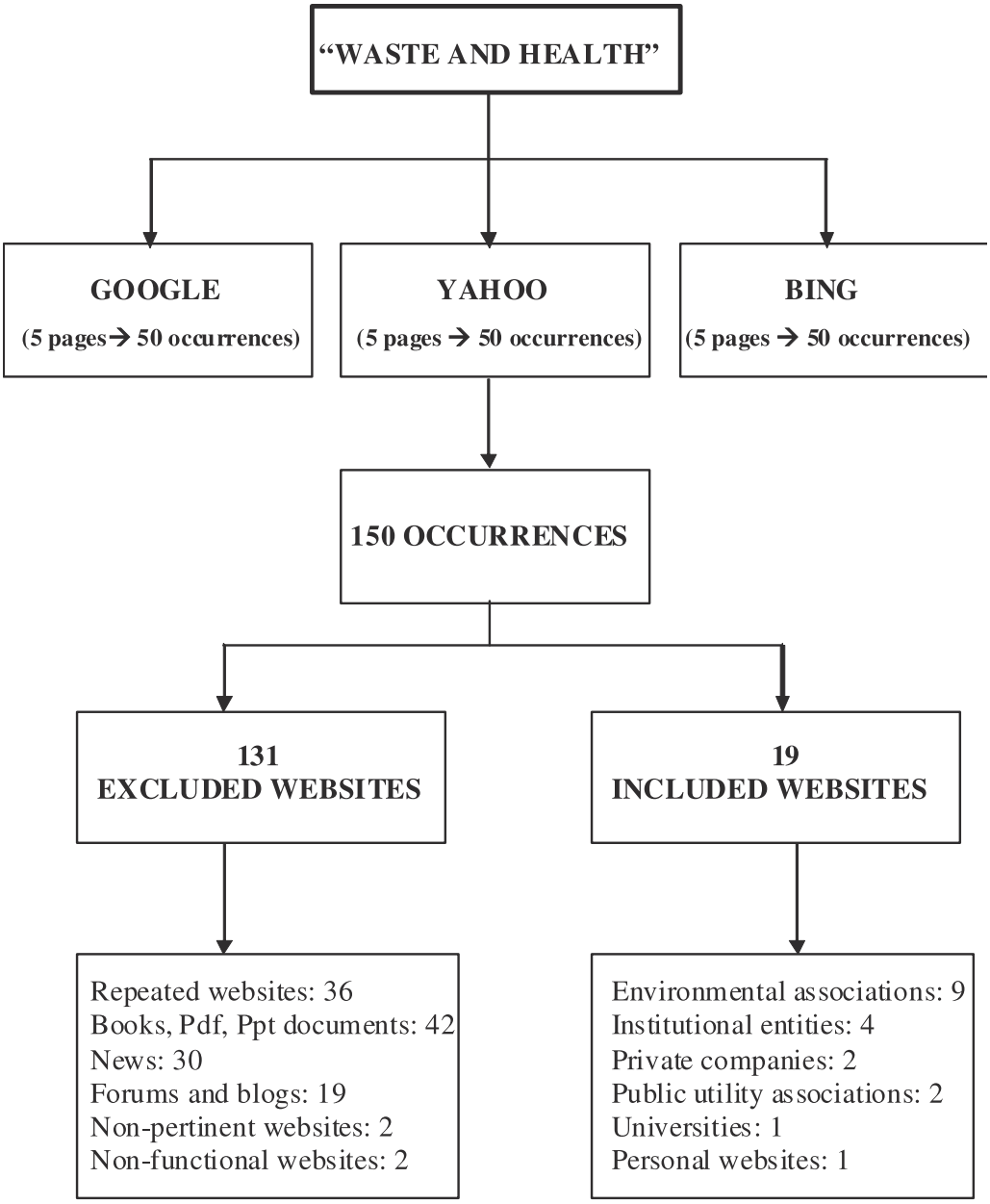

Figure 1. Website selection algorithm; included and excluded occurrences.

3. Results

3.1. Website selection

Out of the 150 occurrences analysed, the number of websites found to deal with this subject was only 19.

3.2. Website coding

(1) General information: in the sample, the most numerous websites belonged to: environmental associations (9), institutional entities (4) and private companies (2) (figure 1). The geographical location of 13 websites was identified, the most frequent (4) being the Campania region, where Naples is situated. Only 3 websites were clearly sponsored, and the same number had links to commercial stakeholders. Two websites had a direct selling area, while almost all (17) had a 'contact us' section.

(2) Technical characteristics: the majority of our sample (17) had a site map, 12 had an internal search engine and the same number declared the date of the last update. About a quarter of the sample had an access counter (5), only one website had a suggestion box and none had a quality certificate.

(3) Web 2.0 tools: a minority of the websites used Web 2.0 tools, such as FEED RSS (7) and had a forum/blog area (4). Only one offered an advisory service, and one had an area for reporting specific situations.

(4) Contents regarding 'waste and health': we found that the majority of websites tackled the topic of interest on the

home page (14), the rest on internal pages. The most frequently dealt with issues were: waste-related only (13), general about environment (12), waste-disposal-related only (7), health effects of waste disposal (7), specific case studies about waste (5), general information (5), environmental sustainability (5), environmental policies (4), waste recycling (2). The group of websites belonging to environmental associations was the only category of websites that tackled all the listed issues.

We were interested in evaluating what kind of message was being transmitted regarding the consequences of different types of waste disposal; the majority of websites gave a message of increased health risk associated with the three types of waste disposal tackled: rubbish piles (5 out of 7 tackling the issue), landfills (7 out of 8 tackling the issue) and incinerators (8 out of 9 tackling the issue). A message of 'no risk' was expressed only by the institutional websites for each of the three types of waste disposal, while only the university website gave a message of 'uncertain risk'.

Information was backed up by a precise scientific reference in 4 websites, an incomplete citation was given in 5 (making it difficult to find the document mentioned) and 10 websites gave information with no references. The 4 specific scientific references were displayed by: one environmental association website, one public utility website, one university website and one institutional website. These citations consisted of national or international publications (2), documents issued by government institutions (1), newspaper or news magazine articles, interviews or news (1).

Downloadable material was available on 12 websites, more specifically, from the most to the less frequent: informative/popular material, documents/scientific publications, law and regulatory contents.

3.3. Page rank

As regards visibility, 7 websites in our sample appeared among the first 10 occurrences (first page) of at least one of the three search engines used. Only one of these 7 websites, which is an institutional website, maintained its position on the first page of the three search engines; the remaining 6 websites appeared only once on the first page of the three search engines.

A quarter of the sample (5 websites) were found in the three search engines (though with very different page ranks), 4 websites were displayed by two search engines and the majority (10) came out in one search engine only, and not on the first page.

We were particularly interested in the position of institutional websites. Only the website of the Italian National Centres for Prevention and Disease Control (Centro di Controllo delle Malattie, CCM) was present and maintained its position on the first page of the three search engines. Of the three remaining institutional websites, those of two Italian Regional Environmental Protection Agencies (Arpa Emilia Romagna and Friuli Venezia Giulia) only appeared in Yahoo, in 14th and 42nd positions, respectively, whereas the Italian Government website, despite appearing in all three engines, was located in 11th and 15th place using Bing and Yahoo, and 40th using Google.

Websites of environmental associations found on the first pages of the three search engines adopted a polemical tone, speaking out against the treatment of waste by means of incinerators and landfills.

4. Discussion

4.1. Main results

The relation between waste and health is a 'hot' media subject, as waste management is a debated issue all over the world, and it is a cause of considerable concern in the populations. Perceived risk is the complex result of a composite process, and since the internet is one of the most widely used sources of information, even in the field of health-related issues, we were interested in analysing websites dealing with this topic, as a probable party involved in the perception process.

We obtained very interesting results in a situation such as that in Italy, where there is huge media exposure on the topic of waste and health due to the Naples case, which was debated globally. In synthesis, we saw that the minority of websites found used Web 2.0 tools; the majority of websites dealing with this subject put out a message of increased risk associated with the three types of waste disposal, even in a situation of high scientific uncertainty; half of the websites providing information on the health consequences of waste disposal gave no linked references, and a quarter of the samples gave incomplete citations. Regarding page rank, different search engines gave very variable results. Last but not least, the presence and the visibility of institutional websites appeared to be very low.

4.2. The internet as a health information provider and the intrinsic limitations of the study

These results raise intriguing considerations from a public health perspective about the nature of the internet as an information provider. Firstly, we wish to highlight the paradox that although the web gives access to a virtually unlimited amount of information, users generally consult only a very small amount when using a search engine, usually just the first 10 results (first page), or possibly the first 20–30 results (second and third page) in certain cases. Indeed, the research showed that a large percentage of users do not go beyond the first page, and that the public has a low tolerance of going in depth through what is retrieved (Spink *et al* 2001). The risk is obtaining only a very partial image of what is 'out there', strongly influenced by the page rank algorithms, the mechanisms and logic of which are often unknown to the general population, who may think that the first-ranked websites are the best, rather than the most clicked ones or even the sponsored ones. Our results showed a huge variability among occurrences on different search engines: what can be found depends greatly on which search engine is used, and it may well vary from day to day.

However, although the study has the intrinsic limitation of capturing a picture of what is available on the web at one

specific time only, we can rely on the fact that page rank algorithms are supposed to list the most clicked websites first, and therefore show what one is more likely to find (Wikipedia 2011). When analysing the presence and content of online information in every field, the continually changing nature of the internet becomes an obstacle; collecting data using search engines is a common method, due to fact that this is the way people were found to access online information when they do not have a specific reference to go and look at (Rieh 2004). It is important to point out that we did not aim to give a representative sample of Italian websites on the subject (because it is very difficult to claim representativeness due to the nature of the internet). Rather, we were interested in finding out how much information and what kind of information would be accessed by a person with no particular skills on the subject, who would perform the simplest search on 'waste and health', putting the two keywords in the three most frequently used search engines.

Another limitation of the study is the method of selection, both regarding keywords and type of web content. The choice of keywords in this type of research is always arbitrary. Our aim was to identify the simplest combination in order to see the number of pertinent results and their quality, which is why we decided to use 'waste and health' as keywords—which synthesized our topic. We performed one query only, as the literature has shown that people tend to perform one query in their information seeking strategy (Spink *et al* 2001). Regarding type of web content, we decided to focus on websites as they are the only ones to identify a specific structure, should have a responsible entity running them, cite other sources and interact with users. On the contrary, pdf/ppt files and documents in general do not have these characteristics, while blogs and forums call for a specific and different method of content analysis, and are not comparable to 'classic' websites.

The third limitation is the fact that no shared codebook for analysing this issue exists: in order to build an effective tool, we used the content analysis method, adapting it to the specific study issue and to the online context (Riffe *et al* 2005). As mentioned in section 2, we also considered significant elements emerging from previous studies (Eysenbach *et al* 2002, Minerva 2005).

However, several considerations (detailed below) can be made in interpreting these results in terms of the effect of online information on risk perception and on the role of government institutions, although confirmation of their validity requires further studies to be performed to assess any changes in the quantity and quality of online information on waste and health, are necessary using different combinations of keywords.

4.3. The active role of the internet user and consequences in terms of risk perception

It is also important to consider the internet's specific feature of requiring the user to play an active role, which is comparable only to a librarian's bibliographic search, though much easier and more accessible. It could be said that the internet is often the information end-point of all the other information channels: when a user becomes interested in a certain topic thanks to information obtained passively via mass media, the web is by far the easiest way of finding out more about that particular subject. Passive information could therefore be a trigger to go and search actively for further information. In this process, online information could be crucial in forming opinions, as it is specifically looked for. To our knowledge, no studies have investigated particularly the role of the internet as a factor in environmental health risk perception shaping. A recent systematic review of the effectiveness of communication strategies for environmental health risk found only one study that used the web as a method of risk communication (Fitzpatrick-Lewis *et al* 2010, Atlas 2007). That review also investigated factors that impact communication uptake; regarding 'trust in sources of information', they concluded that people often turned to the media (internet included) ahead of other sources, including public officers.

The role of mass media in risk perception is still very much under debate (Freudenburg 1996, Walberg and Sjoberg 2000). In our opinion, being a mass medium so different from the traditional ones, as brilliantly discussed by Morris and Ogan back in 1996, the internet adds to the complexity of this process. We do not wish to enter into the current debate over the adequateness of the different models proposed in explaining risk perception. It is difficult, however, to claim that information available online contributes nothing to risk perception, whatever model we take into consideration, whether it be the 'psychometric paradigm', which associates individual and social mechanisms with risk perception (Fischoff *et al* 1978, Slovic 1987), the 'cultural theory', which states that individuals tend to tackle risks in a way that expresses and reinforces their lifestyle (Douglas and Wildavsky 1982), or the theory proposed by Sjoberg, which poses risk sensitivity, attitude and fear as key factors in risk perception (2000). Unfortunately, few studies have investigated the role of the internet in risk perception, and even then they have mainly tackled the issue in the context of online purchase-behaviour rather than health (Ha 2002).

Due to the influence of risk perception on the effectiveness of communication strategies for environmental health risks (Renn 2004), it would be very useful to investigate more deeply the role of the internet as a factor in the processes that lead to risk perception. More specifically, considering the fact that the internet is the final, actively searched source of information, and it is also a place for discussing certain/these topics, its relevance in risk perception building is likely to be significant.

4.4. Health information sources, the internet, and the role of government institutions

As far as our case study is concerned, these results suggest that if someone in Italy built up his knowledge on this theme using the internet as his only source of information, he would mainly log on to non-government websites, whereas government websites are meant to be committed to ensuring the accuracy and reliability of the topics dealt with. This could have an impact in terms of risk perception, because it could

enable providers other than health authorities to contribute to perception building. Risk perception patterns, the complexity of which has been discussed, are probably rendered even more complex by the internet factor, and need to be governed by means of this tool as well. Parties other than governments could have two main types of effect on risk perception, both in a positive and negative way. In a positive way they could raise awareness of neglected or under-considered health issues and urge the authorities to tackle them. On the other hand there is the risk of raising groundless fears and increasing unfounded worries, forcing the authorities to invest unnecessary resources. In particular, the internet represents a virtual space where groundless information can be published for sensationalism, just to increase the visibility of the website itself. The internet is the place where 'plot theories' abound. It is interesting to note that in our search only institutional websites gave a message of no risk and only universities of one uncertain risk, while all the others reported a real risk. Especially in situations where there is a lack of scientific evidence on health effects (e.g. risk factors or substances), messages are more likely to be distorted. A communication strategy by health institutions based on transparency, clarity and openness—despite some uncertainty—is recommended in order to meet the population's information needs. In our case study, with regard to communication and perception, the public could compare the different messages (institutions declaring 'no risk', universities 'uncertain risk' and all the others a real risk) and think that institutions are neglecting the issue, or—worse still—be hiding something.

We could reflect here about where the public health stakeholders are in this context. The low visibility found could be considered an important indicator of the fact that the institutions are unable to meet people's needs in terms of communication on public health issues. These results appear fairly consistent with other investigations, which have revealed a substantial immaturity of the web strategies of both Italian hospitals and public health authorities in interacting with the public about health themes (Maifredi *et al* 2010, Orizio *et al* 2010). One important consequence of not meeting citizens' health information needs is that this is going to strengthen rival health information providers. In addition, the strong association between distrust of professional and regulatory bodies and inadequate and inappropriate communication was shown by a UK analysis of ten case studies on the public perception of environmental health risks (Stewart *et al* 2010). Acquiring authoritativeness is a long process that calls for a strong effort by institutions in terms of communication strategies and interaction with the public. We may wonder how far the institutional work and research activities performed by the Italian public health agencies/bodies have become a part of people's knowledge, rather than remaining within small circles of experts; and if this happens, how useful this work is in terms of adequately understanding and tackling public anxiety and anger, and ultimately in terms of people's wellbeing.

5. Conclusions

Our results show that an average person who has built up his knowledge of health effects of waste online is likely to base this knowledge mainly on non-government websites. So risk perception could be built on messages not supported by the latest scientific advances, leading to the possibility of an over-estimate of the risks and hence distrust of public health organizations. This case study provides evidence which is shared but often forgotten by our institutions: in a public health perspective it is not enough to manage a situation efficiently, it is necessary to communicate clearly how it has been handled to meet people's needs (Nicholson 2000). Taking communication aspects into consideration, especially in a society that increasingly uses the internet for communication purposes, is no longer an option: communication is part of management, but achievement of this milestone still appears to be a long way off, even in a developed country such as Italy.

References

Andreassen H K, Bujnowska-Fedak M M, Chronaki C E, Dumitru R C, Pudule I, Santana S, Voss H and Wynn R 2007 European citizens' use of E-health services: a study of seven countries *BMC Public Health* **10** 7–53

Atlas M 2007 TRI to communicate: public knowledge of the federal toxics release inventory *Soc. Sci. Q.* **88** 555–72

Bianco A, Nobile C G, Gnisci F and Pavia M 2008 Knowledge and perceptions of the health effects of environmental hazards in the general population in Italy *Int. J. Hyg. Environ. Health* **211** 412–9

Douglas M and Wildavsky A 1982 *Risk and Culture* (Berkeley, CA: University of California Press)

Elliot S J, Cole D C, Krueger P, Voorberg N and Wakefield S 1999 The power of perception: health risk attributed to air pollution in an urban industrial neighbourhood *Risk Anal.* **19** 621–34

Eysenbach G, Powell J, Kuss O and Sa E R 2002 Empirical studies assessing the quality of health information for consumers on the world wide web: a systematic review *JAMA* **287** 2691–700

Fischoff B, Slovic P, Lichtenstein S, Read S and Combs B 1978 How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits *Policy Sci.* **9** 127–52

Fitzpatrick-Lewis D, Yost J, Ciliska D and Krishnaratne S 2010 Communication about environmental health risks: a systematic review *Environ. Health.* **9** 67

Freudenburg W R 1996 Media coverage of hazard events: analysing the assumptions *Risk Anal.* **16** 31–42

Ha H-Y 2002 The effects of consumer risk perception on pre-purchase information in online auctions: brand, word-of-mouth, and customized information *J. Comput.-Mediat. Commun.* **8** (available at http://jcmc.indiana.edu/vol8/issue1/ha.html)

Hesse B W, Moser R P and Rutten L J 2010 Surveys of physicians and electronic health information *NEJM* **362** 859–60

Hesse B W, Nelson D E, Kreps G L, Croyle R T, Arora N K, Rimer B K and Viswanath K 2005 Trust and sources of health information: the impact of the internet and its implications for health care providers: findings from the first Health Information National Trends Survey *Arch. Int. Med.* **165** 2618–24

Maifredi G, Orizio G, Bressanelli M, Domenighini S, Gasparotti C, Perini E, Caimi L, Schulz P J and Gelatti U 2010 The Italian hospitals in the web: a cross-sectional analysis of the official websites *BMC Med. Inf. Decis. Mak.* **10** 17

Minerva working group 5 2005 *Quality Principles for Cultural Websites: A Handbook* (www.minervaeurope.org/publications/qualitycommentary/qualitycommentary050314final.pdf)

Morris M and Ogan C 1996 The internet as a mass medium *J. Commun.* **46** 39–50

Nicholson P J 2000 Communicating occupational and environmental issues *Occup. Med. (Lond.)* **50** 226–30

Orizio G, Rubinelli S, Nava E, Domenighini S, Caimi L and Gelatti U 2010 The internet and health promotion: a content analysis of the official websites of Italian public health authorities *J. Med. Person* **8** 121–7

Renn O 2004 Perception of risks *Toxicol. Lett.* **149** 405–13

Rieh S Y 2004 On the web at home: information seeking and web searching in the home environment *J. Am. Soc. Inf. Sci. Technol.* **55** 743–53

Riffe D, Lacy S and Fico F G 2005 Analyzing media messages *Using Quantitative Content Analysis in Research* (Mahwah, NJ: Lawrence Erlbaum)

Seoconsultants.com 2010 *Top Ten Search Engines* (www.seoconsultants.com/search-engines/ accessed 2010-06-14)

Sjoberg L 2000 Factors in risk perception *Risk Anal.* **20** 1

Slovic P 1987 Perception of risk *Science* **236** 280–5

Spink A, Wolfram D, Jansen M B J and Saracevi T 2001 Searching the web: The public and their queries *J. Am. Soc. Inform. Sci. Technol.* **52** 226–34

Stewart A G, Luria P, Reid J, Lyons M and Jarvis R 2010 Real or illusory? Case studies on the public perception of environmental health risks in the north west of England *Int. J. Environ. Res. Public Health* **7** 1153–73

Walberg A and Sjoberg L 2000 Risk perception and the media. A review of research on media influence on public risk perception *J. Risk Res.* **3** 31–50

Wikipedia 2011 *PageRank* (http://en.wikipedia.org/wiki/PageRank accessed 2011-01-05)