Providing consultancy and research in health economics for the NHS, pharmaceutical and health care industries since 1986

NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

Overview of Systematic Reviews Exploring Complex Risk Communication

Final Report

MARIA CIKALO, Research Associate
ANITA FITZGERALD, Senior Consultant
SAM BROWN, Consultant
MARY EDWARDS, Research Assistant
JULIE GLANVILLE. Associate Director

JUNE 2014

THE UNIVERSITY of York

INVESTORS IN PEOPLE

Contents

Abbreviations

AHRQ	Agency for Healthcare Research and Quality
AMSTAR	Tool for assessing the methodological quality of systematic reviews
ARR	Absolute risk reduction
CI	Confidence interval
CDSR	Cochrane Database of Systematic Reviews
DARE	Database of Abstracts of Reviews of Effects
ES	Effect size
NICE	National Institute for Health and Care Excellence
NNT	Number needed to treat
NR	Not reported
OECD	Organisation for Economic Co-operation and Development
PHAC	Public Health Advisory Committee
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RCT	Randomised controlled trial
RRR	Relative risk reduction
SMD	Standardised mean difference
USPTF	U.S. Preventive Services Task Force
YHEC	York Health Economics Consortium

Glossary

Unless otherwise specified, the definitions have been developed by the overview authors.

Absolute risk reduction
The difference in size of risk between two groups. For example, if one group has a 15% risk of contracting a particular disease, and the other has a 10% risk of getting the disease, the risk difference is five percentage points.
(Source: http://www.cochrane.org/glossary/5#term85)

Academic detailing
Academic detailing is service-oriented outreach education for health care professionals. It leverages the communication approach of pharmaceutical industry detailers, combined with the evidence-based; non-commercial aims of academic groups, research and development centres. The term "academic detailing" reflects this hybrid concept. (Source: http://www.alosafoundation.org/academic-detailing/what-is-academic-detailing/)

Active Dissemination
This is communication designed to "(1) increase the reach of information (e.g., postal and electronic mail; electronic/digital, social, and mass media); (2) increase people's *motivation* to use and apply evidence (e.g., using champions, opinion/thought leaders, peer and social networks); and (3) increase people's *ability* to use and apply evidence (e.g., by packaging information so that the factors likely to affect adoption are easy to find or provided "how to" information that bridged the adoption to implementation divide by providing additional resources or information; or by skills-building efforts)". (1)

Attribute framing
Attribute framing is the positive versus negative description of a specific attribute of a single item or a state. For example, "the chance of survival with cancer is 2/3" versus "the chance of mortality with cancer is 1/3". (2)

Complex risk
Risk is complex if there are conflicting messages regarding risk, such as the beneficial and harmful effects of sun exposure.

Directness
"Degree to which the evidence either directly links the interventions to the outcome of interest or directly makes the comparison of interest". (1)

Dissemination
Dissemination of health-related information is the active and targeted distribution of information or interventions via determined channels using planned strategies to a specific public health or clinical practice audience. (1)

Framing the message
"Communication that conveys the same messages in alternative ways (e.g., emphasizing either what is gained or what is lost by taking an action or making a choice)". (1)

Goal framing
Goal framing is the depiction of the consequences of performing or not performing an act as a gain versus a loss. For example, "if you undergo screening for cancer, your survival will be prolonged" versus "if you don't undergo screening for cancer, your survival will be shortened". (2)

Heightening risk appraisal
Attempts to promote relevant behavioural change by heightening an individual's awareness of a potential threat and their sense of vulnerability to harm should they fail to act. (3)

Net benefit
"The balance of benefits and harms at a population level". (1)

Number needed to treat
It is an estimate of how many people need to receive a treatment before one more person would experience a specified outcome. (Source: adapted from "Number needed to treat to harm" from http://www.cochrane.org/glossary/5#term85)

Periodic Prompts
Periodic prompts, defined as messages, reminders, or brief feedback communicated to participants multiple times over the duration of an intervention. (4)

Precision
Degree of random error surrounding an effect estimate with respect to a given outcome.

Relative risk reduction
The proportional reduction in risk in one treatment group compared to another. It is one minus the risk ratio. If the risk ratio is 0.25, then the relative risk reduction is 1-0.25=0.75, or 75%. (Source: http://www.cochrane.org/glossary/5#term85)

Tailoring the message
"Communication designed for an individual based on information from the individual". (1)

Targeting the message to audience segments
"Communication designed for subgroups based on group membership or characteristics such as age, sex, race, cultural background, language, and other "psychographic" characteristics (e.g., a person's attitudes about a particular subject matter)". (1)

Using narratives
“Communication delivered in the form of a story, testimonial, or entertainment education” (1)

Executive Summary

1. INTRODUCTION

The National Institute for Health and Care Excellence (NICE) Centre for Public Health (CPH) has contracted York Health Economics Consortium (YHEC) and the University of Leeds' Nutritional Epidemiology Group (NEG) to produce three evidence reviews, a documentary analysis and an economic model of interventions that present and disseminate the health risks and benefits of ultraviolet radiation (UV) to the general public. As part of this work NICE has commissioned this pragmatic, non-exhaustive, high level summary of the findings of selected systematic reviews which have explored the effectiveness of (complex) risk communication and/or the framing of health messages in the context of a range of health-related situations.

2. METHODS

This pragmatic rapid overview of reviews aimed to summarise the findings of systematic reviews exploring complex risk communication (i.e. conflicting messages regarding risk, such as the beneficial and harmful effects of sun exposure), in relation to the following question:

- What are the most effective and cost-effective ways of presenting and disseminating complex health risk information to help people assess their own level of health benefits and health risks?

The Cochrane Library and Medline were searched to identify systematic reviews. Fourteen experts in the fields of risk communication or the communication of health messages were contacted to obtain recommendations for relevant reviews.

The reviews identified were summarised. The quality of the review methods was assessed using the AMSTAR checklist. Reviews that adequately reported 8 of the eleven possible AMSTAR criteria were assumed to be high quality reviews (designated ++). Those adequately reporting between 5 and 7 criteria were considered to be of moderate quality (designated +), and reviews reporting four or fewer criteria adequately were considered to be of poor quality (designated -).

Assessing the quality of the studies within individual systematic reviews was not possible within the available resources, so pragmatic evidence statements were prepared based on the quantity and consistency of studies reported in the reviews, as follows:

- **Weak evidence:** one study.
- **Moderate evidence:** two or three studies with consistent results.
- **Strong evidence:** more than three studies with consistent results.
- **Inconsistent evidence:** more than one study where the results do not agree.

Evidence summaries were developed combining the AMSTAR quality assessment of the review and the pragmatic assessment of the strength of the evidence.

3. RESULTS

Ten systematic reviews (reported in eight documents) were selected for this rapid review. None of the included reviews aimed to investigate strategies to communicate complex risk such as the cconflicting messages regarding risk around the beneficial and harmful effects of sun exposure. Instead, the reviews focused on approaches to risk communication in general.

3.1 Strategies to Communicate Risk Messages

Seven of the ten systematic reviews assessing strategies to communicate risk messages were identified. Most included randomised controlled trials (RCTs) and, to a lesser extent, other study designs such as quasi-RCTs, cluster RCTs, randomised designs, and cross-over studies. Overlap between the primary studies included in the systematic reviews was not investigated. Few reviews investigated the same strategies: framing messages (three reviews), targeting messages to specific audiences (one review), tailoring messages to the individual (two reviews), periodic prompts (one review), and heightening risk appraisal (one review). The included systematic reviews were of moderate-to-poor methodological quality; three were assessed as being of moderate quality, meeting more than half of the 11 AMSTAR criteria. All of the included reviews suffered from failures in the reporting of their methods.

1. Evidence statement: Framed messages for risk communication

There is evidence from three moderate systematic reviews on the effectiveness of framed messages for conveying risk information where framing was either based on the positive versus negative description of a specific attribute of the risk being communicated (attribute framing) or the depiction of the consequences of compliance or noncompliance as a gain versus a loss (goal framing).[1, 2, 3] There is moderate evidence that positively framed risk messages led to a more positive perception of effectiveness (pooled standardised mean difference (SMD) 0.36, 95% CI: -0.13, 0.85; small effect size). There is inconsistent evidence for a difference in effect between positively and negatively framed messages on individuals' understanding of the risk message or the persuasiveness of the message.[1] There is inconsistent evidence that framing messages as gains or losses have an impact in terms of perception, persuasiveness or behaviour, although there may be publication bias in favour of loss messages for behaviour.. Evidence from one moderate review [2] found inconsistent evidence that loss-framed messages in conjunction with either narratives or a non-targeted approach were more persuasive than gain-framed messages in increasing breast cancer screening and promoting flu vaccination. A third moderate review found inconsistent evidence of the effects on patients' understanding of providing risk information for prostate cancer screening framed in comparison to information about other beneficial services.[3]

[1] Akl *et al.*, 2011a (+)
[2] McCormack *et al.*, 2013a (+)
[3] McCormack *et al.*, 2013c (+)

2. Evidence statement: Targeted messages for risk communication

There is inconsistent evidence from one moderate systematic review on the effectiveness of targeted messages (aimed at particular groups) compared to tailored messages (personalised to individual circumstances) to promote activities such as screening and changes in dietary behaviours.[1]

[1] McCormack *et al.*, 2013 (+)

3. Evidence statement: Tailored messages for risk communication

There is strong evidence from two poor systematic reviews that tailored messages are effective in improving health behaviour.[1,2] One poor review found tailored interventions provided online resulted in improvements to health behaviour outcomes (40 studies; weighted mean effect size (ES), d=0.139, 95% CI: 0.111, 0.166, p<0.001)[1]. The second poor review reported positive effects of face-to-face tailored messages targeting different types of behavioural change in all included studies, albeit to varying degrees and with varying duration of effects (6 studies; pooled ES 0.49, 95% CI: 0.02, 0.657, p=0.042)[2].

[1] Lustria *et al.*, 2013 (-)
[2] Wanyonyi *et al.*, 2011 (-)

4. Evidence statement: Periodic prompts for risk communication

There is inconsistent evidence from one poor quality systematic review about the effectiveness of periodic prompts in communicating regular messages about healthy behaviour.[1] The review reported results selectively.

[1] Fry 2009 (-)

5. Evidence statement: Heightening awareness of potential threats and harm implications

There is strong evidence from one poor systematic review that heightening one risk element in a message had small to moderate effects on intentions (217 tests; overall sample-weighted effect size, d_+, was 0.31, 95% CI: 0.26, 0.35) and subsequent behaviour (93 tests; d_+ 0.23, 95% CI: 0.17, 0.29).[1] There was strong evidence that heightening awareness of potential threats and harm implications (heightening risk appraisals) were effective in promoting intentions to wear protective clothing against sunlight exposure and use sun protection (d_+= 0.53 and 0.42 respectively) and had an impact on behaviours related to sun protection (d_+= 0.40). For sun protection, risk appraisal interventions had broadly similar effects on intentions and behaviour. Heightening risk appraisals had more consistent effects on intentions than on behaviour.[1]

[1] Sheeran 2014 (-)

3.2 Approaches to Disseminating Health Information

One systematic review focused on evidence dissemination to clinicians, patients, or both clinicians and patients. This review included RCTs and cluster RCTs that evaluated approaches used to increase reach to audiences, increase motivation to use and apply such information, and increase ability to use and apply evidence, across a wide range of health-related or clinical problems. Although the review was of moderate quality, the methods were not always reported fully.

6. Evidence statement: Dissemination of health information to clinicians

There is strong evidence from one moderate systematic review that 'ability' strategies (computer-assisted learning, textbooks and academic detailing) are no more effective than 'reach' strategies (delivering guidelines by mail or computer) in affecting clinicians' adherence or compliance with guidelines[1]. There is moderate evidence that multicomponent approaches using a combination of reach, ability and motivation (such as interpersonal telephone counselling) strategies are more effective in changing clinician behaviour, particularly guideline adherence, than a single strategy alone[1].

[1] McCormack *et al.*, 2013 (+)

7. Evidence statement: Dissemination of health information to patients

There is inconsistent evidence from one moderate systematic review to determine the benefit of 'ability' strategies (such as 'how to' guides), 'reach' strategies (such as mailed leaflets or DVDs), 'motivation' strategies (such as interpersonal telephone counselling) or 'multicomponent' approaches (involving the three previous strategies) for achieving health-related decisions and behaviours by patients, changing patients' clinical outcomes or changing patient knowledge [1].

[1] McCormack *et al.*, 2013 (+)

8. Evidence statement: Dissemination of health information to clinicians and patients

There is inconsistent evidence from one moderate systematic review to determine the benefit of 'ability' strategies (such as 'how to' guides), 'reach' strategies (such as mailed leaflets or DVDs), 'motivation' strategies (such as interpersonal telephone counselling) or 'multicomponent' approaches (involving the three previous strategies) targeted at both clinicians and patients in terms of health-related decisions and behaviours and clinical outcomes[1].

[1]McCormack *et al.,* 2013 (+)

3.3 Formats for Presenting and Explaining Risk Information

Three systematic reviews assessing the reporting and presentation of risk information were identified. Two of these reviews included randomised controlled trials (RCTs) and quasi-RCTs, and, to a lesser extent, other study designs such as cluster RCTs, non-randomised trials and cross-over studies; the third review included research articles reported in a journal or book, or presented at a conference. Overlap between the primary studies included in the systematic reviews was not investigated. One moderate quality review examined different statistical formats for presenting a risk and risk reductions. One moderate quality review focused on numeric, non-numeric and visual methods for communicating uncertainty in risk messages. The third, poor quality review attempted to formulate recommendations on presenting probability information about risks in the following formats: frequencies, percentages, base rates and proportions, absolute and relative risk reduction, cumulative probabilities, verbal probability information, numerical versus verbal probability information, graphs, and risk ladders.

9. Evidence statement: Presenting risk information in words

There is weak evidence from one moderate and one poor systematic review that presenting evidence about a risk or the benefit of an intervention, compared with not presenting the explanatory evidence, resulted in patients making a more appropriate healthcare choice.[1, 2]. There is inconsistent evidence from one poor review about the best way to provide probability information to patients, with the review suggesting that the probabilities of risk within a specific context should be conveyed to ensure the probability is interpreted as correctly as possible [2].

[1] McCormack *et al.*, 2013 (+)
[2] Visschers *et al.*, 2009 (-)

10. Evidence statement: Alternative numeric presentations of risk information

There is inconsistent evidence from one poor and one moderate systematic review exploring the formats that people receiving risk information prefer[1, 2] One moderate review reported inconsistent evidence of impact on perceived risk when the degree of precision of the estimate of risk was shown in different ways (numeric, text, graphical)[1]. A poor review of patient preferences reported inconsistent evidence, but suggested that risk messages should use several presentation formats, and that graphs are more likely to highlight probability of harm than numerical information, except for pie charts[2].

[1] McCormack *et al.*, 2013 (+)
[2] Visschers *et al.*, 2009 (-)

11 Evidence statement: Visual presentation of risk information

There is inconsistent evidence from one poor and one moderate systematic review on the effect of different graphical representations of risk information[1,2] One moderate review of one study found no significant difference in risk perception when 95% CIs were shown on two types of bar graph[1]. There was inconsistent evidence from one poor review on the impact on people's understanding of varying graph type, content and layout, due to the variety of materials tested and the mixed results obtained[2].

[1] McCormack *et al.*, 2013 (+)
[2] Visschers *et al.*, 2009 (-)

12 Evidence statement: Statistical presentations of risks

There is strong evidence from one moderate systematic review assessing alternative ways of expressing risk that natural frequencies are probably better understood than probabilities for the presentation of risk (pooled SMD[1] was 0.69 (95% CI: 0.45, 0.93))[1]. There is moderate evidence from a poor review that reporting probability information using the same denominator throughout the risk message (to facilitate comparison) and outlining (step-by-step) a probability calculation to aid understanding of risky scenarios, such as those that include false-positive results, would aid understanding[2].

[1] Akl *et al.*, 2011b (+)
[2] Visschers *et al.*, 2009 (-)

13 Evidence statement: Statistical presentations of risk reductions

There is strong evidence from one moderate and one poor systematic review that risk reductions expressed as a relative risk reduction (RRR) may be perceived to be larger than the same risk presented as both an absolute risk reduction or as a number-needed-to-treat, and this presentation is more likely to persuade people to adopt certain behaviours[1, 2].

[1] Akl *et al.*, 2011b (+)
[2] Visschers *et al.*, 2009 (-)

14 Evidence statement: Statistical presentation of cumulative probabilities

There is inconsistent evidence from one poor systematic review on the impact on perceived risk and understanding of presenting cumulative probabilities in risk communication[1].

[1] Visschers *et al.*, 2009 (-)

4. DISCUSSION

Ten systematic reviews were identified: five were of poor methodological quality and five were of moderate quality. None of these reviews specifically addressed complex risk communication, focusing instead on risk communication in health generally.

Of the strategies used to convey risk messages, only the use of tailored messages was identified as a potentially effective strategy for improving health behaviour outcomes. The overall impact of framed messages, targeted messages, periodic prompts and heightening risk awareness was less clear but was not considered to be detrimental. The use of a combination of reach, ability or motivation strategies to disseminate health information to clinicians alone was suggested to have a positive influence on clinician behaviour. A range of numeric, non-numeric, visual and statistical formats were thought to impact upon people's interpretation of risk information, but evidence was inconsistent. Relative risk reductions were suggested to be more persuasive in terms of achieving the adoption of certain

[1] Standardized mean differences (SMDs) were interpreted in the review using the following rules suggested by the Cochrane Handbook: <0.40 represents a small effect size; 0.40 to 0.70 represents a moderate effect size; >0.70 represents a large effect size.

behaviours, since they were considered to be larger than risks presented as an absolute risk reduction or number-needed-to-treat.

The included reviews highlighted the paucity of studies assessing the effectiveness of different approaches to communicating, disseminating and presenting risk information, and suggested that better quality and better reported studies should be conducted in real-life settings. Some authors reported that there was a need to conduct more direct comparisons that focus on specific intervention components rather than entire programmes, to enable meaningful comparisons of different strategies, and to assess more relevant outcomes using objective and validated outcome measures. Given the pragmatic nature of this overview and the quality of the included reviews, any findings from this overview of systematic reviews should be considered as indicative only.

Section 1: Introduction

The National Institute for Health and Care Excellence (NICE) Centre for Public Health (CPH) has contracted York Health Economics Consortium (YHEC) and the University of Leeds' Nutritional Epidemiology Group (NEG) to produce three evidence reviews, a documentary analysis and an economic model of interventions that present and disseminate the health risks and benefits of ultraviolet radiation (UV) to the general public. This is the report of the rapid overview of systematic reviews exploring complex risk communication.

1.1 BACKGROUND

Exposure to UV radiation carries with it both positive and negative consequences for human health. Too much UV radiation is associated with an increase in the risk of developing a range of negative health conditions including, most notably, skin cancers, eye conditions including cataracts, and immunosuppression (5). Exposure to too little UV radiation can lead to health problems related to inadequate vitamin D, an essential nutrient required to help maintain calcium and phosphate levels in the body and to maintain healthy bone and skeletal growth. Furthermore, there is increasing recognition that vitamin D may have an important role to play in human health and poor vitamin D status has been linked with a range of chronic diseases such as cancers and cardiovascular disease (CVD) as well as markers of cardiometabolic health including obesity and type 2 diabetes mellitus (6).

In the UK, attempts to proactively communicate the risks associated with too much or too little UV exposure have been made through various media. Sun protection messages have been advanced through the mass media (7), through workplace leaflets produced by the Health and Safety Executive (8), through checklists for school children and teachers produced by charitable organisations, and through the direct advice of health practitioners working in the NHS and local authorities, amongst others (9).

These interventions have employed a variety of techniques. Appearance-based interventions use imagery of the damaging effects of UV exposure to try to change attitudes and behaviours towards UV protection (10). Behavioural counselling techniques involve directly communicating UV protection messages through a number of channels. These include primary care interactions, self-guided booklets and 30 minute peer counselling sessions.

The overall efficacy of attempts to communicate the risks of UV exposure is unclear. While there is evidence that the awareness of the risks has increased, so has the incidence of skin cancer (10). This has been explained through the 'knowledge-behaviour gap' (11) whereby individuals are aware of the consequences of activities but continue to practise them, which is not fully understood. Conflicting agendas that seek to advise both more sun exposure, in

the case of vitamin D deficiency, and less exposure, in the case of skin cancer avoidance, may have resulted in a confused message (7).

In the UK NICE have published Public Health Guidance 32 (PH32), which sets out the need to communicate the risks related to UV exposure from the perspective of skin cancer risk (9). The guidelines make recommendations for a national mass-media campaign alongside local information provision, and set out who should be involved and how. The guidelines promote an integrated message targeted at high risk population groups that acknowledges and challenges commonly held perceptions around UV exposure. They also acknowledge the need for a balanced message that incorporates an understanding of the health benefits of UV exposure. NICE will also publish guidelines to inform the implementation of existing guidance on the prevention of vitamin D deficiency in June 2014.

To complement these guidelines NICE CPH are developing further guidance on UV exposure focusing on communicating the risks and benefits to the general population. This rapid overview will inform the development of that guidance from the perspective of identifying relevant evidence on effective communication of complex risk or risk for a range of issues, not only sunlight exposure.

1.2 OBJECTIVE OF THE OVERVIEW

The objective of this rapid overview is to prepare a pragmatic non-exhaustive, high level summary of the findings of selected systematic reviews which have explored the effectiveness of complex risk communication, and in the absence of such evidence, risk communication. This overview was undertaken with a clear acknowledgment of the limitations of the approach adopted.

1.3 RESEARCH QUESTIONS

The rapid overview investigated the following question:

- What are the most effective and cost-effective ways of presenting and disseminating complex health risk information or health risk information to help people assess their own level of health benefits and health risks?

Section 2: Methodology

This rapid overview was conducted according to the principles of systematic reviewing in terms of seeking to be systematic but pragmatic, transparent and rigorous within the available resources. The review was guided by a project protocol developed in close collaboration with the NICE Centre for Public Health (CPH). The protocol was developed on the basis of a NICE scope document (12) and contract of work. Together the scoping document and that contract of work specified the research questions, the record selection process, the quality assessment and data extraction process, and the timelines of the project.

2.1 Study Types

Systematic reviews (SRs) were eligible for inclusion in this overview. SRs were defined, for the purposes of this overview, as reviews that have the following characteristics:

- A stated and clear research question;
- A statement of the eligibility criteria which have guided the selection of studies for the systematic review, including a statement about eligible study designs;
- Indications of an extensive search for relevant studies, i.e. searches beyond MEDLINE;
- A description of study selection methods;
- A synthesis of the included studies, either narrative or statistical.

Individual research studies (unless they are the only study identified within a SR), non-systematic reviews and opinion articles were not eligible for inclusion.

2.2 SEARCH STRATEGY

The literature search was conducted in a small number of relevant databases to identify systematic reviews. A focused search of the following resources was undertaken:

- The Cochrane Library, as the best single source of systematic reviews in the Cochrane Database of Systematic Reviews (CDSR), the Database of Abstracts of Reviews of Effects (DARE) and the Health Technology Assessment (HTA) database;
- MEDLINE, for systematic reviews published from 2009 only, to identify recent reviews that might not have been indexed in DARE.

To identify any relevant reviews that might have been missed by the database searches, experts in the field of risk communication or the communication of health messages were also contacted to request additional evidence in the form of relevant SRs.

Given the rapid nature of the overview, a pragmatic approach was adopted which emphasized precision rather than sensitivity. This ensured that the volume of records retrieved was manageable within the resource constraints of the project. Two focused strategies were used to identify a) SRs reporting risk communication strategies (presented in Appendix A) and (b) SRs reporting communication in the context of sun-exposure and other public health topic areas identified by NICE where complex risk messages are conveyed (presented in Appendix A). These public health areas are smoking, alcohol consumption, exercise, and diet.

The MEDLINE strategy used to identify SRs comprised a focused search for generic risk communication terminology and specific communication methods using subject heading and text-word searches, and a sensitive search filter to identify SRs. To ensure adequate precision some search lines that returned a very large number of irrelevant records when searched in the abstract and author keyword fields (such as lines 88 and 92) were limited to title only. The SR filter was adapted from the filter used by the Centre for Reviews and Dissemination to identify reviews for the DARE database. A sensitive filter for reviews was seen as important given the poor reporting of research methods in titles and abstract of published research, and potential inconsistencies in MEDLINE indexing.

The second strategy used to identify records reporting methods of communication in the context of sunlight exposure and other specified health behaviours was designed specifically to cope with the large number of irrelevant records returned by the use of terms around diet and exercise. These terms were, unlike the sunlight search terms, searched for only in the title and by using focused subject headings only. Although this may have resulted in potentially relevant studies being missed, there was insufficient resource to screen the significantly larger volume of records returned by a more sensitive strategy. Moreover, relevant records not identified by this strategy are likely to have been found by the first MEDLINE strategy or by contacting the risk communication experts.

The titles and abstracts of bibliographic records were downloaded and imported into EndNote bibliographic management software and duplicate records were removed using several algorithms.

Fourteen experts in the fields of risk communication or the communication of health messages were identified using the results of the database searches, and exploratory searches using Web of Science (Science Citation Index and Social Science Citation Network) and Google Scholar, to identify authors that were frequently published and/or cited in this context. Experts were contacted by email, and followed up 7 days later with a reminder of the deadline for responses. A short-list of ten systematic reviews identified by the database searches and selected by the reviewers and NICE was provided to the experts, and the experts were asked whether they thought any important reviews had been omitted. Full details of the correspondence with topic experts are provided in Appendix A.

2.3 SELECTION OF ELIGIBLE REVIEWS

One reviewer undertook initial record selection based on the title and abstract and removed the obviously irrelevant records, such as reports of individual trials and reports of ineligible interventions (first pass). The records were then assessed in more detail to identify the studies most relevant to the research question. This process was undertaken in full consultation with NICE who made a number of recommendations.

The suggestions received from experts were then assessed for relevance by a reviewer who, in consultation with NICE, constructed a final list of the 10 studies most relevant to the overview.

The number of systematic reviews identified by the search and experts, and excluded at various stages is reported in the PRISMA study flow diagram (Figure 3.1).

2.4 DATA EXTRACTION AND SUMMARY

The selected systematic reviews were read by one reviewer.
A data extraction template in Excel was developed and the following data were extracted by the reviewer:

- Review identification data;
- Review objectives;
- Number of studies identified;
- Population;
- Key review results;

Where possible the degree of overlap across reviews was assessed, but this was only possible at a very high level due to resource constraints.

The key messages from each review were summarized.

2.5 QUALITY ASSESSMENT

The quality of included SRs was assessed using criteria based on the AMSTAR tool. (4) (Table 2.1). The following text, describing the AMSTAR questions, is largely taken from the AMSTAR website (http://www.amstar.ca). The quality assessment was used to provide an assessment of the risk of bias for each review and was conducted by one reviewer. The full, detailed quality assessments of each included systematic review can be found in Appendix D.

Table 2.1: Review quality assessment checklist (AMSTAR)

Question number	Review question	How is the question addressed in the review?	Grade (yes/no/not clear/N/A)
1	Was an 'a priori' design provided?		
2	Was a comprehensive literature search performed?		
3	Was there duplicate study selection and data extraction?		
4	Was the status of publication (i.e. grey literature) used as an inclusion criterion?		
5	Was a list of studies (included and excluded) provided?		
6	Were the characteristics of the included studies provided?		
7	Was the scientific quality of the included studies assessed and documented?		
8	Was the scientific quality of the included studies used appropriately in formulating conclusions?		
9	Were the methods used to combine the findings of studies appropriate?		
10	Was the likelihood of publication bias assessed?		
11	Was the conflict of interest stated?		

- Q1: This question was graded 'Yes' if an 'a *priori*' design was described where the research question and inclusion criteria were established before the conduct of the review.

- Q2: In this context a 'comprehensive' literature search was considered to mean that at least two electronic sources were searched and the review provided the years and databases used (e.g. Central, EMBASE and MEDLINE). The keywords and/or subject headings (such as Medical Subject Headings (MeSH)) used in the strategies must have been stated and, where feasible, the search strategy must have been provided. We required all searches to be supplemented by additional activities such as consulting current journal contents pages, reviews, textbooks, specialized registers, or experts in the particular field of study, or by reviewing the references in the relevant studies found.

- Q3: Duplicate study selection and data extraction were considered to be adequate when at least two independent reviewers were involved at the study selection and data extraction stages. A consensus procedure for disagreements should have been reported.

- Q4: To be graded 'Yes' review authors should have stated that they searched for reports regardless of their publication type and should have reported whether or not they had excluded any studies (from the systematic review), based on their publication status, language or other features.

- Q5: To be graded 'Yes' a list of included and excluded studies should have been provided.

- Q6: To be graded 'yes' data from the original studies should have been provided on the participants, interventions and outcomes in an aggregated form such as a table. The ranges of characteristics in all of the studies analysed (e.g. age, ethnicity, gender, relevant socioeconomic data, disease status, duration, severity, or other diseases) should have been reported.

- Q7: To be graded 'Yes' the review authors had to have reported a quality assessment of studies.

- Q8: To be graded 'Yes' the results of the assessment of methodological rigour and scientific quality had to have been considered in the analysis and the conclusions of the review, and explicitly stated in formulating recommendations.

- Q9: To be graded 'Yes' the authors had to report adequate detail of the methods used to combine studies.

- Q10: An assessment of publication bias was considered to be ''adequate', if the review included a combination of graphical aids (e.g. funnel plot, other available tests) and/or statistical tests (e.g. Egger regression test), The assessment was graded as 'unclear' if publication bias was not reported and 'inadequate' if publication bias was considered but no graphical aids or statistical tests were used.

- Q11: Conflicts of interest were considered to have been addressed where potential sources of support (such as funding sources) were clearly acknowledged.

Reviews that adequately reported 8 of the eleven possible AMSTAR criteria were assumed to be high quality reviews (designated ++). Those adequately reporting between 5 and 7 criteria were considered to be of moderate quality (designated +), and reviews reporting four or fewer criteria adequately were considered to be of poor quality (designated -). The poorer the quality of the systematic review, the more likely that it has either been very badly reported (raising questions about its conduct and reliability) or it has been exposed to the range of biases that SRs typically seek to minimise and its results may not represent a true estimate of the effect of the interventions it has investigated.

Assessing the quality of the studies within individual SRs was not possible with resources available, so pragmatic evidence statements were developed based on the quantity and consistency of studies. Specific terms were used to describe the strength of the evidence (quantity and consistency). These were defined as follows:

- **Weak evidence:** one study.
- **Moderate evidence:** two or three studies with consistent results.
- **Strong evidence:** more than three studies with consistent results.
- **Inconsistent evidence:** more than one study where the results do not agree.

Evidence summaries were developed combining the AMSTAR quality assessment of the SRs and the pragmatic assessment of the strength of the evidence presented in the SRs.

Section 3: Results

3.1 SEARCH RESULTS

The searches yielded 5690 records, 4870 remained after de-duplication. An experienced information specialist removed 3318 obviously irrelevant records at first pass screening. These included primary studies, narrative reviews, animal studies, and reviews of clinical interventions, diagnostic methods, epidemiology or aetiology.

Of the 1552 studies whose titles and abstracts were screened for relevance by a reviewer, 886 were excluded because they did not fulfil the inclusion criteria (ineligible intervention, outcome, population, or did not fall within eligible dates) and a further 625 were excluded because they did not report on complex risk communication. The remaining 41 reports were retrieved in full text and reviewed for potential inclusion in the overview.

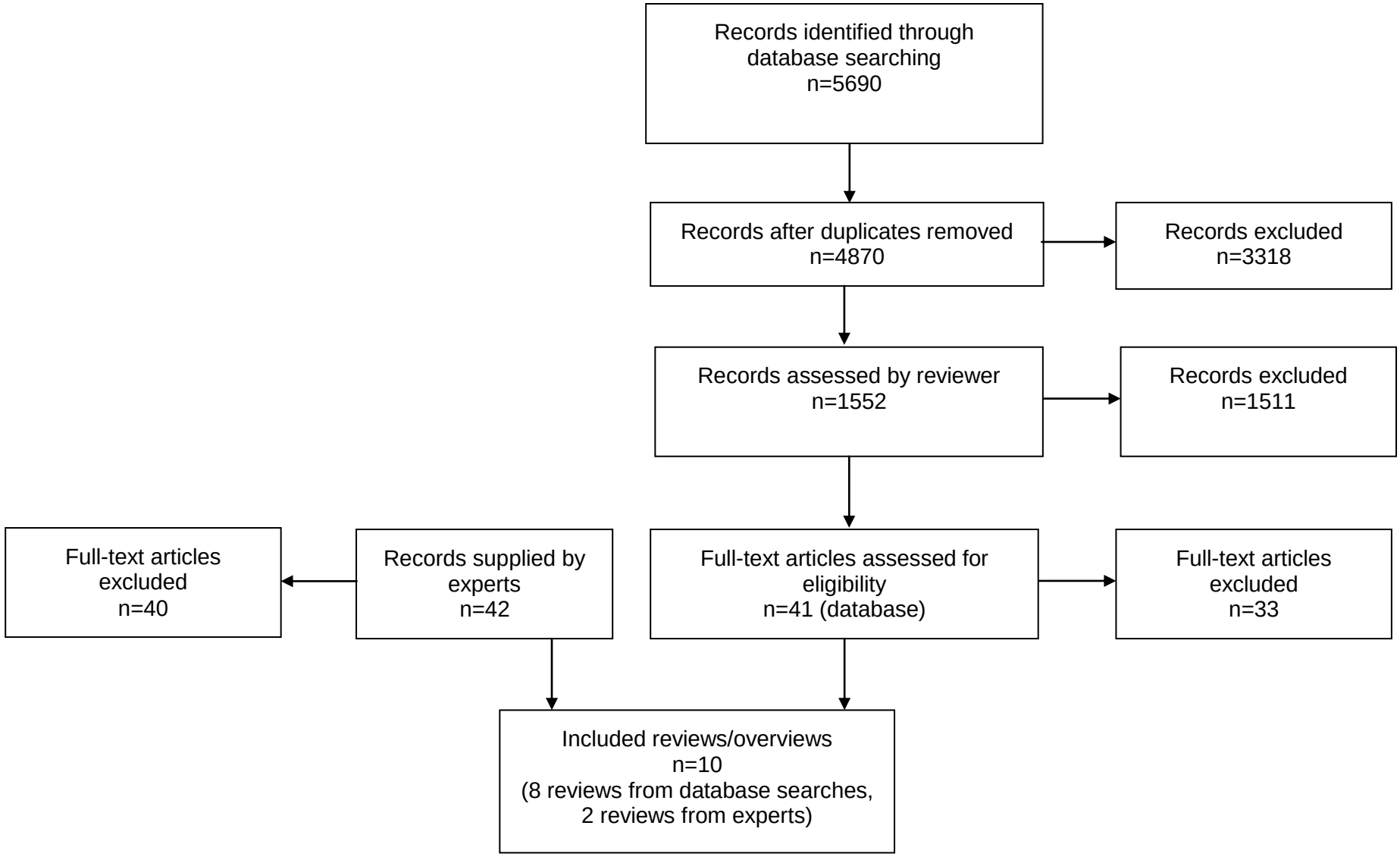
None of the retrieved studies answered the research question, in that they did not report on complex risk communication. In agreement with NICE, the question was broadened to include studies on any risk communication and re-searched the 1552 studies whose titles and abstracts had already been assessed as relevant to identify potential studies for inclusion. Eight studies were agreed by YHEC and NICE for inclusion based on apparent relevance to the communication of risk or complex risk.

14 experts in the field were selected for personal communication, by identifying authors who had multiple publications and also authors suggested by NICE. Thirteen of the 14 experts who were contacted provided a response; these authors suggested an additional 42 studies. Of these 42 studies, nine were assessed to be relevant and met the inclusion criteria for this overview. Two studies were agreed by YHEC and NICE for inclusion.

A total of 10 systematic reviews (reported in 8 documents) contributed to this overview.

Because of resource constraints, practical selection of the ten candidate reviews that would best answer the research question was undertaken by YHEC and agreed by NICE. The excluded studies are listed in Appendix C.

Figure 3.1: PRISMA flow diagram showing the review identification process



3.2 DESCRIPTION OF INCLUDED SYSTEMATIC REVIEWS

Appendix D provides a very brief summary of the included systematic reviews in terms of their risk topic, intervention, comparator, key outcomes, participants, number of included studies and AMSTAR quality rating. The detailed extraction table is also shown in Appendix D.

3.2.1 Studies Included in the Systematic Reviews

Ten systematic reviews were selected for inclusion from the 83 potentially relevant studies identified; three of these (13-15) had been conducted independently (i.e. each had their own research question, search strategy and inclusion/exclusion criteria) but were reported in the same publication, an Agency for Healthcare Research and Quality *(*AHRQ) report with first author McCormack The selected reviews had been published from 2009 to 2014 and included between 6 and 208 primary studies; the majority included fewer than 50 studies. Most systematic reviews included randomised controlled trials (RCTs); some included other study types, one specified experimental designs with a random assignment of participants, and one just specified research articles. Search dates varied widely; some reported searching databases from inception, while others employed more stringent limitations. The upper limit of search dates was between 2007 and 2013 (data not shown).

More than half of the included reviews did not report the country in which their included studies were conducted. For the four reviews that did provide this data, three were from Organisation for Economic Co-operation and Development (OECD) countries only, with the majority conducted in the USA, Canada and Europe (data not shown), whilst the fourth was conducted with studies from the USA and a non-OECD country, Hong Kong.

None of the included reviews aimed to investigate strategies to communicate complex risk (i.e. conflicting messages regarding risk, such as the beneficial and harmful effects of sun exposure), focusing instead on approaches to risk communication in general. The included reviews assessed communication strategies applied under various scenarios including, but not limited to, diagnosis, prevention, screening, treatment and vaccination. The individual included primary studies reported on a wide range of environmental, health/medical, technological and safety risks, and not just public health topics (alcohol consumption, diet, exercise, risky sexual behaviour, smoking and sun exposure).

3.2.2 Interventions

The majority of the ten included SRs explored communication in a range of health contexts including cancer risk presentation, cardiovascular health risk, risk from lack of exercise and smoking, dietary habits, stress, influenza vaccination, alcohol consumption, firearms, substance abuse, and household and outdoor accidents. Details are provided in Appendix D. One review included sunlight exposure as a risk topic. (15)

Of the ten included SRs, seven assessed strategies for communicating health information conveying risk messages, such as framing messages, (2) targeting messages to specific audiences such as specific age groups, racial groups or other characteristics tailoring messages to the individual based on information from the individual (16, 17), periodic prompts (4), and heightening risk appraisal whereby communications seek to promote relevant behavioural change by heightening the individual's awareness of a potential threat (3). One review assessed approaches to disseminate health information to clinicians, patients, and both clinicians and patients Three reviews assessed various formats for presenting and explaining risk information (18), (19).

3.2.3 Types of Participants

Of the ten included reviews, three targeted adults (≥19 years old), specifically patients, the general public and clinicians (13-15). A further two reviews were targeted at health professionals, policy makers and consumers but none of the included studies involved policy makers (2, 18). Two reviews appear to have included the general public (3, 19), one was targeted at patients (17) and another primarily targeted patients or general health consumers (16). One review did not report the types of participants included (4).

Table 3.1: Summary of characteristics of included reviews

Study name	AMSTAR quality grading	Risk topic/ scenario	Intervention	Comparator	Key outcomes	Type of participants	Number of included studies.
Akl 2011a (2)	Moderate	Wide range of disease prevention/health education issues	Positively-framed messages or gain-framed messages of health information.	Negatively-framed messages or loss-framed messages.	Decisions or behaviours.	Health professionals, policy makers and consumers	35
Akl 2011b (18)	Moderate	Diagnosis, prevention, prognosis, screening, treatment and funding.	Statistical presentation of a risk or risk reduction or absolute risk reduction.	Statistical presentation of a risk or risk reduction	Decisions or behaviours.	Health professionals, policy makers and consumers	35
Fry 2009 (4)	Poor	Nutrition, physical activity, weight.	Periodic prompts	Not pre-specified.	Biological or behavioural outcome measures.	Not reported.	19
Lustria 2013 (16)	Poor	Wide range of disease prevention/health education issues	Online health interventions with at least one web-based component and a computer algorithm for tailoring.	Non-tailored interventions.	Health behaviours or clinical outcomes.	Patients or general health consumers.	40
McCormack 2013a (13)	Moderate	A range of preventable diseases.	Strategies to communicate evidence-based information.	Single strategies	Effects on behaviour and outcome	General public (adults) patients and clinicians.	7
McCormack 2013b (14)	Moderate	A range of public health issues.	Active dissemination strategies	Other active dissemination strategies	Health-related decisions and behaviour outcomes, clinical outcomes and knowledge outcomes.	General public (adults), patients, clinicians and pharmacists.	38

Study name	AMSTAR quality grading	Risk topic/ scenario	Intervention	Comparator	Key outcomes	Type of participants	Number of included studies.
McCormack 2013c (15)	Moderate	Cancer	Strategies used to communicate uncertainty about any type of evidence	Strategies used to communicate uncertainty.	Knowledge, perceived risk, accuracy of perceived risk, appropriate choices regarding care.	General public (adults), patients, clinicians and pharmacists.	9
Sheeran 2014 (3)	Poor	Range of disease prevention issues and safety issues.	Interventions (unspecified) that heightened risk appraisal.	Controls (unspecified).	Intention and behaviour.	Adults, students and children.	208.
Visschers 2009 (19)	Poor	Wide range of health-related risks.	Various formats for communicating risk information.	Not reported.	Probability information preferred and the effects of different presentation formats on comprehension, risk perception, and related measures	General public.	Unclear. (approximately 44)
Wanyonyi 2011 (17)	Poor	Range of health-promotion behaviours.	Health education to promote health behaviour change, including tailored messages	Controls.	Change in health behaviour.	Patients.	6

3.3 QUALITY OF INCLUDED SYSTEMATIC REVIEWS

Table 3.2 shows the quality ratings assigned to the included reviews using the AMSTAR quality assessment tool. It should be noted that although the three SRs comprising the AHRQ report achieved identical grades for the quality assessment, they were conducted as independent reviews (and have been considered as such for this overview of reviews) (13-15).

3.3.1 Q1. A Priori Design

For five of the included reviews it was clear that an *a priori* design had been used (i.e. the research question and inclusion criteria had been established before the conduct of the review) as they all referred to protocols, either in the main text or appendices (13-15). In the remaining five reviews it was unclear whether an *a priori* design had been developed; the authors of these five reviews stated their objectives and all or some of their inclusion criteria, but did not specifically refer to a protocol, ethics approval, or pre-determined/*a priori* published research objectives.

3.3.2 Q2. Duplicate Study Selection and Data Extraction

To adequately fulfil this criterion, reviews should have reported the use of at least two independent reviewers at both the study selection and data extraction stages and a consensus procedure for disagreements should have been in place. Two reviews reported duplicate study selection and data extraction (2, 18). The eight remaining reviews did not fully describe their methodology at both the selection and extraction stages and were therefore graded 'unclear'.

3.3.3 Q3. Literature Searches

Eight of the included reviews reported adequate search strategies (2, 3, 16-18). To be considered adequate, searches were required to have been conducted in at least two electronic sources and supplementary searches had to have been undertaken.

Two reviews did not provide clear details of the searches conducted: both reviews stated when they searched the electronic databases, but not specifically the dates or years searched (4, 19).

3.3.4 Q4. Status of Publication Used as an Inclusion Criterion?

To adequately fulfil this criterion, the authors should have stated that they searched for reports regardless of their publication type. The authors should have stated whether they excluded any reports (from the SR), based on their publication status, language or other

feature. Only one review adequately fulfilled this criterion (3). In three reviews it was unclear whether unpublished studies had been included, as supplementary methods used to identify potentially eligible reports may have yielded unpublished articles (2, 18, 19). The remaining six reviews either stated they did not seek grey (i.e. unpublished) literature or restricted inclusion to English language reports only.

3.3.5 Q5. Was a List of Studies (Included and Excluded) Provided?

Only two of the included reviews provided lists of both the included and excluded studies; excluded studies were listed alongside the reason for their exclusion (2, 18).

3.3.6 Q6. Were the Characteristics of the Included Studies Provided?

To be considered adequate, SRs should have provided, in an aggregated form such as a table, data from the original studies on the participants, interventions and outcomes. The ranges of characteristics in all the studies analysed (e.g. age, race, sex, relevant socioeconomic data, disease status, duration, severity, or other diseases) should have been reported. Only three reviews adequately reported the characteristics of the included primary studies One review did not report characteristics of the included studies (3) and the remaining six reviews were considered inadequate, mainly because they did not report ranges of characteristics (2, 4, 16-19).

3.3.7 Q7. Was the Scientific Quality of the Included Studies Assessed and Documented?

Seven of the ten included reviews adequately assessed the quality of their included primary studies. Three reviews assessed the quality of included studies using criteria from the AHRQ "Methods Guide for Effectiveness and Comparative Effectiveness Reviews" alongside questions adapted from the RTI Item Bank[2], the Cochrane Risk of Bias tool and prior work by the U.S. Preventive Services Task Force (USPTF) (13-15) one used the Cochrane Collaboration's risk of bias tool (17), one used a rating system wholly or partially adapted from another review[3] (3, 4) and two did not specifically report the tool used although it was likely to be the Cochrane Risk of Bias tool since they were both Cochrane Reviews (2, 18).

A further two reviews were scored 'unclear' against this criterion, because although they appear to have pre-specified the study design eligible for inclusion, they either did not assess the quality of the included studies or did not summarise or discuss the results of such an assessment (3, 16).

[2] The RTI Item Bank, developed by RTI International, is a series of 29 questions evaluating the risk of bias and precision of observational studies of interventions or exposures.

[3] Fry adapted Revere D & Dunbar P J. review of computer-generated outpatient health behavior interventions: clinical encounters 'in absentia'. J ASm Med Inform Associ 2011;8(1):62-79.

One review did not assess the quality of its included primary studies, although it did grade the quality of the evidence contributing to each of its recommendations (19).

3.3.8 Q8. Was the Scientific Quality of the Included Studies Used Appropriately in Formulating Conclusions?

Having assessed the methodological rigour and scientific quality of included studies, this data should then be considered in the analysis and the conclusions of the review, and explicitly stated in formulating recommendations. None of the included reviews fulfilled this criterion. Six reviews were graded 'unclear' since they referred to methodological issues or quality when discussing recommendations for future research (2,4,13-15,18).

3.3.9 Q9. Were the Methods Used to Combine the Findings of Studies Appropriate?

This criterion refers to the appropriateness of the method chosen to combine primary studies within the SR. Eight of the ten included reviews used appropriate methods to synthesise findings: four reviews conducted meta-analysis following a suitable test for heterogeneity (2, 3, 17, 18) and four reviews reported a narrative synthesis having stated that the heterogeneity of the included studies precluded meta-analysis (4, 13-15). One review found significant heterogeneity between their included studies then pooled the studies inappropriately using a fixed effect model (16). The remaining review described the included studies contributing to each recommendation made, with studies backing the recommendation given prominence (19).

3.3.10 Q10. Was the Likelihood of Publication Bias Assessed?

An assessment of publication bias should include a combination of graphical aids (e.g. funnel plot, other available tests) and/or statistical tests (e.g. Egger regression test). Only three reviews assessed publication bias: two used inverted funnel plots (2, 18) and one calculated fail-safe N values and applied Lipsey and Williams' trim and fill procedure[4] (16).

3.3.11 Q11. Was the Conflict of Interest Stated?

A disclosure of conflicts of interest was considered adequate when potential sources of support were clearly acknowledged in both the SR and the included primary studies. None of the included reviews acknowledged sources of support for both the SR and the individual

[4] L ipsey, M. W., & Wilson, D. B. Practical meta-analysis: Applied social research methods. Thousand Oaks, CA: Sage; 2001.

primary studies, although all but one of the included reviews reported funding for the review alone.

3.3.12 Summary of Methodological Quality

Overall, the quality of the included SRs was moderate to poor; none of the included SRs were of high methodological quality. Lack of reporting was an issue for all included reviews, and every review showed insufficient reporting with at least two criteria reported as unclear. Half of the ten included reviews achieved five to seven of the eleven possible criteria on the AMSTAR checklist and were assessed to be of moderate quality (2, 13-15, 18). The remaining five reviews met three or fewer methodological criteria and were considered to be of poor quality.

None of the reviews adequately reported conflicts of interest.

Table 3.2: Summary of the methodological quality of included studies (assessed using AMSTAR criteria)

Study name	Question 1	Question 2	Question3	Question 4	Question 5	Question 6	Question 7	Question 8	Question 9	Question 10	Question 11	Overall rating[5]
Akl 2011a (2)	Yes	Yes	Yes	Unclear	Yes	Unclear	Yes	Unclear	Yes	Yes	No	Moderate (+)
Akl 2011b (18)	Yes	Yes	Yes	Unclear	Yes	Unclear	Yes	Unclear	Yes	Yes	No	Moderate (+)
Fry 2009 (4)	Unclear	Unclear	Unclear	No	No	Unclear	Yes	Unclear	Yes	No	No	Poor (-)
Lustria 2013 (16)	Unclear	Unclear	Yes	No	No	Unclear	Unclear	No	No	Yes	No	Poor (-)
McCormack 2013a (13)	Yes	Unclear	Yes	No	No	Yes	Yes	Unclear	Yes	No	No	Moderate (+)
McCormack 2013b (14)	Yes	Unclear	Yes	No	No	Yes	Yes	Unclear	Yes	No	No	Moderate (+)
McCormack 2013c (15)	Yes	Unclear	Yes	No	No	Yes	Yes	Unclear	Yes	No	No	Moderate (+)

[5] High quality (++): adequate reporting of eight of the possible eleven AMSTAR criteria;
Moderate quality (+): five to seven AMSTAR criteria were adequately reported;
Low quality (-): four or fewer AMSTAR criteria were adequately reported.

Study name	Question 1	Question 2	Question3	Question 4	Question 5	Question 6	Question 7	Question 8	Question 9	Question 10	Question 11	Overall rating[5]
Sheeran 2014 (3)	Unclear	Unclear	Yes	Yes	No	No	Unclear	No	Yes	No	No	Poor (-)
Visschers 2009 (19)	Unclear	Unclear	Unclear	Unclear	No	Unclear	No	No	Unclear	No	No	Poor (-)
Wanyonyi 2011 (17)	Unclear	Unclear	Yes	No	No	Unclear	Yes	No	Yes	No	No	Poor (-)

3.4 STRATEGIES TO COMMUNICATE RISK MESSAGES

This is an overview of reviews where reported results have been taken from the systematic review publication only; original primary studies have not been revisited. There are differences in the detail provided by the systematic reviews, some reporting more detail data and some reporting less detail. We have reported all instances where the reviews reported effect sizes.

Of the seven reviews reported in this section, three were assessed to be of moderate quality (2, 13, 15) and four were considered to be of poor quality (3, 4, 16, 17).

3.4.1 Framed messages

Three reviews identified studies investigating the impact of framed messages on health information (2, 13, 15), where framing was either based on the positive versus negative description of a specific attribute of the risk being communicated (attribute framing) or the depiction of the consequences of compliance or noncompliance as a gain versus a loss (goal framing). Mixed findings were reported.

The evidence from one moderate quality review of 35 primary studies (reporting 51 comparisons) suggests that attribute and goal framing may have little if any consistent effect on the behaviour of health consumers (2). For attribute framing, positively-framed messages led to a more positive perception of effectiveness than negatively-framed messages in two studies (pooled standardised mean difference (SMD) 0.36, 95% CI: -0.13, 0.85; small effect size[6]), and little or no difference in persuasiveness in 11 studies (pooled SMD 0.07, 95% CI: -0.23, 0.37) and behaviour in one study (SMD 0.09, 95% CI: -0.14, 0.31). However, the patients' understanding was better when the message was framed negatively (1 study, SMD -0.58, 95% CI: -0.94, -0.22; moderate effect size). In terms of goal framing, neither gain nor loss framing led to any difference in perception (8 studies, pooled SMD -0.03, 95% CI: -0.22, 0.16), persuasiveness (14 studies, pooled SMD -0.06, 95% CI: -0.18, 0.06) or behaviour (13 studies, pooled SMD -0.06, 95% CI: -0.15, 0.03), although the authors noted possible publication bias in favour of loss messages for behaviour (2). No study assessed the effect on understanding.

A second moderate quality review (13) identified three studies investigating the persuasiveness of goal-framed messages in adults (19 years and older). In one study of breast cancer screening, loss-framed messages focusing on the possibility of death from not being screened combined with personal narrative stories was more persuasive in the likelihood of women getting a mammogram than gain-framed messages in conjunction with either narratives or statistical information. In the other two studies, the combination of a loss-framed message and non-targeted approach (i.e. a more broad appeal either culturally

[6] Standardized mean differences (SMDs) were interpreted using the following rules suggested by the Cochrane Handbook: <0.40 represents a small effect size; 0.40 to 0.70 represents a moderate effect size; >0.70 represents a large effect size.

or societally) was more persuasive than any other combination of framing and targeting in increasing breast cancer screening and promoting flu vaccination, although for one of the trials the 6-months results were not maintained at 12 months, and the targeting was undertaken on different factors across the trials (13)

The third moderate quality review (15) identified two studies (reporting three trials) examining the effect of presenting net benefit framed in the context of other services with differential net benefit. In one study, a decision aid with prostate cancer information alone was compared with a decision aid with prostate cancer framed in the context of other more beneficial screening services ("in context"). Both approaches increased recipients' knowledge of prostate cancer screening compared with usual care (information on prostate screening presented without other contextual information : (prostate cancer information compared to usual care: +0.9 on a 0–10 scale, $p<0.05$; prostate cancer information in context vs. usual care: +1.5 on a 0–10 scale, $p<0.001$), and slightly increased the proportion actively involved in decision-making (4% $p=0.064$ and 3%, $p=0.045$, respectively, vs. usual care). It was, however, unclear whether the effect differed according to the frame. In the second study (2 trials), where the effects of a highway safety video were compared with the effects of a prostate cancer screening decision aid and coaching tool (framed, in one of the trials, in the context of other more beneficial services), the prostate information frame had no effect on trial outcomes. The pooled results showed that knowledge increased with the prostate cancer screening decision (+34%, 95% CI: 19%, 50%) and 9-month screening rates were reduced (−22%, 95% CI: −38%, −7%), but there were no effects on patient involvement in decision-making (15)

1. Evidence statement: Framed messages for risk communication

There is evidence from three moderate systematic reviews on the effectiveness of framed messages for conveying risk information where framing was either based on the positive versus negative description of a specific attribute of the risk being communicated (attribute framing) or the depiction of the consequences of compliance or noncompliance as a gain versus a loss (goal framing).[1, 2, 3] There is moderate evidence that positively framed risk messages led to a more positive perception of effectiveness (pooled standardised mean difference (SMD) 0.36, 95% CI: -0.13, 0.85; small effect size). There is inconsistent evidence for a difference in effect between positively and negatively framed messages on individuals' understanding of the risk message or the persuasiveness of the message.[1] There is inconsistent evidence that framing messages as gains or losses have an impact in terms of perception, persuasiveness or behaviour, although there may be publication bias in favour of loss messages for behaviour.. Evidence from one moderate review [2] found inconsistent evidence that loss-framed messages in conjunction with either narratives or a non-targeted approach were more persuasive than gain-framed messages in increasing breast cancer screening and promoting flu vaccination. A third moderate review found inconsistent evidence of the effects on patients' understanding of providing risk information for prostate cancer screening framed in comparison to information about other beneficial services.[3]

[1] Akl *et al.*, 2011a (+)
[2] McCormack *et al.*, 2013a (+)
[3] McCormack *et al*. 2013c (+)

3.4.2 Targeted Messages

One moderate quality review identified four primary studies assessing the use of targeted compared with tailored messages in promoting screening or changing dietary and nutritional behaviour (13).

Three trials directly compared the effectiveness of messages targeted directly at specific patient groups against a more personally tailored version of the same approach, but the results were mixed. In one trial, low-income women aged 40 years and older who received letters promoting cancer screening were more likely to schedule a screening within 12 months than women who received a tailored letter based on information about their own personal risk of cancer: 43.9% versus 23.7% for cervical cancer screening and 30.5% versus 13.0% for breast cancer screening. This result, considered unexpected by the study investigators, was attributed to either insufficient tailoring of the message or a 'boomerang effect', where the tailored approach is too alarming. The other two trials found no significant differences between targeted and tailored approaches in changing the dietary behaviour of Latina families or in the uptake of colorectal cancer by participants who were not up-to-date with screening according to guidelines

One trial conducted in U.S. women veterans found no statistically significant differences in screening rates between women who received a letter and information about mammography screening services available through the Veterans Health Administration (targeted group) and women who received the same material but their letter was tailored according to their responses to a baseline survey about screening (targeted plus tailored group). There were also no significant differences between both intervention groups and the control group which received no intervention. The lack of a differential impact was attributed to a possible 'ceiling effect' in the study population since the baseline screening rates were fairly high (about 80%) (13)

2. Evidence statement: Targeted messages for risk communication

There is inconsistent evidence from one systematic review on the effectiveness of targeted messages (aimed at particular groups) compared to tailored messages (personalised to individual circumstances) to promote activities such as screening and changes in dietary behaviours.[1]

[1] McCormack *et al.*, 2013 (+)

3.4.3 Tailored Messages

Two reviews identified studies reporting tailored messages as a strategy for communicating risk information (16, 17).

One poor-quality review identified 40 studies investigating computer-tailored health interventions delivered primarily using the web to patients and general health consumers.(16). Tailored web-based interventions were found to have a significantly greater effect on health behaviour outcomes than non-tailored/control approaches at both the end of

treatment (40 studies; weighted mean effect size (ES), d=0.139, 95% CI: 0.111, 0.166, p<0.001), and over the longer term in those studies that reported follow-up data (21 studies; weighted mean ES, d=0.158, 95% CI: 0.124, 0.192, p<0.001). Subsequent analysis of key moderators on treatment outcomes found no significant difference in the frequency of tailoring assessment (single versus multiple) or in the degree of user control (expert led versus self-guided)(16).

One poor-quality review identified six studies assessing the effectiveness of face-to-face tailored messages in targeting different types of behavioural change (17). The included studies compared either a one-off tailored message (1 study), tailored messages combined with brief clinician advice (3 studies) or tailored messages followed up with additional clinician-patients contacts (2 studies) with unspecified controls. Overall, the studies showed a significant and positive effect of face-to-face tailored messages, although to varying degrees and with varying duration (details not provided by the authors) of effects (6 studies; pooled ES 0.49, 95% CI: 0.02, 0.657, p=0.042) (17).

3. Evidence statement: Tailored messages for risk communication

There is strong evidence from two poor systematic reviews that tailored messages are effective in improving health behaviour.[1,2] One poor review found tailored interventions provided online resulted in improvements to health behaviour outcomes (40 studies; weighted mean effect size (ES), d=0.139, 95% CI: 0.111, 0.166, p<0.001)[1]. The second poor review reported positive effects of face-to-face tailored messages targeting different types of behavioural change in all included studies, albeit to varying degrees and with varying duration of effects (6 studies; pooled ES 0.49, 95% CI: 0.02, 0.657, p=0.042)[2].

[1] Lustria *et al.*, 2013 (-)
[2] Wanyonyi *et al.*, 2011 (-)

3.4.4 Periodic Prompts

One systematic review was identified that assessed the use of periodic prompts in communicating regular messages about behavioural change in health promotion.(4). Periodic prompts were defined as messages, reminders, or brief feedback communicated to participants multiple times over the duration of an intervention. This review also examined how characteristics of the prompts may impact on the effectiveness of interventions, in particular: frequency of delivery, type of medium, multifaceted approaches, personalized prompts, and interaction with prompts.

This poor quality review identified 19 studies, of which 11 reported generally positive results and eight reported mixed results.

One of two studies evaluating the frequency of prompts found statistically significantly increased walking in participants prompted by telephone on a weekly basis compared with prompts every three weeks. Weekly and monthly prompts were delivered by email and/or telephone in the second study, thus conclusions could not be drawn.

Mixed results were obtained in three studies of approaches used to deliver periodic prompts. One study found no significant difference in physical activity level achieved via a booklet with e-mailed reinforcements and a website with e-mailed messages. Another study found significant weight loss in the group receiving telephone prompts compared with those receiving email prompts at 6 months (difference 0.12 kg, $p<0.01$), but no significant different between the two groups at 12 months. The third study was difficult to interpret because of differences in the timing of prompts, but both intervention groups (automated e-mail prompts and monthly telephone prompts) were significantly better than the control group (no prompts) at preventing weight regain through 24 months (data not reported).

The authors commented on the difficulty of evaluating the effectiveness of prompts in multifaceted approaches given that no studies compared prompts combined with additional interventions with prompts alone and given the diversity of the multicomponent programmes.

Fourteen studies described prompts tailored by personal contact with a counsellor or automated online information based on details supplied by participants. Periodic prompts tailored through counsellor contact (9 studies) produced positive results in six studies, particularly when compared over time to groups not receiving personal contact (3 studies). However, groups given personalized periodic prompts were often compared with groups not given any prompts (3 studies), and not all study results were reported in the review.

It was unclear how many studies were identified that measured interaction with prompts (e.g. e-mails opened, log-ins to website). Although five studies found better outcomes were associated with greater interaction with the periodic prompt intervention programme, it is possible that participants who were already motivated to change their behaviour were more inclined to interact with the intervention tools than the other participants.

4. Evidence statement: Periodic prompts for risk communication

There is inconsistent evidence from one poor quality systematic review about the effectiveness of periodic prompts in communicating regular messages about healthy behaviour.[1] The review reported results selectively.

[1] Fry 2009 (-)

3.4.5 Heightening risk appraisal

One systematic review was identified that investigated the impact of heightening individuals' awareness of a potential threat and the harm implications of failure to act on intention and behaviour (3).

This poor quality review meta-analysed experimental evidence from 208 studies (239 independent tests) of messages that heighten elements of risk appraisal: risk perception, anticipatory emotions, anticipated emotions and perceived severity.

Heightening one risk appraisal element had only small-to-medium effects[7] on outcomes across a wide range of risks. Findings showed that heightening one risk element had a significant impact on intention outcomes (217 tests; overall sample-weighted effect size, d_+, was 0.31, 95% CI: 0.26, 0.35) and subsequent behaviour (93 tests; d_+ 0.23, 95% CI: 0.17, 0.29).

Messages that successfully heightened several elements of risk appraisal were found to have larger effects on outcomes than messages that heightened only a single element. The effect of risk perception on outcomes was greater for both intention and behaviour when there was also a significant increase in perceived severity compared to no increase (for intention: d_+= 0.40 (95% CI: 0.26, 0.53) vs 0.29 (95% CI: 0.14, 0.45), p<0.02; for behaviour, d_+= 0.36 (95% CI: 0.26, 0.46) vs 0.16 (95% CI: -0.17, 0.48), p<0.04) and when there was a significant increase in anticipatory emotion compared to no increase (for intention: d_+= 0.40 (95% CI: 0.31, 0.50) vs 0.19 (95% CI: 0.05, 0.34), p<0.001; for behaviour, d_+= 0.22 (95% CI: 0.10, 0.34) vs 0.10 (95% CI: -0.14, 0.35), p<0.04); the number of tests contributing to these analyses was unclear. No other multiples of risk appraisal elements were examined in terms of both intention and behaviour outcomes.

Seventeen studies in the review related to sun protection. Heightening risk appraisals were effective in promoting intentions to wear protective 'gear' (assumed to mean clothing and hats) and use sun protection (d_+= 0.53 and 0.42 respectively) and had an impact on behaviors related to sun protection (d_+= 0.40). For sun protection, risk appraisal interventions had broadly similar effects on intentions and behaviour. Heightening risk appraisals had more consistent effects on intentions than on behaviour.

Boosting coping appraisals such as response efficacy, self-efficacy and response costs had a larger effect on intentions compared with no increase. The lack of studies precluded comparisons of some coping appraisals for both behaviour and intention outcomes. Overall, messages that succeeded in both boosting coping appraisals and heightening risk appraisals had the largest effects on decisions and actions, although observed results were tempered by people's beliefs and confidence in the action.

[7]According to Cohen's (1992) power primer, d_+ 0.20 is a "small" effect, d_+ 0.50 is a "medium" effect, and d_+ 0.80 is a "large" effect.

5. Evidence statement: Heightening awareness of potential threats and harm implications

There is strong evidence from one poor systematic review that heightening one risk element in a message had small to moderate effects on intentions (217 tests; overall sample-weighted effect size, d_+, was 0.31, 95% CI: 0.26, 0.35) and subsequent behaviour (93 tests; d_+ 0.23, 95% CI: 0.17, 0.29).[1] There was strong evidence that heightening awareness of potential threats and harm implications (heightening risk appraisals) were effective in promoting intentions to wear protective clothing against sunlight exposure and use sun protection (d_+= 0.53 and 0.42 respectively) and had an impact on behaviours related to sun protection (d_+= 0.40). For sun protection, risk appraisal interventions had broadly similar effects on intentions and behaviour. Heightening risk appraisals had more consistent effects on intentions than on behaviour.[1]

[1] Sheeran 2014 (-)

3.5 APPROACHES TO DISSEMINATING HEALTH INFORMATION

McCormack defines dissemination of health-related information as "the active and targeted distribution of information or interventions via determined channels using planned strategies to a specific public health or clinical practice audience." (1)

Only one systematic review reported the effectiveness of approaches to disseminate evidence through strategies designed to increase reach, motivation or ability, or strategies that used a multicomponent approach involving one or more of these (14). Increasing the reach of evidence ('reach' strategies) might be achieved through post, e-mail, electronic and digital media, social media and/or mass media. Increasing motivation ('motivation strategies') involves encouraging individuals' motivation to use and apply evidence through approaches such as using champions or thought leaders, or peer and social networks. Finally, 'ability' strategies focus on increasing individuals' ability to use and apply evidence through packaging evidence in specific ways to encourage adoption or providing "how to" information that can facilitate the move from adoption to implementation.

This moderate quality review identified 38 studies that focused on evidence dissemination to clinicians, patients, or both clinicians and patients, across a wide range of health-related or clinical problems, and evaluated its impact on health-related decisions or behaviours, clinical outcomes or knowledge. The review authors noted that for many comparisons there was only a single trial, and that significant tests or confidence intervals were often not reported in cases where there was no direct (i.e. head-to-head) comparison.

3.5.1 Dissemination to Clinicians

Four trials found no significant differences between groups receiving 'reach' strategies (delivering guidelines by mail or computer) and groups receiving 'ability' strategies (computer-assisted learning, textbooks, and individual/group 'academic detailing') in clinicians' adherence or compliance with guidelines. There was only one study each assessing clinical outcomes (no significant differences among groups in guideline

adherence) and knowledge outcomes (significantly higher knowledge and competence scores with the 'ability' strategy option). A 'reach' strategy was also found to be less effective than an approach involving vignette-driven, patient-specific information from an expert panel as part of the guideline message ('motivation' strategy) for decision and behaviour outcomes (14).

Multicomponent strategies that used a combination of reach, ability, or motivation strategies in concurrent combination or in sequence generally appeared to be more effective than a single strategy alone for health-related decisions and behaviour outcomes (1 to 7 studies). No significant differences between groups were found in any of the comparisons reporting clinical outcomes (1 to 3 studies), and inconsistent results were found for knowledge outcomes (multicomponent approach significantly more effective in one study, and no significant differences between groups in another study (14).

6. Evidence statement: Dissemination of health information to clinicians

There is strong evidence from one moderate systematic review that 'ability' strategies (computer-assisted learning, textbooks and academic detailing) are no more effective than 'reach' strategies (delivering guidelines by mail or computer) in affecting clinicians' adherence or compliance with guidelines[1]. There is moderate evidence that multicomponent approaches using a combination of reach, ability and motivation (such as interpersonal telephone counselling) strategies are more effective in changing clinician behaviour, particularly guideline adherence, than a single strategy alone[1]. .

[1] McCormack *et al.*, 2013 (+)

3.5.2 Dissemination to Patients

Twelve studies were identified that assessed the effects of 'reach', 'ability', 'motivation' and multicomponent strategies on patients' health-related decisions and behaviours for various comparisons: different 'reach' strategies (3 studies), 'reach' versus 'motivational' strategies (4 studies), and multicomponent versus 'reach' strategies (4 studies) or 'motivational' strategies (1 study). One study did not report results for 'motivation' strategies versus multicomponent strategies (14).

Inconsistent results were also found in two studies assessing the impact of reach, ability, motivation, or multicomponent approaches in relation to clinical outcomes for patients. One study found no significant difference in health status measures for women with menorrhagia given written and video-based information (reach strategy) and those receiving a preference elicitation interview (motivation strategy). The other trial found that lifestyle advice disseminated through different multicomponent strategies was more effective than the reach strategy (advice only) in affecting blood pressure in patients at risk of hypertension (13).

Five studies examined patient knowledge in comparisons of various dissemination approaches. Results were inconsistent in the three studies assessing different reach

strategies (printed materials and electronic media) aimed at increasing knowledge in prostate screening and infant development, and the single study comparing reach (print materials) versus multicomponent strategies (print materials plus counselling) in terms of risk perception and mammography effectiveness. One study, compared the effect of 'reach' versus 'motivation' strategies on knowledge of treatment options for menorrhagia, but found no significant difference between strategies (study did not report p values or confidence intervals)(14).

7. Evidence statement: Dissemination of health information to patients

There is inconsistent evidence from one moderate systematic review to determine the benefit of 'ability' strategies (such as 'how to' guides), 'reach' strategies (such as mailed leaflets or DVDs), 'motivation' strategies (such as interpersonal telephone counselling) or 'multicomponent' approaches (involving the three previous strategies) for achieving health-related decisions and behaviours by patients, changing patients' clinical outcomes or changing patient knowledge [1].

[1] McCormack *et al.*, 2013 (+)

3.5.3 Dissemination to Clinicians and Patients

Six studies were identified that examined the effect of dissemination approaches targeted at providers (clinicians/physicians) and patients on health-related decisions and behaviour outcomes. There were five studies of single component strategies versus multicomponent approaches, and one study comparing multicomponent strategies. Results were inconsistent, or significance tests and confidence intervals were not reported, for reach strategies that involved dissemination to either a patient or clinicians compared with multicomponent strategies involving both patients and physicians (4 studies). One study found no significant differences between an academic detailing session (one-to-one, often face to face, discussion between a communicator and a clinician on a specific theme) to increase clinician ability and a multicomponent strategy (academic detailing, tools and resources) for both patients and providers. The single study of multicomponent strategies aimed at enhancing colorectal cancer screening did not directly compare the multicomponent arms(educational information and letter to provider, with/without blood test kit), although both were significantly better than the control group (unspecified) (14).

In the only study identified that examined clinical outcomes, a reach strategy (mailed guidelines) was compared with two multicomponent strategies (education and academic detailing with/without motivational counselling) in patients with low back pain. Although no significant differences in functional capacity between groups were observed at either follow-up, significance tests and confidence intervals were not reported (14).

8. Evidence statement: Dissemination of health information to clinicians and patients

There is inconsistent evidence from one moderate systematic review to determine the benefit of 'ability' strategies (such as 'how to' guides), 'reach' strategies (such as mailed leaflets or DVDs), 'motivation' strategies (such as interpersonal telephone counselling) or 'multicomponent' approaches (involving the three previous strategies) targeted at both clinicians and patients in terms of health-related decisions and behaviours and clinical outcomes[1].

[1]McCormack *et al.,* 2013 (+)

3.6 FORMATS FOR PRESENTING AND EXPLAINING RISK INFORMATION

Three systematic reviews were identified that examined the reporting and presentation of risk information (15, 18, 19). Of these, two were assessed to be of moderate quality (15, 18) and one was considered to be of poor quality (19). One review formulated recommendations based on the studies identified[8].(19).

3.6.1 Non-numeric presentation (text/verbal)

Two systematic reviews examined the effect of verbal information on people's understanding and interpretation of information relating to risk of heart attacks and treatment of heartburn (15, 19).

One moderate quality review examined alternative ways to communicate the directness and net benefit of evidence, and overall strength of recommendations(15). Directness is the degree to which the evidence directly links the interventions to the outcome of interest or directly makes the comparison of interest. Net benefit is the presentation of the balance or trade-offs in benefits or harms for prevention or treatment services. Inconsistent results were obtained from studies reviewed. One study compared the effect of providing a factual statement or a factual statement plus non-numeric advice to encourage the use of cholesterol-lowering drugs. These approaches were compared to providing no explanation of the evidence for the drugs. The advice group were told that "Surrogates do not always translate into patient outcomes. Ask for a drug to reduce heart attacks" (direct outcome); the factual statement group were told that "Surrogates do not always translate to patient outcomes" (indirect outcomes). Compared to the control group, who received no explanation about evidence, both the advice and the factual group showed an improved choice of an appropriate cholesterol-lowering drug (1 study; factual statement only compared to no information: +12 percentage points, 95% CI: 7 to18; factual statement plus advice compared to no information: +12 percentage points, 95% CI: 7 to 18). The choice of medication did not differ by the type of instruction.

[8] The cited review formulated a recommendation when at least several studies about several types of risks support it, although not all studies may back the recommendation.

Similar results were obtained in one of two studies communicating net benefit. In one study patients were provided with a factual statement about the evidence for the effectiveness of a heartburn drug or a factual statement of the evidence and advice about what to do. The factual information was designed to encourage patients to use the drugs with a high likelihood of net benefit. These two approaches were compared to providing no explanation of the evidence. Both approaches improved the appropriate choice of heartburn drugs compared to no explanation (factual statement: +19 percentage points, 95% CI: 13, 24; factual statement and advice: +19 percentage points, 95% CI: 13, 24). The other study explored providing no risk or benefit information about diagnostic tests compared to providing moderate risk (false positive results) or benefit (survival benefit) or a lot of information on risk (false positive and false negative results) or benefit (survival benefit and reassurance about the test). Providing information on harms significantly increased test refusals (moderate risk information vs. no harm information: OR 2.5, 95% CI: 1.8, 3.4; a lot of risk information vs. no harm information: OR 3.0, 95% CI: 2.2 to 4.2). Providing either moderate or a lot of risk information significantly decreased decision satisfaction (−5.1, 95% CI: −6.6, −3.6, on a scale of 0 to 100). One study examining different wording for health care recommendations found that medical residents were more likely to adhere to guideline-concordant care if they received weak recommendations (e.g. “we suggest”, but less likely if they received strong recommendations (e.g. “we recommend”) (15).

The other, poor quality review identified four studies reporting the impact of verbal expressions of probability information upon which to make recommendations about the type of information and presentation format people prefer (19). No recommendation could be made from three studies reporting people’s understanding of verbal probability expressions, which numerical probability they associate with each verbal expression, and risk perception following a verbal expression. Based on three studies looking at the effect of context of numerical probability estimate, perceived severity, risk perception and behaviour compliance, the review authors recommended that providing a specific context for the risk communication (rather than no context) should be considered when selecting appropriate verbal probability expressions for a risk message (19). For example, the verbal expression “possible” might be given a different rating in the context of life threatening side effects in comparison to a sprained ankle.

9. Evidence statement: Presenting risk information in words

There is weak evidence from one moderate and one poor systematic review that presenting evidence about a risk or the benefit of an intervention, compared with not presenting the explanatory evidence, resulted in patients making a more appropriate healthcare choice.[1,2] There is inconsistent evidence from one poor review about the best way to provide probability information to patients, with the review suggesting that the probabilities of risk within a specific context should be conveyed to ensure the probability is interpreted as correctly as possible [2].

[1] McCormack *et al.*, 2013 (+)
[2] Visschers *et al.*, 2009 (-)

3.6.2 Alternative numeric presentations of risk

Two systematic reviews compared the effect of different numeric presentations, such as 95% confidence intervals (CI) or point estimates, or numeric versus visual presentations, of the same information on people's risk perception (15, 19).

One moderate quality review identified three studies that assessed the effects of different numeric presentations of precision (the degree of random error surrounding an effect estimate with respect to a given outcome) on perceived risk. Studies found mixed effects on perceived risk of presenting numeric risks as point estimates versus 95% CIs. The effects appeared to depend on the outcome studied, the width of the confidence interval described, and the presence or absence of comparative information about average population risk. One of these studies also compared numeric versus graphical presentation of 95% CIs and found no significant difference between the two approaches in terms of perceived risk of colon cancer (-0.4 on a 0-5 scale, p not significant (15)

One poor quality review examined numerical probability information compared with verbal information (a qualitative description) and graphs (19). Based on the review's analysis of 10 studies of people's preference for information type and 6 studies of risk perception, the authors recommended that risk messages should contain both numerical and verbal probability information. The review reported that people receiving risk information prefer numerical information for accuracy but will express a probability to others verbally. The review suggested that based on information from 6 studies graphs are a useful way to present probability of harm, as they are more likely to draw the reader's attention to a probability of harm than numerical information (except for pie charts) (19).

10 Evidence statement: Alternative numeric presentations of risk information

There is inconsistent evidence from one poor and one moderate systematic review exploring the formats that people receiving risk information prefer[1, 2]. One moderate review reported inconsistent evidence of impact on perceived risk when the degree of precision of the estimate of risk was shown in different ways (numeric, text, graphical)[1]. A poor review of patient preferences reported inconsistent evidence, but suggested that risk messages should use several presentation formats, and that graphs are more likely to highlight probability of harm than numerical information, except for pie charts[2].

[1] McCormack *et al.*, 2013 (+)
[2] Visschers *et al.*, 2009 (-)

3.6.3 Visual presentation (graphs/risk ladders)

Two systematic reviews explored the impact of different visual presentations (graphs/risk ladders) on highlighting relevant information (15, 19).

One moderate quality review found one study that examined the effect of different graphical presentations to convey information about uncertainty. This study found no significant difference in perceived risk of colon cancer between two alternative presentations of 95 per cent confidence intervals (95% CIs) on a horizontal bar graph: a solid bar graph and a bar graph with blurred edges that was intended to give a better indication of the uncertainty).(15)

The poor quality review identified two studies assessing the effect of different types of graph on peoples' understanding, and further studies (unclear number) exploring graph content and layout. However, mixed results and the diversity of the materials tested meant it was unable to draw strong conclusions (19). This review also identified three studies assessing the effects of location of a new risk on a risk ladder and the probability of the target risk on risk perception, each reporting a different aspect of the outcomes. The review authors stated that they were unable to make any recommendations given the paucity of studies (19).

11 Evidence statement: Visual presentation of risk information

There is inconsistent evidence from one poor and one moderate systematic review on the effect of different graphical representations of risk information[1,2] One moderate review of one study found no significant difference in risk perception when 95% CIs were shown on two types of bar graph[1]. There was inconsistent evidence from one poor review on the impact on people's understanding of varying graph type, content and layout, due to the variety of materials tested and the mixed results obtained[2].

[1] McCormack *et al.*, 2013 (+)
[2] Visschers *et al.*, 2009 (-)

3.6.4 Statistical presentation of risks

Two systematic reviews were identified that evaluated the effects of alternative statistical presentations (frequencies, probabilities, percentages, base rates and proportions) of the same risks on understanding and risk perception (18, 19).

Evidence from one moderate quality review of 35 primary studies (reporting 83 comparisons) suggests that natural frequencies are probably better understood than probabilities for the presentation of risk. This review found eight comparisons of the use of natural frequencies and probabilities for presenting risk in five studies involving health professionals (three comparisons) and health consumers (five comparisons), although one comparison was not included in the meta-analysis. The overall pooled SMD[9] was 0.69 (95% CI: 0.45, 0.93) in favour of natural frequencies and was statistically significant ($p < 0.00001$)(18).

[9] Standardized mean differences (SMDs) were interpreted in the review using the following rules suggested by the Cochrane Handbook: <0.40 represents a small effect size; 0.40 to 0.70 represents a moderate effect size; >0.70 represents a large effect size.

One poor quality review identified six papers reporting the effects of different formats of risk expression (19). The review authors made two recommendations. First, use the same denominator in probability information throughout the risk message, so that people who neglect the denominator can still compare the probability information. This recommendation was supported by two of three studies evaluating the effect of risks expressed as frequencies with alternative formats (percentages, base rates or proportions) on understanding and perceived risk. A further two studies informed the second recommendation to present risky scenarios (e.g. screening test results, which include false positives) using a step-by-step description of a probability calculation, as these are relatively easy to understand and are likely to result in adequate risk estimates. A third study found that women in a focus group thought risks expressed as frequencies were easier to interpret, but were positively interpreted (labelled an optimistic bias) was observed (19).

12 Evidence statement: Statistical presentations of risks

There is strong evidence from one moderate systematic review assessing alternative ways of expressing risk that natural frequencies are probably better understood than probabilities for the presentation of risk (pooled SMD[10] was 0.69 (95% CI: 0.45, 0.93))[1]. There is moderate evidence from a poor review that reporting probability information using the same denominator throughout the risk message (to facilitate comparison) and outlining (step-by-step) a probability calculation to aid understanding of risky scenarios, such as those that include false-positive results, would aid understanding[2].

[1] Akl *et al.*, 2011b (+)
[2] Visschers *et al.*, 2009 (-)

3.6.5 Statistical presentation of risk reductions

Two SRs were identified that evaluated the effects of alternative statistical presentations of the same risk reductions (absolute, relative, and number-needed-to-treat) on understanding, perception and persuasiveness (18, 19).

Evidence from one moderate quality review of 35 primary studies (reporting 83 comparisons) conducted in health professionals and consumers suggests that relative risk reduction (RRR)[11] may be thought to be larger than both absolute risk reduction[12] (ARR) and number-needed-to-treat[13] (NNT), and is more likely to persuade people to adopt a health intervention (18). Meta-analysis found that study participants understood (measured as correct estimate or interpretation of risk) risk better when expressed as natural frequencies compared to probabilities (SMD 0.69 (95% confidence interval (CI) 0.45, 0.93)). Presenting by ARR or

[10] Standardized mean differences (SMDs) were interpreted in the review using the following rules suggested by the Cochrane Handbook: <0.40 represents a small effect size; 0.40 to 0.70 represents a moderate effect size; >0.70 represents a large effect size.
[11] The proportional reduction in risk in one treatment group compared to another. It is one minus the risk ratio.
[12] The difference in size of risk between two groups.
[13] An estimate of how many people need to receive a treatment before one more person would experience a specified outcome.

RRR made little or no difference in terms of understanding, (2 studies; pooled SMD[14] 0.02, 95% CI: -0.39, 0.43). However, when presented as RRR, the risk was perceived (rating of effectiveness) to be larger than when using ARR (5 studies; pooled SMD 0.41, 95% CI: 0.03, 0.79) and was also considered to be more persuasive (often assessed by using decision making scenarios and used as a surrogate for actual decisions) (23 studies; pooled SMD 0.66, 95% CI: 0.51, 0.81). Risk presented as RRR was also perceived to be larger and more persuasive than when presented as NNT (perception: 3 studies; pooled SMD 1.15, 95% CI: 0.80, 1.50; persuasiveness: 21 studies; pooled SMD 0.65, 95% CI: 0.51, 0.80). However, NNT was better understood than RRR (1 study; SMD 0.73, 95% CI: 0.43, 1.04). ARR was also better understood than NNT (1 study; SMD 0.42, 95% CI: 0.12, 0.71) and the risks it conveyed were perceived to be larger than NNT (3 studies; pooled SMD 0.79, 95% CI: 0.43, 1.15), but there was little or no difference in persuasiveness between NNT and ARR (19 studies; pooled SMD 0.05, 95% CI: -0.04, 0.15 (18).

One poor quality review identified 11 studies assessing the effect of presenting risk using RRR, compared with ARR or other presentation formats on a variety of outcomes, five of which also examined the effects of NNT and of benefit information (presented, for example, as the absolute survival benefit or personal probability of benefit) (19). The majority of studies found RRR increased people's willingness to get treatment, willingness to recommend treatment and willingness to pay to prevent the risk compared with other formats including ARR, NNT, absolute survival benefit and personal probability of benefit. Other findings were mixed and highlighted issues in comprehension and misinterpretation, in particular where RRR is presented as a larger figure than ARR of the same probability and the accompanying words are almost identical. The authors recommended taking care in presenting RRR as they may be mistaken for ARR (based on 10 studies), and also using the NNT with care because people do not like the format and have difficulty understanding it (5 studies). The paucity of studies about benefit information negated any recommendation (19).

13 Evidence statement: Statistical presentations of risk reductions

There is strong evidence from one moderate and one poor systematic review that risk reductions expressed as a relative risk reduction (RRR) may be perceived to be larger than the same risk presented as both an absolute risk reduction or as a number-needed-to-treat, and this presentation is more likely to persuade people to adopt certain behaviours[1, 2].

[1] Akl *et al.*, 2011b (+)
[2] Visschers *et al.*, 2009 (-)

[14] Standardized mean differences (SMDs) were interpreted in the review using the following rules suggested by the Cochrane Handbook: <0.40 represents a small effect size; 0.40 to 0.70 represents a moderate effect size; >0.70 represents a large effect size.

3.6.6 Statistical presentation of cumulative probabilities

Only one SR examined the effectiveness of cumulative probabilities to communicate cumulative risk (19). This poor quality review identified only two studies assessing the impact of cumulative probabilities on perceived risk and understanding. No recommendation was made as there was only one study of each outcome and the findings were considered insufficient. Probability information in a cumulative format (i.e. the cumulative probability *per se*) increased perceived risk compared with probability presented as a single event (i.e. a percentage) in one study (two experiments). The other study found that formats that present the probability that an event will happen at least once (disjunctive probability) are understood better than those that present the probability that an event will never happen (conjunctive probability (19).

14 Evidence statement: Statistical presentation of cumulative probabilities

There is inconsistent evidence from one poor systematic review on the impact on perceived risk and understanding of presenting cumulative probabilities in risk communication[1].

[1] Visschers *et al.*, 2009 (-)

Section 4: Summary and Discussion

4.1 SUMMARY OF KEY FINDINGS

Ten SRs exploring the effectiveness of risk communication were selected for this rapid overview; none specifically reported on the subject of complex risk communication. Given the diversity of these reviews, their results were broadly categorized according to three main themes: strategies to communicate risk messages, approaches to disseminating health information, and formats for presenting and explaining risk information. Six of the ten SRs reported outcomes related to communication strategies, three evaluated presentation formats, one reported the effects of both communication strategies and presentation formats, and one reported on dissemination approaches.

Across SRs evaluating the effect of different strategies for communicating risk, the most commonly reported outcome was the use of messages framed in either the context (positive/negative) of a specific attribute of the risk or in terms of a specific goal (gain/loss). The findings were mixed with one SR suggesting that framed messages where the evidence on health effects can be framed in positive or negative words were more persuasive in getting individuals to take up health services, another review suggesting that they improved knowledge, and a third finding little if any effect on the behaviour of health consumers. Two additional SRs reported positive effects of tailored messages (ranging from web-based interventions to personal interventions) and suggested that tailored messages are likely to be an effective strategy for improving health behaviour outcomes. Evidence for other communication strategies was either limited or unclear, with only one SR each reporting findings for targeted messages, periodic prompts, and heightening risk appraisal. Results for targeted messages were inconsistent. Frequent prompts and personal contact with a counsellor were thought to improve the effectiveness of prompts. Heightening an individual's awareness of a potential threat was thought to have a small-to-moderate effect on intention and behaviour outcomes.

Only one of the selected SRs investigated approaches to disseminating health information to clinicians, patients, or both clinicians and patients. Findings suggested that approaches designed to increase the reach of information by distributing evidence widely to many audiences and across many settings and to improve recipients' ability to use and apply evidence (regardless of delivery mode) -have a similar effect on clinician behaviour, with effectiveness enhanced by the use of multicomponent approaches that used a combination of reach, ability or motivation strategies. Evidence was inconsistent for dissemination strategies targeted at patients and both clinicians and patients.

Overall, three SRs examined the different ways risk information is presented and explained to people, with two reviews at most reporting on each particular presentation format discussed. Evidence from two SRs suggested that people may perceive a relative risk reduction (RRR) to be larger than an absolute risk reduction or number-needed-to-treat, and

are more likely to be persuaded by a RRR to adopt certain behaviours. Findings were largely inconsistent for the effects of numeric, non-numeric and visual presentation of risk information, and statistical formats for presenting risk and cumulative probabilities on outcomes including, but not restricted to, behaviour, understanding, perceived severity, persuasiveness, risk perception and understanding. The underlying message appears to be to take care when reporting risk information as no single approach has proven to be effective and there is the potential for lack of understanding or misinterpretation given the diversity of the recipients. It may aid understanding and add clarity to present the risk information within a specific context and to use a mixture of numeric and alternative forms.

4.2 QUALITY OF THE INCLUDED SYSTEMATIC REVIEWS

Overall, the quality of the included SRs was moderate to poor; none of the included SRs were of high methodological quality. Five of the ten included reviews were assessed as being of moderate quality, on account of achieving five to seven of the eleven AMSTAR criteria. The other five reviews were assessed as being of poor quality, reporting four or fewer criteria. The moderate-to-poor quality of the reviews, in terms of their performance against the AMSTAR criteria, limits our ability to draw confident conclusions for any of the reported strategies for communicating risk to health care professionals and to the general public. Only three of the reviews evaluated publication bias and this does not provide confidence that the majority of relevant studies will have been identified.

Given these limitations, the findings of this overview should be considered as indicative only. There is a need for better reported and possibly better protocol-driven SRs.

4.3 LIMITATIONS OF THIS OVERVIEW

This rapid overview of reviews was guided by a project protocol developed on the basis of a NICE scope and contract of work. The scoping document and contract of work, together, specified the research questions and conduct of the review process. Given the objective of this rapid review – to prepare a pragmatic non-exhaustive, high level summary of the findings of selected SRs – the record selection, quality assessment and data extraction processes were not conducted in duplicate. However, the selection process was undertaken in full consultation with NICE and experts in the field were contacted for details of any key reviews that might have been omitted. The final list of the ten studies most relevant to the review was constructed in consultation with NICE.

One of the important limitations of this report is that we did not retrieve the included primary studies. Thus, we were unable to also assess their quality, or extract further data when information was not provided in the review reports. In addition, some primary studies may have been double-counted since we did not investigate the overlap between the primary studies included in the SRs.

4.4 LIMITATIONS OF THE INCLUDED REVIEWS (AS DESCRIBED BY REVIEW AUTHORS)

The review authors either specifically described limitations of their review or highlighted issues within a broader discussion of methodology, analysis and practice/research implications. A diverse range of issues was evident, but few points were common to many reviews. The included reviews generally noted that the paucity of studies to test particular approaches, comparisons or hypotheses did not warrant meaningful analysis and made it difficult to draw meaningful conclusions. In addition, the lack of direct comparisons of strategies was considered to preclude conclusions about comparative effectiveness. Some review authors reported the use of surrogate outcomes and hypothetical scenarios, which might not reflect actual behaviour, whilst others questioned the applicability of their results to population groups and risk settings other than those they had investigated. Many of the included reviews acknowledged the implication of heterogeneity across the primary studies in terms of interventions, data collection, outcomes and effect sizes, on drawing conclusions about effectiveness. Some also highlighted problems arising from confounding between variables.

Less frequently, some authors reported that their searches were not specific enough or did not seek unpublished literature, thus introducing the possibility of missed studies. One review acknowledged that trade-offs had been necessary, despite a rigorous methodology, and these had limited the scope of the review. Only one of the included reviews noted the potential for bias in self-reported data, and another that different population groups may have different perceptions of risk, level of understanding, numeracy skills

4.5 VARIABLES AFFECTING DATA ANALYSIS

The included SRs varied widely in their reporting, in particular the characteristics of the primary studies they included. Some reviews provided detailed information on the study designs, participants, intervention content, risk behaviour and outcomes, whilst others provided summary data or very little detail at all. One review elected to describe in detail only those primary studies backing the recommendations it made. Although interventions could be broadly categorised according to aim, the diversity of intervention content hindered comparison, especially when multicomponent approaches were involved. There were also some discrepancies in how review authors defined the interventions they investigated. The included reviews reported the primary research variously in terms of the number of articles, studies, experiments and comparisons, often inconsistently within the review itself. There was a paucity of reviews (and contributing primary studies) for many of the topics examined in this overview. These factors all make it difficult to draw comprehensive conclusions.

4.6 GAPS IN THE EVIDENCE (AS DESCRIBED BY REVIEW AUTHORS)

The included reviews generally agreed that there were too few studies assessing the effectiveness of different approaches to communicating, disseminating and presenting risk information. They highlighted a need for better quality studies that use a variety of

methodologies, and report better descriptions of the intervention components and delivery. Some review authors advocated the testing of a wider variety of strategies and approaches to risk communication, but using more direct comparisons (to evaluate comparative effectiveness) and a focus on specific intervention components rather than entire programmes. Other authors suggested that studies should be conducted in real-life settings and assess more relevant outcomes (e.g. actual behaviour and consistency of decisions), using objective and validated outcome measures. In addition, more studies should be targeted at health professionals and policy makers, and should examine the effectiveness of risk communication in different subpopulations.

4.7 CONCLUSIONS

We identified ten SRs, half of which were of poor methodological quality. None of these reviews specifically addressed complex risk communication, focusing instead on risk communication in general.

Of the strategies used to convey risk messages, only the use of tailored messages was identified as a potentially effective strategy for improving health behaviour outcomes. The overall impact of framed messages, targeted messages, periodic prompts and heightening risk awareness was less clear but was not considered to be detrimental. The use of a combination of reach, ability or motivation strategies to disseminate health information to clinicians alone was suggested to have a positive influence on clinician behaviour. A number of numeric, non-numeric, visual and statistical formats were thought to impact upon people's interpretation of risk information, but evidence was inconsistent. Relative risk reductions were suggested to be more persuasive in getting people to adopt certain behaviours, since they were considered to be larger than an absolute risk reduction or number-needed-to-treat.

The included reviews highlighted the paucity of studies assessing the effectiveness of different approaches to communicating, disseminating and presenting risk information, and recommended better quality and better reported studies should be conducted in real-life settings. Some authors reported that there was a need to conduct more direct comparisons that focus on specific intervention components rather than entire programmes, to enable meaningful comparisons of different strategies, and assess more relevant outcomes using objective and validated outcome measures. Given the pragmatic nature of this review and the quality of the reviews, any findings from this overview of SRs should be considered as indicative only.

References

1. McCormack L, Sheridan S, Lewis M, Boudewyns V, Melvin CL, Kistler C, et al. Communication and dissemination strategies to facilitate the use of health-related evidence. Rockville, MD; 2013.
2. Akl EA, Oxman AD, Herrin J, Vist GE, Terrenato I, Sperati F, et al. Framing of health information messages. Cochrane Database Syst Rev. 2011a(12):CD006777.
3. Sheeran P, Harris PR, Epton T. Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies. Psychol Bull. 2014;140(2):511-43.
4. Fry JP, Neff RA. Periodic prompts and reminders in health promotion and health behavior interventions: systematic review. Journal of medical Internet research. 2009;11(2):e16.
5. Lucas R, McMichael T, Smith W, Armstrong B. Solar ultraviolet radiation: Global burden of disease from solar ultraviolet radiation. Geneva: World Health Organization; 2006.
6. Pilz S, Kienreich K, Tomaschitz A, Ritz E, Lerchbaum E, Obermayer-Pietsch B, et al. Vitamin D and cancer mortality: systematic review of prospective epidemiological studies. Anticancer Agents Med Chem. 2013;13(1):107-17.
7. Kemp G, Eagle L, Verne J. Mass media barriers to social marketing interventions: the example of sun protection in the UK. Health Promot Int. 2011;26(1):37-45.
8. Health and Safety Executive of Great Britain. Sun protection: advice for employers of outdoor workers. Sheffield: Health and Safety Executive; 2001.
9. National Institute for Health and Clinical Excellence. Skin cancer prevention: information, resources and environmental changes. London: National Institute for Health and Clinical Excellence (NICE); 2011. Available from: http://guidance.nice.org.uk/PH32
10. Williams A, Grogan S, Clark-Carter D, Buckley E. Appearance-based interventions to reduce ultraviolet exposure and/or increase sun protection intentions and behaviours: a systematic review and meta-analyses. Br J Health Psychol. 2013;18(1):182-217.
11. Hiom S. Public awareness regarding UV risks and vitamin D--the challenges for UK skin cancer prevention campaigns. Prog Biophys Mol Biol. 2006;92(1):161-6.
12. National Institute for Health and Clinical Excellence. Sunlight exposure - benefits and risks: final scope. London: National Institute for Health and Clinical Excellence (NICE); 2013.
13. McCormack L, Sheridan S, Lewis M, Boudewyns V, Melvin CL, Kistler C, et al. Review 1: Communication Strategies. In: Communication and Dissemination Strategies to Facilitate the Use of Health-Related Evidence. Rockville, MD: Agency for Healthcare Research and Quality (US); 2013. p. 28-41.
14. McCormack L, Sheridan S, Lewis M, Boudewyns V, Melvin CL, Kistler C, et al. Review 2: Dissemination Strategies to Clinicians and Patients. In: Communication and Dissemination Strategies to Facilitate the Use of Health-Related Evidence. Rockville, MD: Agency for Healthcare Research and Quality (US); 2013. p. 42-84.
15. McCormack L, Sheridan S, Lewis M, Boudewyns V, Melvin CL, Kistler C, et al. Review 3: Communicating Uncertainty. In: Communication and Dissemination Strategies to Facilitate the Use of Health-Related Evidence. Rockville, MD: Agency for Healthcare Research and Quality (US); 2013. p. 85-104.
16. Lustria ML, Noar SM, Cortese J, Van Stee SK, Glueckauf RL, Lee J. A meta-analysis of web-delivered tailored health behavior change interventions. J Health Commun. 2013;18(9):1039-69.
17. Wanyonyi KL, Themessl-Huber M, Humphris G, Freeman R. A systematic review and meta-analysis of face-to-face communication of tailored health messages: implications for practice. Patient Educ Couns. 2011;85(3):348-55.
18. Akl EA, Oxman AD, Herrin J, Vist GE, Terrenato I, Sperati F, et al. Using alternative statistical formats for presenting risks and risk reductions. Cochrane Database Syst Rev. 2011b(3):CD006776.

19. Visschers VH, Meertens RM, Passchier WW, de Vries NN. Probability information in risk communication: a review of the research literature. Risk Anal. 2009;29(2):267-87.

APPENDIX A

SEARCH STRATEGIES

A.1: Source: MEDLINE(R) In-Process & Other Non-Indexed Citations and MEDLINE(R) 1946 to Present

Interface / URL: OvidSP
Search date: 26/02/14
Retrieved records: 1734

1 systematic$ review$.ti,ab. (51900)
2 meta-analysis as topic/ (13223)
3 meta-analytic$.ti,ab. (3459)
4 meta-analysis.ti,ab,pt. (64349)
5 metanalysis.ti,ab. (123)
6 metaanalysis.ti,ab. (1019)
7 meta-synthesis.ti,ab. (201)
8 metasynthesis.ti,ab. (113)
9 meta-regression.ti,ab. (2097)
10 metaregression.ti,ab. (256)
11 pooled analys#s.ti,ab. (3998)
12 (synthes$ adj3 literature).ti,ab. (1320)
13 (synthes$ adj3 evidence).ti,ab. (3763)
14 integrative review.ti,ab. (808)
15 data synthesis.ti,ab. (7031)
16 (research synthesis or narrative synthesis).ti,ab. (654)
17 (systematic study or systematic studies).ti,ab. (7295)
18 (systematic comparison$ or systematic overview$).ti,ab. (1765)
19 evidence based review.ti,ab. (1220)
20 comprehensive review.ti,ab. (6448)
21 critical review.ti,ab. (10676)
22 quantitative review.ti,ab. (447)
23 structured review.ti,ab. (447)
24 realist review.ti,ab. (47)
25 realist synthesis.ti,ab. (30)
26 review.pt. (1833199)
27 medline.ab. (54559)
28 pubmed.ab. (28499)
29 cochrane.ab. (28412)
30 embase.ab. (26904)
31 cinahl.ab. (9233)
32 psyc?lit.ab. (868)
33 psyc?info.ab. (10994)
34 (literature adj3 search$).ab. (24317)
35 (database$ adj3 search$).ab. (22387)
36 (bibliographic adj3 search$).ab. (1170)
37 (electronic adj3 search$).ab. (7813)
38 (electronic adj3 database$).ab. (9523)
39 (computeri?ed adj3 search$).ab. (2532)
40 (internet adj3 search$).ab. (1626)

41 included studies.ab. (6188)
42 (inclusion adj3 studies).ab. (5841)
43 inclusion criteria.ab. (32856)
44 selection criteria.ab. (18805)
45 predefined criteria.ab. (1020)
46 predetermined criteria.ab. (716)
47 (assess$ adj3 (quality or validity)).ab. (38757)
48 (select$ adj3 (study or studies)).ab. (36205)
49 (data adj3 extract$).ab. (27039)
50 extracted data.ab. (6166)
51 (data adj2 abstracted).ab. (3064)
52 (data adj3 abstraction).ab. (803)
53 published intervention$.ab. (98)
54 ((study or studies) adj2 evaluat$).ab. (100944)
55 (intervention$ adj2 evaluat$).ab. (5760)
56 confidence interval$.ab. (207878)
57 heterogeneity.ab. (89083)
58 pooled.ab. (42328)
59 pooling.ab. (7322)
60 odds ratio$.ab. (138529)
61 (Jadad or coding).ab. (116938)
62 or/27-61 (766912)
63 26 and 62 (107837)
64 review.ti. (250730)
65 62 and 64 (42880)
66 (review$ adj4 (papers or trials or studies or evidence or intervention$ or evaluation$)).ti,ab. (97902)
67 or/1-25 (144179)
68 63 or 65 or 66 or 67 (271710)
69 Communication/ (60811)
70 communication barriers/ or health communication/ or information dissemination/ or persuasive communication/ or social networking/ or communications media/ or exp mass media/ or exp Marketing/ (83172)
71 health education/ or exp consumer health information/ or patient education as topic/ or decision support techniques/ or audiovisual aids/ (137319)
72 Probability Learning/ (1206)
73 or/69-72 (265917)
74 exp risk/ or uncertainty/ (808613)
75 risk reduction behavior/ or risk-taking/ (24937)
76 decision making/ or choice behavior/ (84641)
77 or/74-76 (901095)
78 73 and 77 (30264)
79 health communication.jn. (843)
80 journal of health communication.jn. (1146)
81 ((risk$ or probabilit$ or uncertain$ or message$1 or communicat$ or counsel$ or marketing or advice or advise$ or advising or loss or gain or positiv$ or negativ$ or attribute$1 or goal$1) adj3 (frame or framed or framing)).ti,ab,kf. (870)

82 ((risk$ or probabilit$ or uncertain$) adj3 (notif$ or inform$ or message$1 or communicat$ or counsel$ or marketing or dissemin$ or advice or advise$ or advising or perceive$ or perception$)).ti,ab,kf. (23075)
83 ((tailor$ or personal$ or individual$ or targeted or targeting) adj3 (message$1 or material$1 or communica$ or feedback or feed back or promot$ or market$)).ti,ab,kf. (11162)
84 ((cognitive or cognition or associative or affective or positiv$ or negativ$) adj3 message$1).ti,ab,kf. (450)
85 (risk$ adj2 present$).ti,ab,kf. (5660)
86 or/79-85 (42141)
87 health behavior/ or exp attitude to health/ or awareness/ or health promotion/ (355988)
88 ((health$ or health care or lifestyle$ or life-style$) adj3 (aware$ or knowledg$ or attitude$ or behavio$ or value$ or understand$ or belief$ or believe or perception$ or perceive$ or view or views or intention$ or habit$1 or practice$)).ti. (21315)
89 ((uncertain$ or ambigu$ or conflict$ or missing or complex or vague or imprecis$ or unclear) adj3 (evidence or message$ or advice)).ti. (735)
90 or/87-89 (368049)
91 (motivational interview$ or coach$ or mentor$ or counsel$ or champion$ or self-study or self-guided).ti,ab,kf. (86984)
92 ((graphic$ or visual$ or pictorial or illustra$ or print$) adj3 (image$1 or stimuli or display$ or dissemin$ or present or presented or presentation$1 or communicat$ or message$1 or advice or feedback or feed back or inform or information or aid or aids or representation$1 or material$1)).ti. (6486)
93 ((data or statistic$ or graph or graphs or numeric$ or verbal or textual or written) adj3 (stimuli or display$1 or dissemin$ or presentation$1 or communicat$ or message$1 or advice or feedback or feed back or inform or information or aid or aids or representation$1 or material$1)).ti. (3525)
94 (pictogram$ or picto-gram$ or pictograph$ or picto-graph$ or infogram$ or info-gram$ or infographic$ or info-graphic$).ti,ab,kf. (277)
95 (mass media or new media or social media or social network$ or marketing or marketed or television$1 or tele-vision$1 or tv or advert$ or billboard$1 or bill-board$1 or poster$1 or cinema$ or video$1 or newspaper$1 or news or magazine$1 or journalis$ or comic$1 or cartoon$1 or leaflet$1 or pamphlet$1 or booklet$1 or radio or radios or internet or multimedia or multi-media or web or website$ or online or on-line or interactive or inter-active or facebook or twitter or youtube or you-tube or mail$ out$1 or mailout$1 or mail-shot$1 or mailshot$1).ti. (96740)
96 (phone$1 or telephone$1 or smartphone$1 or email$1 or e-mail or electronic mail$1 or text messag$ or texting or sms or short messag$ or app or apps or android$ or blackberr$ or iphone$1 or ipad$1).ti. (12185)
97 (media$1 adj3 (coverage or report$ or article$ or content$ or present$ or discuss$ or messag$ or campaign$)).ti. (1195)
98 or/91-97 (204628)
99 98 and (90 or 77) (35262)
100 78 or 86 or 99 (98719)
101 68 and 100 (3969)
102 exp animals/ not humans/ (3880949)
103 (news or editorial or letter or comment or case reports).pt. (2937065)

104 case report.ti. (155657)
105 101 not (102 or 103 or 104) (3844)
106 limit 105 to (english language and yr="2009 -Current") (1767)
107 remove duplicates from 106 (1734)

A.2: Source: MEDLINE(R) In-Process & Other Non-Indexed Citations and MEDLINE(R) 1946 to Present

Interface / URL: OvidSP
Search date: 26/02/14
Retrieved records: 1555

1 systematic$ review$.ti,ab. (51900)
2 meta-analysis as topic/ (13223)
3 meta-analytic$.ti,ab. (3459)
4 meta-analysis.ti,ab,pt. (64349)
5 metanalysis.ti,ab. (123)
6 metaanalysis.ti,ab. (1019)
7 meta-synthesis.ti,ab. (201)
8 metasynthesis.ti,ab. (113)
9 meta-regression.ti,ab. (2097)
10 metaregression.ti,ab. (256)
11 pooled analys#s.ti,ab. (3998)
12 (synthes$ adj3 literature).ti,ab. (1320)
13 (synthes$ adj3 evidence).ti,ab. (3763)
14 integrative review.ti,ab. (808)
15 data synthesis.ti,ab. (7031)
16 (research synthesis or narrative synthesis).ti,ab. (654)
17 (systematic study or systematic studies).ti,ab. (7295)
18 (systematic comparison$ or systematic overview$).ti,ab. (1765)
19 evidence based review.ti,ab. (1220)
20 comprehensive review.ti,ab. (6448)
21 critical review.ti,ab. (10676)
22 quantitative review.ti,ab. (447)
23 structured review.ti,ab. (447)
24 realist review.ti,ab. (47)
25 realist synthesis.ti,ab. (30)
26 review.pt. (1833199)
27 medline.ab. (54559)
28 pubmed.ab. (28499)
29 cochrane.ab. (28412)
30 embase.ab. (26904)
31 cinahl.ab. (9233)
32 psyc?lit.ab. (868)
33 psyc?info.ab. (10994)

34 (literature adj3 search$).ab. (24317)
35 (database$ adj3 search$).ab. (22387)
36 (bibliographic adj3 search$).ab. (1170)
37 (electronic adj3 search$).ab. (7813)
38 (electronic adj3 database$).ab. (9523)
39 (computeri?ed adj3 search$).ab. (2532)
40 (internet adj3 search$).ab. (1626)
41 included studies.ab. (6188)
42 (inclusion adj3 studies).ab. (5841)
43 inclusion criteria.ab. (32856)
44 selection criteria.ab. (18805)
45 predefined criteria.ab. (1020)
46 predetermined criteria.ab. (716)
47 (assess$ adj3 (quality or validity)).ab. (38757)
48 (select$ adj3 (study or studies)).ab. (36205)
49 (data adj3 extract$).ab. (27039)
50 extracted data.ab. (6166)
51 (data adj2 abstracted).ab. (3064)
52 (data adj3 abstraction).ab. (803)
53 published intervention$.ab. (98)
54 ((study or studies) adj2 evaluat$).ab. (100944)
55 (intervention$ adj2 evaluat$).ab. (5760)
56 confidence interval$.ab. (207878)
57 heterogeneity.ab. (89083)
58 pooled.ab. (42328)
59 pooling.ab. (7322)
60 odds ratio$.ab. (138529)
61 (Jadad or coding).ab. (116938)
62 or/27-61 (766912)
63 26 and 62 (107837)
64 review.ti. (250730)
65 62 and 64 (42880)
66 (review$ adj4 (papers or trials or studies or evidence or intervention$ or evaluation$)).ti,ab. (97902)
67 or/1-25 (144179)
68 63 or 65 or 66 or 67 (271710)
69 sunlight/ or ultraviolet rays/ or sunburn/ or sunbathing/ or suntan/ or exp sunscreening agents/ or sun protection factor/ (77655)
70 ((sun or suns or sunning or sunshine or sunlight$) adj3 (damag$ or protect$ or safe or safety or risk$ or benefit$1 or beneficial or index or indexes or exposure$1 or overexposure$1 or expose$1 or overexpose$1 or underexpose$1 or underexposure$1)).ti,ab,kf. (10175)
71 ((uv or uva or uv-a or uvb or uv-b or uvc or uv-c or ultra-violet or ultraviolet or solar) adj2 (ray$1 or radiation or irradiat$ or protect$ or index or indexes or exposure$1 or overexposure$1 or expose$1 or overexpose$1)).ti,ab,kf. (46702)
72 (sunscreen$ or sunblock$ or spf or sunburn$ or photo-damag$ or photodamag$ or photoag$ or photo-expos$ or photoexpos$).ti,ab,kf. (12301)

73 (sunbath$ or suntan$ or tan or tans or tanning or tanned or sunbed$1 or sunlamp$1 or solarium$1 or solaria$).ti,ab,kf. (6432)
74 *food habits/ or *food preferences/ or *nutrition therapy/ (15078)
75 (diet$1 or dietary).ti. (112106)
76 ((health$ or unhealthy or poor$ or behav$ or advic$ or recommend$) adj3 (eat$ or diet$ or food$ or nutrition$)).ti. (12214)
77 ((fruit$ or vegetable$ or sugar$ or salt$ or fat or fats or fatty or fibre) adj2 (intake* or consum* or eat* or ate)).ti. (4703)
78 exp *alcohol-related disorders/pc or *alcohol drinking/ (32083)
79 (alcohol$ adj3 (consum$ or misuse or abuse or intoxication or harmful or excess$ or binge or bingeing or hazardous or heavy or temperance or abstinence or abstain$)).ti. (12440)
80 ((change$ or changing or modification$ or modify or modifying) adj2 (behavio?r$ or lifestyle$ or life style$) adj2 (intervention$ or therapy or therapies or program$)).ti. (402)
81 (physical activity or healthy eating or fruit$ or vegetable$ or exercis$ or fitness or alcohol or (smok$ adj5 (stop$ or cessation or quit$))).ti. (203302)
82 or/69-81 (452015)
83 Communication/ (60811)
84 exp marketing/ or communication barriers/ or health communication/ or information dissemination/ or persuasive communication/ or social networking/ or communications media/ or exp mass media/ (83172)
85 health education/ or exp consumer health information/ or patient education as topic/ or decision support techniques/ or audiovisual aids/ or health promotion/ (180669)
86 Probability Learning/ (1206)
87 decision making/ or choice behavior/ (84641)
88 risk reduction behavior/ or risk-taking/ (24937)
89 exp risk/ or uncertainty/ (808613)
90 pamphlets/ or electronic mail/ or exp telephone/ or exp Internet/ or exp educational technology/ or computer-assisted instruction/ (152758)
91 counseling/ or exp directive counseling/ (28526)
92 health communication.jn. (843)
93 journal of health communication.jn. (1146)
94 ((risk$ or probabilit$ or uncertain$ or message$1 or communicat$ or counsel$ or marketing or advice or advise$ or advising) adj3 (frame or framed or framing)).ti,ab,kf. (478)
95 ((risk$ or probabilit$ or uncertain$) adj3 (notif$ or inform$ or message$1 or communicat$ or counsel$ or marketing or advice or advise$ or advising or perceive$ or perception$)).ti,ab,kf. (22376)
96 ((tailor$ or personal$ or individual$ or targeted or targeting) adj3 (message$1 or material$1 or communica$ or feedback or feed back or promot$ or market$)).ti,ab,kf. (11162)
97 ((cognitive or cognition or associative or affective or positiv$ or negativ$) adj3 message$1).ti,ab,kf. (450)
98 ((health$ or health care or lifestyle$ or life style$1) adj2 (information or message$1 or communicat$)).ti,ab,kf. (23083)
99 (decision aid$1 or decision tool$1 or decision support$).ti,ab,kf. (8797)

100 ((health$ or health care or lifestyle$ or life-style$) adj3 (aware$ or knowledg$ or attitude$ or behavio$ or value$ or understand$ or belief$ or believe or perception$ or perceive$ or view or views or intention$ or habit$1 or practice$)).ti,ab,kf. (90507)
101 ((uncertain$ or ambigu$ or conflict$ or missing or complex or vague or imprecis$ or unclear) adj3 (evidence or message$ or advice)).ti,ab,kf. (6897)
102 (motivational interview$ or coach$ or mentor$ or counsel$ or champion$ or self-study or self-guided).ti,ab,kf. (86984)
103 (pictogram$ or picto-gram$ or infogram$ or info-gram$ or infographic$ or info-graphic$).ti,ab,kf. (177)
104 ((graphic$ or visual$ or pictorial or illustra$ or print$) adj3 (image$1 or stimuli or display$ or dissemin$ or present or presented or presentation$1 or communicat$ or message$1 or advice or feedback or feed back or inform or information or aid or aids or representation$1 or material$1)).ti. (6486)
105 ((data or statistic$ or graph or graphs or numeric$ or verbal or textual or written) adj3 (stimuli or display$1 or dissmin$ presented or presentation$1 or communicat$ or message$1 or advice or feedback or feed back or inform or information or aid or aids or representation$1 or material$1)).ti. (3473)
106 (mass media or new media or social media or social network$ or marketing or marketed or television$1 or tele-vision$1 or tv or advert$ or billboard$1 or bill-board$1 or poster$1 or cinema$ or video$1 or newspaper$1 or news or magazine$1 or journalis$ or comic$1 or cartoon$1 or leaflet$1 or pamphlet$1 or booklet$1 or radio or radios or internet or multimedia or multi-media or web or website$ or online or interactive or inter-active or facebook or twitter or youtube or you-tube or mail$ out$1 or mailout$1 or mail-shot$1 or mailshot$1).ti,ab,kf. (308209)
107 (phone$1 or telephone$1 or smartphone$1 or email$1 or electronic mail$1 or text messag$ or texting or sms or short messag$ or app or apps or android$ or blackberr$ or iphone$1 or ipad$1).ti,ab,kf. (69035)
108 (media$1 adj3 (coverage or report$ or article$ or content$ or present$ or discuss$ or messag$ or campaign$)).ti,ab,kf. (12205)
109 (appearance adj3 (based or focused or orientated)).ti,ab. (973)
110 ((uv or ultra-violet or ultraviolet) adj4 (photo$1 or photograph$ or image$1 or imaging)).ti,ab. (1276)
111 ed.fs. (215110)
112 or/83-111 (1865371)
113 68 and 82 and 112 (3092)
114 exp animals/ not humans/ (3880949)
115 (news or editorial or letter or comment or case reports).pt. (2937065)
116 case report.ti. (155657)
117 113 not (114 or 115 or 116) (3033)
118 limit 117 to (english language and yr="2009 -Current") (1555)

A.3: Source: Cochrane Library - Issue 2 of 12, February 2014

Interface / URL: Cochrane Library/Wiley Interscience
Search date: 26/02/14
Retrieved records from CDSR: 498

#1 MeSH descriptor: [Communication] this term only 1262
#2 MeSH descriptor: [Communication Barriers] this term only 76
#3 MeSH descriptor: [Health Communication] this term only 23
#4 MeSH descriptor: [Information Dissemination] this term only 157
#5 MeSH descriptor: [Persuasive Communication] this term only 190
#6 MeSH descriptor: [Social Networking] this term only 12
#7 MeSH descriptor: [Communications Media] this term only 17
#8 MeSH descriptor: [Mass Media] explode all trees 1398
#9 MeSH descriptor: [Marketing] explode all trees 307
#10 MeSH descriptor: [Health Education] this term only 2750
#11 MeSH descriptor: [Consumer Health Information] explode all trees 125
#12 MeSH descriptor: [Patient Education as Topic] this term only 6065
#13 MeSH descriptor: [Decision Support Techniques] this term only 1497
#14 MeSH descriptor: [Audiovisual Aids] this term only 250
#15 MeSH descriptor: [Probability Learning] this term only 42
#16 or #1-#15 12845
#17 MeSH descriptor: [Risk] explode all trees 28749
#18 MeSH descriptor: [Uncertainty] this term only 79
#19 MeSH descriptor: [Risk Reduction Behavior] this term only 918
#20 MeSH descriptor: [Risk-Taking] this term only 839
#21 MeSH descriptor: [Decision Making] this term only 1470
#22 MeSH descriptor: [Choice Behavior] this term only 738
#23 or #18-#22 31950
#24 #16 and #23 2139
#25 "health communication":so 127
#26 ((risk* or probabilit* or uncertain* or message* or communicat* or counsel* or marketing or advice or advise* or advising or loss or gain or positiv* or negativ* or attribute* or goal*) near/3 (frame or framed or framing)):ti,ab 138
#27 ((risk* or probabilit* or uncertain*) near/3 (notif* or message* or communicat* or counsel* or marketing or dissemin* or advice or advise* or advising or perceive* or perception*)):ti,ab or ((risk* or probabilit* or uncertain*) near/1 inform*):ti,ab 1232
#28 ((tailor* or personal* or individual* or targeted or targeting) near/3 (message* or material* or communica* or feedback or "feed back" or promot* or market*)):ti,ab 1192
#29 ((cognitive or cognition or associative or affective or positiv* or negativ*) near/3 message*):ti,ab 43
#30 (risk* near/2 present*):ti,ab 450
#31 or #25-#30 2942
#32 MeSH descriptor: [Health Behavior] this term only 2144
#33 MeSH descriptor: [Attitude to Health] explode all trees 22747
#34 MeSH descriptor: [Awareness] this term only 671
#35 MeSH descriptor: [Health Promotion] this term only 3328
#36 ((health* or "health care" or lifestyle* or life-style*) near/3 (aware* or knowledg* or attitude* or behavio* or value* or understand* or belief* or believe or perception* or perceive* or view or views or intention* or habit* or practice*)):ti 1084
#37 ((uncertain* or ambigu* or conflict* or missing or complex or vague or imprecis* or unclear) near/3 (evidence or message* or advice)):ti 18
#38 or #32-#37 27293

#39 (motivational next interview* or coach* or mentor* or counsel* or champion* or self-study or self-guided):ti,ab 7855
#40 ((graphic* or visual* or pictorial or illustra* or print*) near/3 (image* or stimuli or display* or dissemin* or present or presented or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 398
#41 ((data or statistic* or graph or graphs or numeric* or verbal or textual or written) near/3 (stimuli or display* or dissemin* or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 245
#42 (pictogram* or picto-gram* or pictograph* or picto-graph* or infogram* or info-gram* or infographic* or info-graphic*):ti,ab 40
#43 ("mass media" or "new media" or "social media" or social next network* or marketing or marketed or television* or tele-vision* or tv or advert* or billboard* or bill-board* or poster* or cinema* or video* or newspaper* or news or magazine* or journalis* or comic* or cartoon* or leaflet* or pamphlet* or booklet* or radio or radios or internet or multimedia or multi-media or web or website* or online or on-line or interactive or inter-active or facebook or twitter or youtube or you-tube or mail* next out* or mailout* or mail-shot* or mailshot*):ti 8321
#44 (phone* or telephone* or smartphone* or email* or e-mail or electronic next mail* or text next messag* or texting or sms or short next messag* or app or apps or android* or blackberr* or iphone* or ipad*):ti 1906
#45 (media* near/3 (coverage or report* or article* or content* or present* or discuss* or messag* or campaign*)):ti 107
#46 or #39-#45 18040
#47 #46 and (#38 or #23) 3964
#48 #24 or #31 or #47 in Cochrane Reviews (Reviews and Protocols) 498

A.4: Source: Cochrane Library - Issue 2 of 12, February 2014

Interface / URL: Cochrane Library/Wiley Interscience
Search date: 26/02/14
Retrieved records from CDSR: 152

#1 MeSH descriptor: [Sunlight] this term only 240
#2 MeSH descriptor: [Ultraviolet Rays] this term only 511
#3 MeSH descriptor: [Sunburn] this term only 149
#4 MeSH descriptor: [Sunbathing] this term only 17
#5 MeSH descriptor: [Suntan] this term only 4
#6 MeSH descriptor: [Sunscreening Agents] explode all trees 212
#7 MeSH descriptor: [Sun Protection Factor] this term only 6
#8 ((sun or suns or sunning or sunshine or sunlight*) near/3 (damag* or protect* or safe or safety or risk* or benefit* or beneficial or index or indexes or exposure* or overexposure* or expose* or overexpose* or underexpose* or underexposure*)):ti,ab 510
#9 ((uv or uva or uv-a or uvb or uv-b or uvc or uv-c or ultra-violet or ultraviolet or solar) near/2 (ray* or radiation or irradiat* or protect* or index or indexes or exposure* or overexposure* or expose* or overexpose*)):ti,ab 876

#10 (sunscreen* or sunblock* or spf or sunburn* or photo-damag* or photodamag* or photoag* or photo-expos* or photoexpos*):ti,ab 794
#11 (sunbath* or suntan* or tan or tans or tanning or tanned or sunbed* or sunlamp* or solarium* or solaria*):ti,ab 339
#12 MeSH descriptor: [Food Habits] this term only 961
#13 MeSH descriptor: [Food Preferences] this term only 408
#14 MeSH descriptor: [Nutrition Therapy] this term only 56
#15 (diet* or diets or dietary):ti 9641
#16 ((health* or unhealthy or poor* or behav* or advic* or recommend*) near/3 (eat* or diet* or food* or nutrition*)):ti 1002
#17 ((fruit* or vegetable* or sugar* or salt* or fat or fats or fatty or fibre) near/2 (intake* or consum* or eat* or ate)):ti 655
#18 MeSH descriptor: [Alcohol-Related Disorders] explode all trees and with qualifier(s): [Prevention & control - PC] 419
#19 MeSH descriptor: [Alcohol Drinking] this term only 2249
#20 (alcohol* near/3 (consum* or misuse or abuse or intoxication or harmful or excess* or binge or bingeing or hazardous or heavy or temperance or abstinence or abstain*)):ti 817
#21 ((change* or changing or modification* or modify or modifying) near/2 (behavior* or behaviour* or lifestyle* or life style*) near/2 (intervention* or therapy or therapies or program*)):ti 141
#22 ("physical activity" or "healthy eating" or fruit* or vegetable* or exercis* or fitness or alcohol):ti 24351
#23 (smok* near/5 (stop* or cessation or quit*)):ti 3141
#24 or #1-#23 40879
#25 MeSH descriptor: [Communication] this term only 1262
#26 MeSH descriptor: [Marketing] explode all trees 307
#27 MeSH descriptor: [Communication Barriers] this term only 76
#28 MeSH descriptor: [Health Communication] this term only 23
#29 MeSH descriptor: [Information Dissemination] this term only 157
#30 MeSH descriptor: [Persuasive Communication] this term only 190
#31 MeSH descriptor: [Social Networking] this term only 12
#32 MeSH descriptor: [Communications Media] this term only 17
#33 MeSH descriptor: [Mass Media] explode all trees 1398
#34 MeSH descriptor: [Health Education] this term only 2750
#35 MeSH descriptor: [Consumer Health Information] explode all trees 125
#36 MeSH descriptor: [Patient Education as Topic] this term only 6065
#37 MeSH descriptor: [Decision Support Techniques] this term only 1497
#38 MeSH descriptor: [Audiovisual Aids] this term only 250
#39 MeSH descriptor: [Health Promotion] this term only 3328
#40 MeSH descriptor: [Probability Learning] this term only 42
#41 MeSH descriptor: [Decision Making] this term only 1470
#42 MeSH descriptor: [Choice Behavior] this term only 738
#43 MeSH descriptor: [Risk Reduction Behavior] this term only 918
#44 MeSH descriptor: [Risk-Taking] this term only 839
#45 MeSH descriptor: [Risk] explode all trees 28749
#46 MeSH descriptor: [Uncertainty] this term only 79
#47 MeSH descriptor: [Pamphlets] this term only 572

#48 MeSH descriptor: [Electronic Mail] this term only 168
#49 MeSH descriptor: [Telephone] explode all trees 1552
#50 MeSH descriptor: [Internet] explode all trees 1525
#51 MeSH descriptor: [Educational Technology] explode all trees 2305
#52 MeSH descriptor: [Computer-Assisted Instruction] this term only 816
#53 MeSH descriptor: [Counseling] this term only 2691
#54 MeSH descriptor: [Directive Counseling] explode all trees 275
#55 "health communication":so 127
#56 ((risk* or probabilit* or uncertain* or message* or communicat* or counsel* or marketing or advice or advise* or advising) near/3 (frame or framed or framing)):ti,ab 113
#57 ((risk* or probabilit* or uncertain*) near/3 (notif* or inform* or message* or communicat* or counsel* or marketing or advice or advise* or advising or perceive* or perception*)):ti,ab 1985
#58 ((tailor* or personal* or individual* or targeted or targeting) near/3 (message* or material* or communica* or feedback or "feed back" or promot* or market*)):ti,ab 1192
#59 ((cognitive or cognition or associative or affective or positiv* or negativ*) near/3 message*):ti,ab 43
#60 ((health* or "health care" or lifestyle* or life next style*) near/2 (information or message* or communicat*)):ti,ab 1114
#61 (decision next aid* or decision next tool* or decision next support*):ti,ab 765
#62 ((health* or "health care" or lifestyle* or life-style*) near/3 (aware* or knowledg* or attitude* or behavio* or value* or understand* or belief* or believe or perception* or perceive* or view or views or intention* or habit* or practice*)):ti,ab 6671
#63 ((uncertain* or ambigu* or conflict* or missing or complex or vague or imprecis* or unclear) near/3 (evidence or message* or advice)):ti,ab 350
#64 (motivational next interview* or coach* or mentor* or counsel* or champion* or self-study or self-guided):ti,ab 7855
#65 (pictogram* or picto-gram* or infogram* or info-gram* or infographic* or info-graphic*):ti,ab 26
#66 ((graphic* or visual* or pictorial or illustra* or print*) near/3 (image* or stimuli or display* or dissemin* or present or presented or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 398
#67 ((data or statistic* or graph or graphs or numeric* or verbal or textual or written) near/3 (stimuli or display* or dissemin* or presented or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 254
#68 ("mass media" or "new media" or "social media" or social next network* or marketing or marketed or television* or tele-vision* or tv or advert* or billboard* or bill-board* or poster* or cinema* or video* or newspaper* or news or magazine* or journalis* or comic* or cartoon* or leaflet* or pamphlet* or booklet* or radio or radios or internet or multimedia or multi-media or web or website* or online or interactive or inter-active or facebook or twitter or youtube or you-tube or mail* next out* or mailout* or mail-shot* or mailshot*):ti,ab 25644
#69 (phone* or telephone* or smartphone* or email* or electronic mail*or text next messag* or texting or sms or short next messag* or app or apps or android* or blackberr* or iphone* or ipad*):ti,ab 7281

#70 (media* near/3 (coverage or report* or article* or content* or present* or discuss* or messag* or campaign*)):ti,ab 849
#71 (appearance near/3 (based or focused or orientated)):ti,ab 38
#72 ((uv or ultra-violet or ultraviolet) near/4 (photo* or photograph* or image* or imaging)):ti,ab 209
#73 Any MeSH descriptor with qualifier(s): [Education - ED] 4709
#74 or #25-#73 84822
#75 #24 and #74 in Cochrane Reviews (Reviews and Protocols) 152

A.5: Source: Cochrane Library - Issue 1 of 4, Jan 2014

Interface / URL: Cochrane Library/Wiley Interscience
Search date: 26/02/14
Retrieved records from DARE: 972
Search strategy:

#1 MeSH descriptor: [Communication] this term only 1262
#2 MeSH descriptor: [Communication Barriers] this term only 76
#3 MeSH descriptor: [Health Communication] this term only 23
#4 MeSH descriptor: [Information Dissemination] this term only 157
#5 MeSH descriptor: [Persuasive Communication] this term only 190
#6 MeSH descriptor: [Social Networking] this term only 12
#7 MeSH descriptor: [Communications Media] this term only 17
#8 MeSH descriptor: [Mass Media] explode all trees 1398
#9 MeSH descriptor: [Marketing] explode all trees 307
#10 MeSH descriptor: [Health Education] this term only 2750
#11 MeSH descriptor: [Consumer Health Information] explode all trees 125
#12 MeSH descriptor: [Patient Education as Topic] this term only 6065
#13 MeSH descriptor: [Decision Support Techniques] this term only 1497
#14 MeSH descriptor: [Audiovisual Aids] this term only 250
#15 MeSH descriptor: [Probability Learning] this term only 42
#16 or #1-#15 12845
#17 MeSH descriptor: [Risk] explode all trees 28749
#18 MeSH descriptor: [Uncertainty] this term only 79
#19 MeSH descriptor: [Risk Reduction Behavior] this term only 918
#20 MeSH descriptor: [Risk-Taking] this term only 839
#21 MeSH descriptor: [Decision Making] this term only 1470
#22 MeSH descriptor: [Choice Behavior] this term only 738
#23 31950
#24 #16 and #23 2139
#25 "health communication":so 127
#26 ((risk* or probabilit* or uncertain* or message* or communicat* or counsel* or marketing or advice or advise* or advising or loss or gain or positiv* or negativ* or attribute* or goal*) near/3 (frame or framed or framing)) 179

#27 ((risk* or probabilit* or uncertain*) near/3 (notif* or message* or communicat* or counsel* or marketing or dissemin* or advice or advise* or advising or perceive* or perception*)) or ((risk* or probabilit* or uncertain*) near/1 inform*) 2378
#28 ((tailor* or personal* or individual* or targeted or targeting) near/3 (message* or material* or communica* or feedback or "feed back" or promot* or market*)) 2667
#29 ((cognitive or cognition or associative or affective or positiv* or negativ*) near/3 message*) 53
#30 (risk* near/2 present*) 837
#31 or #25-#30 5572
#32 MeSH descriptor: [Health Behavior] this term only 2144
#33 MeSH descriptor: [Attitude to Health] explode all trees 22747
#34 MeSH descriptor: [Awareness] this term only 671
#35 MeSH descriptor: [Health Promotion] this term only 3328
#36 ((health* or "health care" or lifestyle* or life-style*) near/3 (aware* or knowledg* or attitude* or behavio* or value* or understand* or belief* or believe or perception* or perceive* or view or views or intention* or habit* or practice*)):ti 1084
#37 ((uncertain* or ambigu* or conflict* or missing or complex or vague or imprecis* or unclear) near/3 (evidence or message* or advice)):ti 18
#38 or #32-#37 27293
#39 (motivational next interview* or coach* or mentor* or counsel* or champion* or self-study or self-guided) 12579
#40 ((graphic* or visual* or pictorial or illustra* or print*) near/3 (image* or stimuli or display* or dissemin* or present or presented or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 398
#41 ((data or statistic* or graph or graphs or numeric* or verbal or textual or written) near/3 (stimuli or display* or dissemin* or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 245
#42 (pictogram* or picto-gram* or pictograph* or picto-graph* or infogram* or info-gram* or infographic* or info-graphic*) 52
#43 ("mass media" or "new media" or "social media" or social next network* or marketing or marketed or television* or tele-vision* or tv or advert* or billboard* or bill-board* or poster* or cinema* or video* or newspaper* or news or magazine* or journalis* or comic* or cartoon* or leaflet* or pamphlet* or booklet* or radio or radios or internet or multimedia or multi-media or web or website* or online or on-line or interactive or inter-active or facebook or twitter or youtube or you-tube or mail* next out* or mailout* or mail-shot* or mailshot*):ti 8321
#44 (phone* or telephone* or smartphone* or email* or e-mail or electronic next mail* or text next messag* or texting or sms or short next messag* or app or apps or android* or blackberr* or iphone* or ipad*):ti 1906
#45 (media* near/3 (coverage or report* or article* or content* or present* or discuss* or messag* or campaign*)):ti 107
#46 or #39-#45 22529
#47 #46 and (#38 or #23) 5093
#48 #24 or #31 or #47 in Other Reviews 972

A.6: Source: Cochrane Library - Issue 1 of 4, Jan 2014

Interface / URL: Cochrane Library/Wiley Interscience
Search date: 26/02/14
Retrieved records from DARE: 639
Search strategy:

#1 MeSH descriptor: [Sunlight] this term only 240
#2 MeSH descriptor: [Ultraviolet Rays] this term only 511
#3 MeSH descriptor: [Sunburn] this term only 149
#4 MeSH descriptor: [Sunbathing] this term only 17
#5 MeSH descriptor: [Suntan] this term only 4
#6 MeSH descriptor: [Sunscreening Agents] explode all trees 212
#7 MeSH descriptor: [Sun Protection Factor] this term only 6
#8 ((sun or suns or sunning or sunshine or sunlight*) near/3 (damag* or protect* or safe or safety or risk* or benefit* or beneficial or index or indexes or exposure* or overexposure* or expose* or overexpose* or underexpose* or underexposure*)) 643
#9 ((uv or uva or uv-a or uvb or uv-b or uvc or uv-c or ultra-violet or ultraviolet or solar) near/2 (ray* or radiation or irradiat* or protect* or index or indexes or exposure* or overexposure* or expose* or overexpose*)) 1357
#10 (sunscreen* or sunblock* or spf or sunburn* or photo-damag* or photodamag* or photoag* or photo-expos* or photoexpos*) 955
#11 (sunbath* or suntan* or tan or tans or tanning or tanned or sunbed* or sunlamp* or solarium* or solaria*) 3460
#12 MeSH descriptor: [Food Habits] this term only 961
#13 MeSH descriptor: [Food Preferences] this term only 408
#14 MeSH descriptor: [Nutrition Therapy] this term only 56
#15 (diet* or diets or dietary):ti 9641
#16 ((health* or unhealthy or poor* or behav* or advic* or recommend*) near/3 (eat* or diet* or food* or nutrition*)):ti 1002
#17 ((fruit* or vegetable* or sugar* or salt* or fat or fats or fatty or fibre) near/2 (intake* or consum* or eat* or ate)):ti 655
#18 MeSH descriptor: [Alcohol-Related Disorders] explode all trees and with qualifier(s): [Prevention & control - PC] 419
#19 MeSH descriptor: [Alcohol Drinking] this term only 2249
#20 (alcohol* near/3 (consum* or misuse or abuse or intoxication or harmful or excess* or binge or bingeing or hazardous or heavy or temperance or abstinence or abstain*)):ti 817
#21 ((change* or changing or modification* or modify or modifying) near/2 (behavior* or behaviour* or lifestyle* or life style*) near/2 (intervention* or therapy or therapies or program*)):ti 141
#22 ("physical activity" or "healthy eating" or fruit* or vegetable* or exercis* or fitness or alcohol):ti 24351
#23 (smok* near/5 (stop* or cessation or quit*)):ti 3141
#24 or #1-#23 44177#25 MeSH descriptor: [Communication] this term only 1262
#26 MeSH descriptor: [Marketing] explode all trees 307
#27 MeSH descriptor: [Communication Barriers] this term only 76

#28 MeSH descriptor: [Health Communication] this term only 23
#29 MeSH descriptor: [Information Dissemination] this term only 157
#30 MeSH descriptor: [Persuasive Communication] this term only 190
#31 MeSH descriptor: [Social Networking] this term only 12
#32 MeSH descriptor: [Communications Media] this term only 17
#33 MeSH descriptor: [Mass Media] explode all trees 1398
#34 MeSH descriptor: [Health Education] this term only 2750
#35 MeSH descriptor: [Consumer Health Information] explode all trees 125
#36 MeSH descriptor: [Patient Education as Topic] this term only 6065
#37 MeSH descriptor: [Decision Support Techniques] this term only 1497
#38 MeSH descriptor: [Audiovisual Aids] this term only 250
#39 MeSH descriptor: [Health Promotion] this term only 3328
#40 MeSH descriptor: [Probability Learning] this term only 42
#41 MeSH descriptor: [Decision Making] this term only 1470
#42 MeSH descriptor: [Choice Behavior] this term only 738
#43 MeSH descriptor: [Risk Reduction Behavior] this term only 918
#44 MeSH descriptor: [Risk-Taking] this term only 839
#45 MeSH descriptor: [Risk] explode all trees 28749
#46 MeSH descriptor: [Uncertainty] this term only 79
#47 MeSH descriptor: [Pamphlets] this term only 572
#48 MeSH descriptor: [Electronic Mail] this term only 168
#49 MeSH descriptor: [Telephone] explode all trees 1552
#50 MeSH descriptor: [Internet] explode all trees 1525
#51 MeSH descriptor: [Educational Technology] explode all trees 2305
#52 MeSH descriptor: [Computer-Assisted Instruction] this term only 816
#53 MeSH descriptor: [Counseling] this term only 2691
#54 MeSH descriptor: [Directive Counseling] explode all trees 275
#55 "health communication":so 127
#56 ((risk* or probabilit* or uncertain* or message* or communicat* or counsel* or marketing or advice or advise* or advising) near/3 (frame or framed or framing)) 137
#57 ((risk* or probabilit* or uncertain*) near/3 (notif* or inform* or message* or communicat* or counsel* or marketing or advice or advise* or advising or perceive* or perception*)) 3732
#58 ((tailor* or personal* or individual* or targeted or targeting) near/3 (message* or material* or communica* or feedback or "feed back" or promot* or market*)) 2667
#59 ((cognitive or cognition or associative or affective or positiv* or negativ*) near/3 message*) 53
#60 ((health* or "health care" or lifestyle* or life next style*) near/2 (information or message* or communicat*)) 2365
#61 (decision next aid* or decision next tool* or decision next support*) 2397
#62 ((health* or "health care" or lifestyle* or life-style*) near/3 (aware* or knowledg* or attitude* or behavio* or value* or understand* or belief* or believe or perception* or perceive* or view or views or intention* or habit* or practice*)) 17485
#63 ((uncertain* or ambigu* or conflict* or missing or complex or vague or imprecis* or unclear) near/3 (evidence or message* or advice)) 1253
#64 (motivational next interview* or coach* or mentor* or counsel* or champion* or self-study or self-guided) 12579

#65 (pictogram* or picto-gram* or infogram* or info-gram* or infographic* or info-graphic*) 38
#66 ((graphic* or visual* or pictorial or illustra* or print*) near/3 (image* or stimuli or display* or dissemin* or present or presented or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 398
#67 ((data or statistic* or graph or graphs or numeric* or verbal or textual or written) near/3 (stimuli or display* or dissemin* or presented or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 254
#68 ("mass media" or "new media" or "social media" or social next network* or marketing or marketed or television* or tele-vision* or tv or advert* or billboard* or bill-board* or poster* or cinema* or video* or newspaper* or news or magazine* or journalis* or comic* or cartoon* or leaflet* or pamphlet* or booklet* or radio or radios or internet or multimedia or multi-media or web or website* or online or interactive or inter-active or facebook or twitter or youtube or you-tube or mail* next out* or mailout* or mail-shot* or mailshot*) 44128
#69 (phone* or telephone* or smartphone* or email* or electronic mail*or text next messag* or texting or sms or short next messag* or app or apps or android* or blackberr* or iphone* or ipad*) 13485
#70 (media* near/3 (coverage or report* or article* or content* or present* or discuss* or messag* or campaign*)) 3143
#71 (appearance near/3 (based or focused or orientated)) 70
#72 ((uv or ultra-violet or ultraviolet) near/4 (photo* or photograph* or image* or imaging)) 302
#73 Any MeSH descriptor with qualifier(s): [Education - ED] 4709
#74 or #25-#73 111031
#75 #24 and #74 in Other Reviews 639

A.7: Source: Cochrane Library - Issue 1 of 4 Jan 2014

Interface / URL: Cochrane Library/Wiley Interscience
Search date: 26/02/14
Retrieved records from HTA database: 64

#1 MeSH descriptor: [Communication] this term only 1262
#2 MeSH descriptor: [Communication Barriers] this term only 76
#3 MeSH descriptor: [Health Communication] this term only 23
#4 MeSH descriptor: [Information Dissemination] this term only 157
#5 MeSH descriptor: [Persuasive Communication] this term only 190
#6 MeSH descriptor: [Social Networking] this term only 12
#7 MeSH descriptor: [Communications Media] this term only 17
#8 MeSH descriptor: [Mass Media] explode all trees 1398
#9 MeSH descriptor: [Marketing] explode all trees 307
#10 MeSH descriptor: [Health Education] this term only 2750
#11 MeSH descriptor: [Consumer Health Information] explode all trees 125
#12 MeSH descriptor: [Patient Education as Topic] this term only 6065

#13 MeSH descriptor: [Decision Support Techniques] this term only 1497
#14 MeSH descriptor: [Audiovisual Aids] this term only 250
#15 MeSH descriptor: [Probability Learning] this term only 42
#16 #1-#15 12845
#17 MeSH descriptor: [Risk] explode all trees 28749
#18 MeSH descriptor: [Uncertainty] this term only 79
#19 MeSH descriptor: [Risk Reduction Behavior] this term only 918
#20 MeSH descriptor: [Risk-Taking] this term only 839
#21 MeSH descriptor: [Decision Making] this term only 1470
#22 MeSH descriptor: [Choice Behavior] this term only 738
#23 31950
#24 #16 and #23 2139
#25 "health communication":so 127
#26 ((risk* or probabilit* or uncertain* or message* or communicat* or counsel* or marketing or advice or advise* or advising or loss or gain or positiv* or negativ* or attribute* or goal*) near/3 (frame or framed or framing)) 179
#27 ((risk* or probabilit* or uncertain*) near/3 (notif* or message* or communicat* or counsel* or marketing or dissemin* or advice or advise* or advising or perceive* or perception*)) or ((risk* or probabilit* or uncertain*) near/1 inform*) 2378
#28 ((tailor* or personal* or individual* or targeted or targeting) near/3 (message* or material* or communica* or feedback or "feed back" or promot* or market*)) 2667
#29 ((cognitive or cognition or associative or affective or positiv* or negativ*) near/3 message*) 53
#30 (risk* near/2 present*) 837
#31 or #25-#30 5572
#32 MeSH descriptor: [Health Behavior] this term only 2144
#33 MeSH descriptor: [Attitude to Health] explode all trees 22747
#34 MeSH descriptor: [Awareness] this term only 671
#35 MeSH descriptor: [Health Promotion] this term only 3328
#36 ((health* or "health care" or lifestyle* or life-style*) near/3 (aware* or knowledg* or attitude* or behavio* or value* or understand* or belief* or believe or perception* or perceive* or view or views or intention* or habit* or practice*)):ti 1084
#37 ((uncertain* or ambigu* or conflict* or missing or complex or vague or imprecis* or unclear) near/3 (evidence or message* or advice)):ti 18
#38 or #32-#37 27293
#39 (motivational next interview* or coach* or mentor* or counsel* or champion* or self-study or self-guided) 12579
#40 ((graphic* or visual* or pictorial or illustra* or print*) near/3 (image* or stimuli or display* or dissemin* or present or presented or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 398
#41 ((data or statistic* or graph or graphs or numeric* or verbal or textual or written) near/3 (stimuli or display* or dissemin* or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 245
#42 (pictogram* or picto-gram* or pictograph* or picto-graph* or infogram* or info-gram* or infographic* or info-graphic*) 52

#43 ("mass media" or "new media" or "social media" or social next network* or marketing or marketed or television* or tele-vision* or tv or advert* or billboard* or bill-board* or poster* or cinema* or video* or newspaper* or news or magazine* or journalis* or comic* or cartoon* or leaflet* or pamphlet* or booklet* or radio or radios or internet or multimedia or multi-media or web or website* or online or on-line or interactive or inter-active or facebook or twitter or youtube or you-tube or mail* next out* or mailout* or mail-shot* or mailshot*):ti 8321
#44 (phone* or telephone* or smartphone* or email* or e-mail or electronic next mail* or text next messag* or texting or sms or short next messag* or app or apps or android* or blackberr* or iphone* or ipad*):ti 1906
#45 (media* near/3 (coverage or report* or article* or content* or present* or discuss* or messag* or campaign*)):ti 107
#46 or #39-#45 22529
#47 #46 and (#38 or #23) 5093
#48 #24 or #31 or #47 in Technology Assessments 64

A.8: Source: Cochrane Library - Issue 1 of 4 Jan 2014

Interface / URL: Cochrane Library/Wiley Interscience
Search date: 26/02/14
Retrieved records from HTA database: 79

#1 MeSH descriptor: [Sunlight] this term only 240
#2 MeSH descriptor: [Ultraviolet Rays] this term only 511
#3 MeSH descriptor: [Sunburn] this term only 149
#4 MeSH descriptor: [Sunbathing] this term only 17
#5 MeSH descriptor: [Suntan] this term only 4
#6 MeSH descriptor: [Sunscreening Agents] explode all trees 212
#7 MeSH descriptor: [Sun Protection Factor] this term only 6
#8 ((sun or suns or sunning or sunshine or sunlight*) near/3 (damag* or protect* or safe or safety or risk* or benefit* or beneficial or index or indexes or exposure* or overexposure* or expose* or overexpose* or underexpose* or underexposure*)) 643
#9 ((uv or uva or uv-a or uvb or uv-b or uvc or uv-c or ultra-violet or ultraviolet or solar) near/2 (ray* or radiation or irradiat* or protect* or index or indexes or exposure* or overexposure* or expose* or overexpose*)) 1357
#10 (sunscreen* or sunblock* or spf or sunburn* or photo-damag* or photodamag* or photoag* or photo-expos* or photoexpos*) 955
#11 (sunbath* or suntan* or tan or tans or tanning or tanned or sunbed* or sunlamp* or solarium* or solaria*) 3460
#12 MeSH descriptor: [Food Habits] this term only 961
#13 MeSH descriptor: [Food Preferences] this term only 408
#14 MeSH descriptor: [Nutrition Therapy] this term only 56
#15 (diet* or diets or dietary):ti 9641
#16 ((health* or unhealthy or poor* or behav* or advic* or recommend*) near/3 (eat* or diet* or food* or nutrition*)):ti 1002
#17 ((fruit* or vegetable* or sugar* or salt* or fat or fats or fatty or fibre) near/2 (intake* or consum* or eat* or ate)):ti 655

#18 MeSH descriptor: [Alcohol-Related Disorders] explode all trees and with qualifier(s): [Prevention & control - PC] 419
#19 MeSH descriptor: [Alcohol Drinking] this term only 2249
#20 (alcohol* near/3 (consum* or misuse or abuse or intoxication or harmful or excess* or binge or bingeing or hazardous or heavy or temperance or abstinence or abstain*)):ti 817
#21 ((change* or changing or modification* or modify or modifying) near/2 (behavior* or behaviour* or lifestyle* or life style*) near/2 (intervention* or therapy or therapies or program*)):ti 141
#22 ("physical activity" or "healthy eating" or fruit* or vegetable* or exercis* or fitness or alcohol):ti 24351
#23 (smok* near/5 (stop* or cessation or quit*)):ti 3141
#24 44177
#25 MeSH descriptor: [Communication] this term only 1262
#26 MeSH descriptor: [Marketing] explode all trees 307
#27 MeSH descriptor: [Communication Barriers] this term only 76
#28 MeSH descriptor: [Health Communication] this term only 23
#29 MeSH descriptor: [Information Dissemination] this term only 157
#30 MeSH descriptor: [Persuasive Communication] this term only 190
#31 MeSH descriptor: [Social Networking] this term only 12
#32 MeSH descriptor: [Communications Media] this term only 17
#33 MeSH descriptor: [Mass Media] explode all trees 1398
#34 MeSH descriptor: [Health Education] this term only 2750
#35 MeSH descriptor: [Consumer Health Information] explode all trees 125
#36 MeSH descriptor: [Patient Education as Topic] this term only 6065
#37 MeSH descriptor: [Decision Support Techniques] this term only 1497
#38 MeSH descriptor: [Audiovisual Aids] this term only 250
#39 MeSH descriptor: [Health Promotion] this term only 3328
#40 MeSH descriptor: [Probability Learning] this term only 42
#41 MeSH descriptor: [Decision Making] this term only 1470
#42 MeSH descriptor: [Choice Behavior] this term only 738
#43 MeSH descriptor: [Risk Reduction Behavior] this term only 918
#44 MeSH descriptor: [Risk-Taking] this term only 839
#45 MeSH descriptor: [Risk] explode all trees 28749
#46 MeSH descriptor: [Uncertainty] this term only 79
#47 MeSH descriptor: [Pamphlets] this term only 572
#48 MeSH descriptor: [Electronic Mail] this term only 168
#49 MeSH descriptor: [Telephone] explode all trees 1552
#50 MeSH descriptor: [Internet] explode all trees 1525
#51 MeSH descriptor: [Educational Technology] explode all trees 2305
#52 MeSH descriptor: [Computer-Assisted Instruction] this term only 816
#53 MeSH descriptor: [Counseling] this term only 2691
#54 MeSH descriptor: [Directive Counseling] explode all trees 275
#55 "health communication":so 127
#56 ((risk* or probabilit* or uncertain* or message* or communicat* or counsel* or marketing or advice or advise* or advising) near/3 (frame or framed or framing)) 137

#57 ((risk* or probabilit* or uncertain*) near/3 (notif* or inform* or message* or communicat* or counsel* or marketing or advice or advise* or advising or perceive* or perception*)) 3732
#58 ((tailor* or personal* or individual* or targeted or targeting) near/3 (message* or material* or communica* or feedback or "feed back" or promot* or market*)) 2667
#59 ((cognitive or cognition or associative or affective or positiv* or negativ*) near/3 message*) 53
#60 ((health* or "health care" or lifestyle* or life next style*) near/2 (information or message* or communicat*)) 2365
#61 (decision next aid* or decision next tool* or decision next support*) 2397
#62 ((health* or "health care" or lifestyle* or life-style*) near/3 (aware* or knowledg* or attitude* or behavio* or value* or understand* or belief* or believe or perception* or perceive* or view or views or intention* or habit* or practice*)) 17485
#63 ((uncertain* or ambigu* or conflict* or missing or complex or vague or imprecis* or unclear) near/3 (evidence or message* or advice)) 1253
#64 (motivational next interview* or coach* or mentor* or counsel* or champion* or self-study or self-guided) 12579
#65 (pictogram* or picto-gram* or infogram* or info-gram* or infographic* or info-graphic*) 38
#66 ((graphic* or visual* or pictorial or illustra* or print*) near/3 (image* or stimuli or display* or dissemin* or present or presented or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 398
#67 ((data or statistic* or graph or graphs or numeric* or verbal or textual or written) near/3 (stimuli or display* or dissemin* or presented or presentation* or communicat* or message* or advice or feedback or "feed back" or inform or information or aid or aids or representation* or material*)):ti 254
#68 ("mass media" or "new media" or "social media" or social next network* or marketing or marketed or television* or tele-vision* or tv or advert* or billboard* or bill-board* or poster* or cinema* or video* or newspaper* or news or magazine* or journalis* or comic* or cartoon* or leaflet* or pamphlet* or booklet* or radio or radios or internet or multimedia or multi-media or web or website* or online or interactive or inter-active or facebook or twitter or youtube or you-tube or mail* next out* or mailout* or mail-shot* or mailshot*) 44128
#69 (phone* or telephone* or smartphone* or email* or electronic mail*or text next messag* or texting or sms or short next messag* or app or apps or android* or blackberr* or iphone* or ipad*) 13485
#70 (media* near/3 (coverage or report* or article* or content* or present* or discuss* or messag* or campaign*)) 3143
#71 (appearance near/3 (based or focused or orientated)) 70
#72 ((uv or ultra-violet or ultraviolet) near/4 (photo* or photograph* or image* or imaging)) 302
#73 Any MeSH descriptor with qualifier(s): [Education - ED] 4709
#74 or #25-#73 111031
#75 #24 and #74 in Technology Assessments 79

Contacting experts:

The following highly cited and/or published authors in risk communication or the communication of health messages were contacted via email on 31 March 2014 with the message below:

- Prof David Spiegelhalter. Winton Professor of the Public Understanding of Risk. University of Cambridge. D.Spiegelhalter@statslab.cam.ac.uk
- Dr. Jonathan Van 't Riet. Assistant Professor of Persuasive Communication. Radboud University Nijmegen (Netherlands). j.vantriet@maw.ru.nl
- Dr Elie Akl. Associate Professor, School of Medicine and Biomedical Sciences, University at Buffalo. elieakl@buffalo.edu
- Professor Peter Salovey. President, Yale University. Peter.Salovey@yale.edu
- Professor Glyn Elwyn. Cardiff University, School of Medicine. ElwynG@cf.ac.uk
- Professor Adrian Edwards. Director of the Institute of Primary Care and Public Health, Cardiff University. ElwynG@cf.ac.uk
- Brian J. Zikmund Fischer. Assistant Professor - Health Behavior and Health Education, School of Public Health, University of Michigan bzikmund@umich.edu
- Alexander J Rothman. Department of Psychology, University of Minnesota. rothm001@umn.edu
- John A. Updegraff. Associate Professor, Department of Psychology, Kent State University. jupdegr1@kent.edu
- Prof. Dr. Robert.A.C. Ruiter. Professor of Applied Psychology, Maastricht University. r.ruiter@maastrichtuniversity.nl
- Kristel M. Gallagher. Associate Professor, Keystone College. kristel.gallagher@keystone.edu
- Dr. Vivianne Visschers. Professor of Consumer Behaviour, ETH Zurich. vvisschers@ethz.ch
- Dr Petra Dickmann. Research Fellow, LSE Health. p.dickmann@lse.ac.uk
- Professor Daniel O'Keefe. Owen L. Coon Professor of Argumentation and Debate, Northwestern University. d-okeefe@northwestern.edu

Email sent to Professor Spiegelhalter 31 March 2014

Request for evidence to inform NICE guidance - risk communication

Dear Professor Spiegelhalter,

York Health Economics Consortium has been commissioned by the National Institute for Health and Care Excellence (NICE) to produce a number of evidence reviews and economic modelling to inform the development of public health guidance titled "Sunlight exposure: communicating the benefits and risks of ultraviolet light to the general public". We understand that NICE has been in contact with you as an expert in risk communication and public perceptions of risk.

As part of our work to inform the guidance, we have been asked to undertake a pragmatic, non-exhaustive, high level summary of the findings of selected systematic reviews which have explored the effectiveness of risk communication and/or the framing of health messages (not just in the context

of sunlight exposure). NICE have agreed that we will identify the ten most useful and/or relevant reviews.

We have prepared a shortlist of systematic reviews based on our literature searches (attached). However, we would be grateful if you could alert us to any important systematic reviews that we have not included in the shortlist, that you feel should be considered. Unfortunately the timescales for this project are very short, and therefore if you would like to propose a review for inclusion, we would be incredibly grateful if you could respond by 7 April.

Please do get in touch if you have any questions or would like to discuss further.

Email sent to all other experts 31 March 2014

Review of the effectiveness of risk communication - request for evidence

Dear …..

We are currently undertaking a review of the effectiveness of risk communication, including the framing of health messages. Given your expertise and publication history in this context, we would be very grateful if you could suggest any additional evidence for us to consider. Please see below for more information about this project.

York Health Economics Consortium has been commissioned by the National Institute for Health and Care Excellence (NICE) to produce a number of evidence reviews and economic modelling to inform the development of public health guidance titled "Sunlight exposure: communicating the benefits and risks of ultraviolet light to the general public". You can find out more about the development of this guidance on the NICE webpages http://guidance.nice.org.uk/PHG/77.

As part of this work, we have been asked to undertake a pragmatic, non-exhaustive, high level summary of the findings of selected systematic reviews which have explored the effectiveness of risk communication and/or the framing of health messages (not just in the context of sunlight exposure). NICE have agreed that we will identify the ten most useful and/or relevant reviews.

We have prepared a shortlist of systematic reviews based on our literature searches (attached). However, we would be grateful if you could alert us to any important systematic reviews that we have not included in the shortlist, that you feel should be considered. Unfortunately the timescales for this project are very short, and therefore if you would like to propose a review for inclusion, we would be incredibly grateful if you could respond by 7 April.

Please do get in touch if you have any questions or would like to discuss further.

Chaser email sent to non-responders to remind them of the deadline 07/04/14

Review of the effectiveness of risk communication - request for evidence

Dear

Just a quick reminder to say that if you wish to suggest a systematic review on risk communication for consideration, the deadline is 5.00pm this afternoon.

Responses were received from 13 of the experts as follows:

Professor David Speigelhalter

Dear Hannah

Many thanks for this . I can't identify anything left out, but that doesn't necessarily mean too much as I don't know the literature well. There is another literature on visualisations, of course.

On a superficial view, the conclusions seem rather weak! Personally I think it would be very valuable to identify some successful case studies - there is not much firm guidance from the literature

Best wishes

David

Dr. Jonathan Van 't Riet

Dear Dr. Wood,

The list looks good, I have no additional suggestions.

Best of luck with your work!

Kind regards,
Jonathan

Dr Elie Akl

Dear Hannah
Great that you are working on this
No other SR comes to mind. Just make sure to review the discussion sections of our 2 papers as we might have discussed other relevant SRs
Best of luck
Elie

Professor Peter Salovey. (Amy Latimer responded on his behalf)

Hello Hannah,

Peter Salovey passed along your note. Your list of reviews is quite thorough. I have attached an additional review specific to physical activity the might be of use. You might also find the following paper helpful.

Clin Cancer Res. 2014 Jan 15;20(2):301-9. doi: 10.1158/1078-0432.CCR-13-2261. Epub 2014 Jan 16.
"Quitting smoking will benefit your health": the evolution of clinician messaging to encourage tobacco cessation.
Toll BA1, Rojewski AM, Duncan LR, Latimer-Cheung AE, Fucito LM, Boyer JL, O'Malley SS, Salovey P, Herbst RS.

Finally, I have attached a commentary for you to consider. As you prepare your review, I hope you will consider some of the points we raise - many reviews conclude that specific messaging techniques are ineffective in the absence of considering the quality and quantity of information delivered.

Best of luck with your review. I would be interested in receiving a copy of the final product.

Amy

Two studies attached:

Latimer AE, Brawley LR, Bassett RL. A systematic review of three approaches for constructing physical activity messages: What messages work and what improvements are needed? The international journal of behavioral nutrition and physical activity. 2010;7:36.

Latimer AE, Salovey P, Rothman AJ. The effectiveness of gain-framed messages for encouraging disease prevention behavior: is all hope lost? Journal of health communication. 2007;12(7):645-9.

Prof Glyn Elwyn

A few leads for you ;)

Helping patients decide: ten steps to better risk communication.
Fagerlin A, Zikmund-Fisher BJ, Ubel PA.
J Natl Cancer Inst. 2011 Oct 5;103(19):1436-43. doi: 10.1093/jnci/djr318. Epub 2011 Sep 19.
PMID: 21931068 [PubMed - indexed for MEDLINE] Free PMC Article
Related citations

Understanding risk and lessons for clinical risk communication about treatment preferences
A Edwards, G Elwyn - Quality in Health Care, 2001 - qualitysafety.bmj.com
Abstract This paper defines risk and its component elements and describes where clinical practice may be starting from in terms of what is reported in the literature about understanding risks and the information requirements of consumers. It notes briefly how ...
Cited by 122 Related articles All 7 versions Web of Science: 32 Cite Saved
Resources @ Dartmouth

The Effectiveness of One-to-one Risk-communication Interventions in Health Care A Systematic Review
A Edwards, K Hood, E Matthews… - Medical Decision …, 2000 - mdm.sagepub.com
Objectives. To assess whether risk-communication interventions are associated with changes in patient knowledge, attitudes, and behaviors, and to identify aspects of these interventions that modify these effects. Design. Systematic review. Data sources. 96 ...
Cited by 121 Related articles All 6 versions Web of Science: 74 Cite Saved
Resources @ Dartmouth

How should effectiveness of risk communication to aid patients' decisions be judged? A review of the literature
A Edwards, G Elwyn - Medical Decision Making, 1999 - mdm.sagepub.com
Abstract Risk-communication interventions are associated with benefits at both the individual and the public health level. However, the types of outcomes used to assess the effec tiveness of risk-communication interventions vary greatly. This makes synthesis of ...
Cited by 104 Related articles All 6 versions Web of Science: 65 Cite Saved

Professor Adrian Edwards

thanks Hannah for your interest;
The main recent one to draw your attention to is our BMC paper last year for the IPDAS collaboration - attached.
My Cochrane review on personalised risk communication in screening is also relevant. Depends a bit what your question is exactly.
An old one was the 'Framing' review, but this has been superseded by more recent ones (including Akl from Cochrane which you have) I'm sure.
Hope these help;
best
Adrian Edwards

Brian J. Zikmund-Fisher

Ms. Wood,

Of your list, #6 is not a systematic review but a narrative review that is not exhaustive. I believe there are better resources.

You should consider a recent narrative review that, while not formally systematic, tapped the expertise of over a dozen different risk communication experts in service of developing guidance for the International Patient Decision Aid Standards Collaboration. The report is available as part of a special journal supplement: http://www.biomedcentral.com/1472-6947/13/S2/S7

I also draw your attention to the book published recently by the US Food and Drug Administration's Risk Communication Advisory Committee:
Fischhoff, Baruch, Noel T. Brewer, and Julie Downs. Communicating Risks and Benefits: An Evidence-Based User's Guide. Silver Spring, MD: Food and Drug Administration, US Department of Health and Human Services, August 2011. http://www.fda.gov/AboutFDA/ReportsManualsForms/Reports/ucm268078.htm

Brian Zikmund-Fisher

Alexander Rothman

Dear Hannah,

I was out of the office nearly all of last week and did not have a chance to review your email. Given your tight time line, I would quickly offer the following suggestions. I've provided references below. I wasn't sure if you needed the papers themselves.

Rothman, A.J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. Psychological Bulletin, 121, 3-19. PMID: 9000890

Rothman, A.J., Wlaschin, J., Bartels, R., Latimer, A., & Salovey, P. (2008). How persons and situations regulate message framing effects: The study of health behavior. In A. Elliot (Ed.), Handbook of approach and avoidance motivation. (pp. 475-486). Mahwah, NJ: LEA.

Updegraff, J.A., & Rothman, A.J. (2013). Health message framing: Moderators, mediators, and mysteries. Social and Personality Psychology Compass, 7/9, 668-679.

Alex

John A. Updegraff

Hi Hannah – this looks like a pretty comprehensive set of reviews. – John

Prof. Dr. Robert. A.C. Ruiter

Dear Hannah,

I miss three reviews by O'Keefe and Jensen (2006, 2007, 2009):

O'Keefe, D. J., & Jensen, J. D. (2006). The advantages of compliance or the disadvantages of noncompliance? A meta-analytic review of the relative persuasive effectiveness of gain-framed and loss-framed messages. In C. S. Beck (Ed.), Communication yearbook 30 (Vol. 30, pp. 1-44). Mahwah, NJ: Lawrence Erlbaum Associates.
O'Keefe, D. J., & Jensen, J. D. (2007). The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease prevention behaviors: A meta-analytic review. Journal of Health Communication, 12(7), 623-644. doi: 10.1080/10810730701615198
O'Keefe, D. J., & Jensen, J. D. (2009). The Relative Persuasiveness of GainFramed and Loss-Framed Messages for Encouraging Disease Detection Behaviors: A Meta-Analytic Review. Journal of Communication, 59, 296-316. doi: 10.1111/j.1460-2466.2009.01417.x

Good luck with the project.

Rob

Dear Hannah,

The attached paper just came out. It might be of interest to you.

Best wishes,

Rob

Attached:

Van 't Riet J, Cox AD, Cox D, Zimet GD, De Bruijn GJ, Van den Putte B, *et al.* Does perceived risk influence the effects of message framing? A new investigation of a widely held notion. Psychology & health. 2014.

Kristel M. Gallagher

Hi Hannah,

Sounds like a very interesting project! As far as I can tell, you have nailed the big ones. I don't have anything further to add.

If you could keep me updated on the progress of the project, that would be fabulous. Best of luck!

Kristel :)

Dr. Vivianne Visschers

Dear Hannah,
That is quite a challenge, to review the most relevant and best reviews on the communication of health risks. I did a quick search through my personal literature database and found some additional studies you may want to consider. I didn't have much time to look in detail at them, so they may not fulfill your criteria.
Good luck on this project and I would be very interested in seeing the final report.
Best wishes,
Vivianne Visschers

The following list was attached:

Adams, A. M., & Smith, F. (2001). Risk perception and communication: recent developments and implications for anaesthesia. Anaesthesia, 56, 745-755.
risk communication review
anaesthesia, doctor-patient risk communication
verbal probabilities, risk scales, absolute and relative risk reduction, number needed to treat (and alternatives). Short descriptions of issues, not always supported by research data.

Ancker, J. S., Senathirajah, Y., Kukafka, R., & Starren, J. B. (2006). Design features of graphs in health risk communication: A systematic review. Journal of the American Medical Informatics Association, 13, 608-618.
risk communication, graphs, review, icon arrays, pictograms, bar graphs, line graphs, part-to-whole relationships, risk ladders, risk scales

Covello, V. T., von Winterfeldt, D., & Slovic, P. (1986). Risk communication: A review of the literature. Risk Abstracts, 3, 172-182.
risk communication review, problems, recommendations
general risk communication, risk communication problems (model of McGuire), not science based: general recommendations.

Edwards, A., Unigwe, S., Elwyn, G., & Hood, K. (2003). Effects of communicating individual risks in screening programmes: Cochrane systematic review. British Medical Journal, 327, 703-709.
risk communication review
medical screening, individualized risk communication, systematic review
Individualized risk communication vs. general risk communciation >> individualized RC leads to more screening, but how about informed decision making? No attention to effects of content or presentation mode. See also Edwards *et al.* (2006).

Fagerlin, A., Ubel, P. A., Smith, D. M., & Zikmund-Fisher, B. J. (2007). Making numbers matter: Present and future research in risk communication. American Journal of Health Behavior, 31, S47-S56.
numeracy, risk communication, subjective numeracy, medical decision making, review

Finucane, M. L. (2008). Emotion, affect, and risk communication with older adults: challenges and opportunities. Journal of Risk Research, 11, 983 - 997.
risk communicaiton, elderly, visual displays, graphs, affect, cognitions
Recent research suggests that emotion, affect, and cognition play important roles in risk perception and that their roles in judgment and decision-making processes may change over the lifespan. This paper discusses how emotion and affect might help or hinder risk communication with older adults. Currently, there are few guidelines for developing effective risk messages for the world's aging population, despite the array of complex risk decisions that come with increasing age and the importance of maintaining good decision making in later life. Age-related declines in cognitive abilities such as memory and processing speed, increased reliance on automatic processes, and adaptive motivational shifts toward focusing more on affective (especially positive) information mean that older and younger adults may respond differently to risk messages. Implications for specific risk information formats (probabilities, frequencies, visual displays, and narratives) are discussed and directions for future research are highlighted.

Ghosh, A. K., & Ghosh, K. (2005). Translating evidence-based information into effective risk communication: Current challenges and opportunities. Journal of Laboratory and Clinical Medicine, 145, 171-180.
review, risk perception, risk perception, numerical presentation, verbal presentation,

Julian-Reynier, C., Welkenhuysen, M., Hagoel, L., Decruyenaere, M., & Hopwood, P. (2003). Risk communication strategies: state of the art and effectiveness in the context of cancer genetic services. European Journal of Human Genetics, 11, 725-736.
risk communication review
cancer genetics
2 approaches of risk communication: probability-based approach and contextualized approach. Short description and evaluation of studies.

Numerical probabilities, verbal probabilities, life time risks, cumulative risks, visual displays, framing, tailoring.

Lipkus, I. M., & Hollands, J. G. (1999). The visual communication of risk. Journal of the National Cancer Institute Monographs, 25, 149-163.
visual format, graphs, pictures, visual displays. review, risk communication, charts, stick figure, risk ladder

Paling, J. (2003). Strategies to help patients understand risks. British Medical Journal, 327, 745-748.
risk communication review
health risk communication, doctor-patient
Issues: verbal probabilities, consistent denominator, framing, absolute risks, visual aids. Only few studies are mentioned, short descriptions of issues, also based on personal experience.

Rohrmann, B. (1992). The evaluation of risk communication effectiveness. Acta Psychologica, 81, 169-192.
risk communication review
General risk communication.
Evaluation of risk communication research and projects.
General recommendation: evaluation of RC should be included in project/research.

Rothman, A. J., & Kiviniemi, M. T. (1999). Treating people with information: An analysis and review of approaches to communicating health risk information. Journal of the National Cancer Institute Monographs, 25, 44-51.
risk communication review
health risk communication, informed decision making
2 approaches to risk communication: 1). probability based approach: accurate information (numerical and verbal probability information, cumulative risks, frequencies and percentages, risk ladders).
2). contextualized approach: antecendents (how, causes of risk, increasing availability of own risky behaviour) and consequences (what, simulation, visualisation of consequences) of risk.
Short descriptions of studies.

Spiegelhalter, D., Pearson, M., & Short, I. (2011). Visualizing uncertainty about the future. Science, 333, 1393-1400.
We are all faced with uncertainty about the future, but we can get the measure of some uncertainties in terms of probabilities. Probabilities are notoriously difficult to communicate effectively to lay audiences, and in this review we examine current practice for communicating uncertainties visually, using examples drawn from sport, weather, climate, health, economics, and politics. Despite the burgeoning interest in infographics, there is limited experimental evidence on how different types of visualizations are processed and understood, although the effectiveness of some graphics clearly depends on the relative numeracy of an audience. Fortunately, it is increasingly easy to present data in the form of interactive visualizations and in multiple types of representation that can be adjusted to user needs and capabilities. Nonetheless, communicating deeper uncertainties resulting from incomplete or disputed knowledge—or from essential indeterminacy about the future—remains a challenge.

Thomson, R., Edwards, A., & Grey, J. (2005). Risk communication in the clinical consultation. Clinical Medicine, 5, 465-469.
risk communication review
doctor-patient communication

short description of studies about: frequencies vs. percentages, relative risks, base rate neglect, verbal descriptions, framing, time framing, graphical presentation, tailoring.

Visschers, V. H. M., Wiedemann, P. M., Gutscher, H., Kurzenhäuser, S., Seidl, R., Jardine, C. G., *et al.* (2012). Affect-inducing risk communication: current knowledge and future directions. Journal of Risk Research, 15, 257-271.
Affect appears to have a central role in people?s risk perception and decision-making. It is, therefore, important that researchers and communicators know how risk communication can induce affect or more specific emotions. In this paper, several studies that examined affect-inducing cues presented in and around risk communication are discussed. We thereby distinguish between integral affect induction, meaning through the risk message, and incidental affect induction, which occurs unintentional through the risk communication context. The following cues are discussed: emotion induction, fear appeals, outrage factors, risk stories, probability information, uncertainty information and graphs and images. Relatively few studies assessed the effect of their risk communication material on affect or specific emotions. Incidental affect induction appeared to occur more often than expected based on its factual content. Risk communication easily seems to induce affect incidentally and, thus, may be difficult to control. We, therefore, argue that incidental affect induction is more influential than integral affect induction. Implications for further research and risk communication in practice are given. Based on this overview, we strongly suggest considering and empirically assessing the affect-inducing potential of risk communication formats and content during their development and evaluation.

Waters, E. A. (2008). Feeling good, feeling bad, and feeling at-risk: a review of incidental affect's influence on likelihood estimates of health hazards and life events. Journal of Risk Research, 11, 569 - 595.
affect, priming, risk perception, communication, ambient mood, likelihood estimates, probability estimates, review
The recent increased interest among researchers in the ways in which emotion, mood, and affect influence risk perceptions is an important step in better understanding how people understand and perceive health risk information. However, the literature involving incidental affect (ambient mood) is not as well known. The 23 years of research examining incidental affect's influence on likelihood estimates of health hazards and life events has not previously been integrated and examined critically. This comprehensive review found that incidental affect influenced likelihood estimates in a predictable way. Individuals experiencing positive affect made more optimistic likelihood estimates than did individuals experiencing negative affect. Individuals experiencing negative affect made more pessimistic likelihood estimates than did individuals experiencing positive affect. Anger was unique among negatively valenced emotions by influencing judgments in the same way as positive affect (i.e., relatively optimistic likelihood estimates). Three theoretical explanations are offered, including one that addresses the role of anger specifically.

Professor Daniel O'Keefe

Dear Ms. Wood,
Thanks for your inquiry. The attached document lists several papers that might be of interest. (Of course, it may well be that the team already knows of many of these and found them less suitable than the ones on the current list.)
Best of luck with the project,
Dan O'Keefe

The following list was attached:

de Hoog, N., Stroebe, W., & de Wit, J. (2007). The impact of vulnerability to and severity of a health risk on processing and acceptance of fear-arousing communications: A meta-analysis. Review of General Psychology, 11, 258-285. doi: 10.1037/1089-2680.11.3.258 [This meta-analysis of studies of the persuasive impact of fear appeals evaluated the contribution of our stage model of the processing of fear-arousing communications relative to other fear appeal theories. In contrast to other theories, our stage model (a) specifies the cognitive processes underlying persuasion through fear-arousing communications, (b) proposes that threat-induced defensive processing does not interfere with the effectiveness of fear-arousing communications but actually contributes to it, and (c) predicts that vulnerability and severity manipulations have differential effects on measures of attitude as compared with intention and behavior. To evaluate these predictions, the authors expanded on previous meta-analyses by assessing the independent as well as joint effects of vulnerability to and severity of a risk, both on information processing and on measures of persuasion (attitude, intention, behavior). Overall, findings were consistent with the stage model. The theoretical and practical implications of these findings are discussed.]

Fischhoff, B., Brewer, N. T., & Downs, J. T. (Eds.). (2011). Communicating risks and benefits: An evidence-based user's guide. US Food and Drug Administration (FDA), US Department of Health and Human Services, August 2011. available at: http://www.fda.gov/ScienceResearch/SpecialTopics/RiskCommunication/ default.htm

Krebs, P., Prochaska, J. O., & Rossi, J. S. (2010). A meta-analysis of computer-tailored interventions for health behavior change. Preventive Medicine, 51, 214-221. doi: 10.1016/j.ypmed.2010.06.004 [abstract: Objective: Computer-tailored interventions have become increasingly common for facilitating improvement in behaviors related to chronic disease and health promotion. A sufficient number of outcome studies from these interventions are now available to facilitate the quantitative analysis of effect sizes, permitting moderator analyses that were not possible with previous systematic reviews. Method: The present study employs meta-analytic techniques to assess the mean effect for 88 computer-tailored interventions published between 1988 and 2009 focusing on four health behaviors: smoking cessation, physical activity, eating a healthy diet, and receiving regular mammography screening. Effect sizes were calculated using Hedges g. Study, tailoring, and demographic moderators were examined by analyzing between-group variance and meta-regression. Results: Clinically and statistically significant overall effect sizes were found across each of the four behaviors. While effect sizes decreased after intervention completion, dynamically tailored interventions were found to have increased efficacy over time as compared with tailored interventions based on one assessment only. Study effects did not differ across communication channels nor decline when up to three behaviors were identified for intervention simultaneously. Conclusion: This study demonstrates that computer-tailored interventions have the potential to improve health behaviors and suggests strategies that may lead to greater effectiveness of these techniques.]

Lustria, M. L. A., Noar, S. M., Cortese, J., Van Stee, S. K., Glueckauf, R. L, & Lee, J. (2013). A meta-analysis of web-delivered tailored health behavior change interventions. Journal of Health Communication, 18, 1039-1069. doi: 10.1080/10810730.2013.768727 [abstract: Web-based tailored intervention programs show considerable promise in effecting health-promoting behaviors and improving health outcomes across a variety of medical conditions and patient populations. This meta-analysis compares the effects of tailored versus nontailored web-based interventions on health behaviors and explores the influence of key moderators on treatment outcomes. Forty experimental and quasi-experimental studies (N =20,180) met criteria for inclusion and were analyzed using meta-analytic procedures. The findings indicated that web-based tailored interventions effected significantly greater improvement in health outcomes as compared with control conditions both at posttesting, d =.139 (95% CI = .111, .166,p <.001,k =40) and at follow-up, d =.158 (95% CI = .124, .192,p <.001,k

=21). The authors found no evidence of publication bias. These results provided further support for the differential benefits of tailored web-based interventions over nontailored approaches. Analysis of participant/descriptive, intervention, and methodological moderators shed some light on factors that may be important to the success of tailored interventions. Implications of these findings and directions for future research are discussed.]

Peters, G.-J. Y., Ruiter, R. A. C., & Kok, G. (2012). Threatening communication: A critical re-analysis and a revised meta-analytic test of fear appeal theory. Health Psychology Review. doi: 10.1080/17437199.2012.703527 [abstract: Despite decades of research, consensus regarding the dynamics of fear appeals remains elusive. A meta-analysis was conducted that was designed to resolve this controversy. Publications that were included in previous meta-analyses were re-analysed, and a number of additional publications were located. The inclusion criteria were full factorial orthogonal manipulations of threat and efficacy, and measurement of behaviour as an outcome. Fixed and random effects models were used to compute mean effect size estimates. Meta-analysis of the six studies that satisfied the inclusion criteria clearly showed a significant interaction between threat and efficacy, such that threat only had an effect under high efficacy (d = 0.31), and efficacy only had an effect under high threat (d = 0.71). Inconsistency in results regarding the effectiveness of threatening communication can likely be attributed to flawed methodology. Proper tests of fear appeal theory yielded the theoretically hypothesised interaction effect. Threatening communication should exclusively be used when pilot studies indicate that an intervention successfully enhances efficacy.]

Portnoy, D. B., Ferrer, R. A., Bergman, H. E., & Klein, W. M. P. (in press as of 2014). Changing deliberative and affective responses to health risk: A meta-analysis. Health Psychology Review. doi: 10.1080/17437199.2013.798829 [abstract: Perceptions of risk for health outcomes are integral to many theories of health behaviour, and are often targeted in interventions. Evidence suggests that affective responses to risk, including worry, are empirically distinguishable from commonly used perceived risk measures such as perceived susceptibility. The aims of this meta-analysis were to (1) examine if perceived susceptibility and worry can be independently influenced, and what manipulation types are most effective at changing each construct and (2) examine the efficacy of interventions to change worry and perceived susceptibility. Thirty-eight studies using 43 separate samples provided 78 independent comparisons that were meta-analysed using the inverse variance method with random-effects modelling. The overall effect size (d) was 0.50, 95% CI [0.362, 0.632] for perceived susceptibility; and 0.25, 95% CI [0.148, 0.349] for worry. Effect sizes for perceived susceptibility were significantly related to those for worry, B=0.495, p < 0.001. Moderators of these effects are discussed. The present meta-analysis provides further evidence that perceived susceptibility and worry are distinguishable but related constructs, and that it is possible to perturb one and not the other.]

Sheeran, P., Harris, P. R., & Epton, T. (2014). Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies. Psychological Bulletin, 140, 511-543. doi: 10.1037/a0033065 [abstract: Several theories construe risk appraisals as key determinants of decisions and actions, and this idea has been supported in correlational studies. However, correlational data cannot answer the question, "Does heightening risk appraisals change people's intentions and behavior?" The present review meta-analyzed experimental evidence in order to address this issue. We identified 4 elements of risk appraisal—risk perception, anticipatory emotion, anticipated emotion, and perceived severity—and located experiments that (a) engendered a statistically significant increase in risk appraisal among treatment compared to control participants and (b) measured subsequent intention or behavior. Heightening risk appraisals had effects of d+ = .31 (k = 217) and d+ = .23 (k = 93) on intention and behavior, respectively. There was evidence that the elements of risk appraisal combined to influence outcomes. For instance, heightening risk perceptions had larger effects on outcomes when anticipatory emotions or perceived severity was

also increased. Crucially, risk appraisal effects were augmented by coping appraisals: Risk appraisals had larger effects on outcomes when response efficacy and self-efficacy were enhanced or when response costs were reduced. The largest effect sizes were observed when risk appraisals, response efficacy, and self-efficacy were simultaneously heightened (d+ = .98 and .45, for intention and behavior, respectively). These findings indicate that heightening risk appraisals changes intentions and behavior. However, the direct effects of risk appraisals were generally small. Exploiting synergies among the elements of risk appraisal, and between risk appraisals and coping appraisals, should make for more effective behavior change interventions.]

Shen, L., & Dillard, J. P. (2014). Threat, fear, and persuasion: Review and critique of questions about functional form. Review of Communication Research, 2, 94-114. doi: 10.12840/issn.2255-4165.2014.02.01.004 [abstract: Theories of threat appeals have been rightly concerned with the form of the relationship between fear and persuasion: Linear or curvilinear. They have not, however, clearly distinguished the question as a between- or within-persons phenomenon. In fact, the literature often treats these two perspectives as if they were interchangeable. We show that between- versus within-person questions about functional form are distinct from one another. Previous research, which is the product of between-persons designs, shows a linear relationship between fear and persuasion. Between-persons studies cannot address the question of how changes in fear over time produce persuasion. Consequently, a major piece of the fear appeals-persuasion puzzle may have been overlooked. Reanalysis of an existing data set shows curvilinearity of fear in within-persons data and demonstrates that the curve predicts persuasion. Audience segmentation reveals different curves for different groups as well as differential associations between those curves and persuasion. Overall, the argument and the empirical results suggest that a great deal less is known about fear appeals than it is currently believed.]

Williams, A. L., Grogan, S., Clark-Carter, D., & Buckley, E. (2013). Appearance-based interventions to reduce ultraviolet exposure and/or increase sun protection intentions and behaviours: A systematic review and meta-analyses. British Journal of Health Psychology, 18, 182–217. doi: 10.1111/j.2044-8287.2012.02089.x [abstract: Objectives. A systematic review and meta-analyses were conducted to identify and review research examining the impact of appearance-based interventions on sun protection intentions and/or ultraviolet (UV) exposure behaviour. Methods. A search of 16 databases including PsycARTICLES, Cochrane Library and Web of Knowledge was conducted to identify studies examining the impact of appearance-based interventions on reducing UV exposure and/or increasing sun protection intentions and behaviours. A total of 21 articles met the inclusion criteria, and these studies were subjected to a systematic review and meta-analyses to determine the effectiveness of the interventions. Results. Interventions used a variety of techniques including UV technology and photoaging information. Study design and outcome measures varied. The research indicated that appearance-based interventions have a positive effect on UV exposure and sun protection intentions and behaviour. Conclusions. Findings suggest that interventions based on the appearance-damaging effects of UV exposure, and the positive effects of sun protection, may have a role in health promotion. It is concluded that there is a need for further research incorporating a wider range of participants, and using qualitative and mixed methods designs. Statement of contribution. What is already known on the subject? Recreational exposure to ultraviolet (UV) radiation, are the primary causes of all melanomas, leading to skin cancer. A previous systematic review (Dodd & Forshaw,) looking at the efficacy of appearance-focused interventions in skin cancer prevention, suggested that there were significant effects for UV protection behaviour after such interventions. What does this study add? An up-to-date systematic review of studies that has carried out appearance-based interventions to reduce UV exposure and/or increase sun protection intentions and behaviours. A meta-analysis of data providing statistical evidence indicating that appearance-based interventions have a positive effect on UV exposure and sun protection intentions and behaviour.

APPENDIX B

Detailed Quality Assessment of Included Studies

Included systematic reviews/overviews: detailed quality criteria and study risk of bias assessment

Study name: Akl 2011a **Reference: Akl EA, Oxman AD, Herrin J, *et al.* Framing of health information messages. Cochrane Database of Systematic Reviews 2011, Issue 12. Art. No.: CD006777. DOI:10.1002/14651858.CD006777.pub2.**		
AMSTAR criteria	**Assessed**	**Explanation**
1. Was an 'a priori' design provided?	Yes	The objectives of the review were stated and inclusion/exclusion criteria were reported. Although the authors did not specifically refer to a protocol, the publication of a protocol was documented under 'History' in the appendices.
2. Was there duplicate study selection and data extraction?	Yes	Study selection was a two-stage process: screening the titles and abstracts of retrieved references, then assessment based on full text articles. Two independent reviewers were involved at both stages. The data extraction was also conducted in duplicate by two independent reviewers. At all stages, any disagreements were resolved by discussion or by consulting a third reviewer.
3. Was a comprehensive literature search performed?	Yes	Four electronic databases, including Cochrane CENTRAL, were searched in June 2002 with update searches conducted in 2004 and 2007. The search years and search strategies were reported. Additional articles were sought using the 'Related Articles' feature of PubMed MEDLINE, searching databases for other publication by the first authors of included and other closely related studies, and by checking the reference lists of systematic reviews, included studies and excluded but closely related studies. Experts in the field were also contacted. The authors stated that the search was part of a larger search for studies assessing alternative presentations of the same empirical evidence about health.
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?	Unclear	The searches were not restricted by language or date, but the authors did not specifically state that they searched for reports regardless of their publication type. Unpublished reports may have been identified given that experts were contacted as part of the search process. The authors acknowledged in their discussion that the search strategy for the next update of this review would benefit from widening the scope to include trial registers and some grey literature.
5. Was a list of studies (included and excluded) provided?	Yes	Lists of included studies and excluded studies (with reasons for exclusion) were provided.
6. Were the characteristics of the included studies provided?	Unclear	Brief details of the included studies (population, intervention, numbers of studies and participants) were provided in an aggregated table according to comparison, and some further characteristics (population, response rate, number of comparisons, messages explored) were described in the text. However, the ranges of characteristics across the studies analysed were not reported.
7. Was the scientific quality of the included studies assessed and documented?	Yes	Eligible study designs were pre-specified in the inclusion criteria. The methodological quality of each included study was assessed on the basis of allocation concealment, randomization, objectivity and directness of outcomes. The risk of bias for each item was summarized overall and also tabulated for the individual studies. The quality of the underlying evidence for each outcome was graded using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach (references given).

Study name: Akl 2011a **Reference: Akl EA, Oxman AD, Herrin J, *et al.* Framing of health information messages. Cochrane Database of Systematic Reviews 2011, Issue 12. Art. No.: CD006777. DOI:10.1002/14651858.CD006777.pub2.**		
AMSTAR criteria	**Assessed**	**Explanation**
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?	Unclear	The results for each outcome message were reported with only a general statement of the quality of the contributing evidence. The methodological quality/risk of bias was summarized and discussed briefly, but separately from the findings of the included studies. It was not taken into consideration when drawing conclusions or making recommendations for future studies, although the quality of the available studies was noted and the impact of lower quality studies was addressed in the sensitivity analysis. The authors stated that future research should use high-quality randomized controlled trials.
9. Were the methods used to combine the findings of studies appropriate?	Yes	The heterogeneity of the results across studies was tested using the I^2 statistic. The authors pooled results from different studies when appropriate using random-effects models with the inverse variance approach. Multiple outcome measures for a single trial were pooled using a fixed-effect model. The statistical significance of the test for interaction was also taken into consideration for the pre-planned subgroup and sensitivity analyses.
10. Was the likelihood of publication bias assessed?	Yes	Inverted funnel plots of individual study results plotted against inverse of the variance were used to check for possible publication bias
11. Was the conflict of interest stated?	No	Declaration of interest and sources of support were declared for the systematic review, but not acknowledged for the individual included studies.

Study name: Akl 2011b **Reference: Akl EA, Oxman AD, Herrin J *et al.* Using alternative statistical formats for presenting risks and risk reductions. Cochrane Database of Systematic Reviews 2011, Issue 3. Art. No.: CD006776.DOI: 10.1002/14651858.CD006776.pub2.**		
AMSTAR criteria	**Assessed**	**Explanation**
1. Was an 'a priori' design provided?	Yes	The objectives of the review were stated and inclusion/exclusion criteria were reported. Although the authors did not specifically refer to a protocol, the publication of a protocol was documented under 'History' in the appendices.
2. Was there duplicate study selection and data extraction?	Yes	Study selection was a two-stage process: screening the titles and abstracts of retrieved references, then assessment based on full text articles. Two independent reviewers were involved at both stages. The data extraction was also conducted in duplicate by two independent reviewers. At all stages, any disagreements were resolved by discussion or by consulting a third reviewer.
3. Was a comprehensive literature search performed?	Yes	Four electronic databases, including Cochrane CENTRAL, were searched in June 2002 with update searches conducted in 2004 and 2007. The search years and search strategies were reported. Additional articles were sought using the 'Related Articles' feature of PubMed MEDLINE, searching databases for other publication by the first authors of included and other closely related studies, and by checking the reference lists of systematic reviews, included studies and excluded but closely related studies. Experts in the field were also contacted. The authors stated that the search was part of a larger search for studies assessing alternative presentations of the same empirical evidence about health.
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?	Unclear	The searches were not restricted by language or date, but the authors did not specifically state that they searched for reports regardless of their publication type. Unpublished reports may have been identified given that experts were contacted as part of the search process. The authors acknowledged in their discussion that the search strategy for the next update of this review would benefit from widening the scope to include trial registers and some grey literature.
5. Was a list of studies (included and excluded) provided?	Yes	Lists of included studies and excluded studies (with reasons for exclusion) were provided.
6. Were the characteristics of the included studies provided?	Unclear	Brief details of the included studies (population, intervention, numbers of studies and participants) were provided in an aggregated table according to comparison, and some further characteristics (population, response rate, number of comparisons, messages explored) were described in the text. However, the ranges of characteristics across the studies analysed were not reported.
7. Was the scientific quality of the included studies assessed and documented?	Yes	Eligible study designs were pre-specified in the inclusion criteria. The methodological quality of each included study was assessed on the basis of allocation concealment, randomization, objectivity and directness of outcomes. The risk of bias for each item was summarized overall and also tabulated for the individual studies. The quality of the underlying evidence for each outcome was graded using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach (references given).
8. Was the scientific quality of the included studies used	Unclear	The results for each outcome message were reported with only a general statement of the quality of the contributing evidence. The methodological quality/risk of bias was summarized and discussed

Study name: Akl 2011b **Reference: Akl EA, Oxman AD, Herrin J *et al.* Using alternative statistical formats for presenting risks and risk reductions. Cochrane Database of Systematic Reviews 2011, Issue 3. Art. No.: CD006776.DOI: 10.1002/14651858.CD006776.pub2.**		
AMSTAR criteria	**Assessed**	**Explanation**
appropriately in formulating conclusions?		briefly, but separately from the findings of the included studies. It was not taken into consideration when drawing conclusions or making recommendations for future studies, although the quality of the available studies was noted and the impact of lower quality studies was addressed in the sensitivity analysis. The authors stated that future research should use high-quality randomized controlled trials.
9. Were the methods used to combine the findings of studies appropriate?	Yes	The heterogeneity of the results across studies was tested using the I^2 statistic. The authors pooled results from different studies when appropriate using random-effects models with the inverse variance approach. Multiple outcome measures for a single trial were pooled using a fixed-effect model.
10. Was the likelihood of publication bias assessed?	Yes	Inverted funnel plots of individual study results plotted against inverse of the variance were used to investigate small study effects that may occur because of publication bias.
11. Was the conflict of interest stated?	No	Declaration of interest and sources of support were declared for the systematic review, but not acknowledged for the individual included studies.

Study name: Fry 2009 **Reference: Fry J P, Neff RA. Periodic prompts and reminders in health promotion and health behavior interventions: systematic review. Journal of Medical Internet Research 2009;11(2): e16.**		
AMSTAR criteria	**Assessed**	**Explanation**
1. Was an 'a priori' design provided?	Unclear.	The objective of the review was stated and some inclusion criteria were reported. However, there was no reference to a protocol, ethics approval or pre-determined/a priori published research objectives.
2. Was there duplicate study selection and data extraction?	Unclear	Titles and abstracts were reviewed to identify relevant articles and the inclusion criteria were applied. No other details of the study selection and data extraction processes were reported.
3. Was a comprehensive literature search performed?	Unclear	Five electronic databases/search tools were searched between February and April 2008; the search dates were not reported. Publication data was not an exclusion criterion. The search terms were given but not specific search strategies. The references of identified articles were reviewed but no other sources were
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?	No	The authors stated in their discussion that they did not examine the grey literature (unpublished documents and reports) on this topic, focusing instead on data that had been through the peer-review process.
5. Was a list of studies (included and excluded) provided?	No	A list of included and excluded studies was not provided.
6. Were the characteristics of the included studies provided?	Unclear	Tables summarising study design, number of participants, health behaviour, intervention duration and components, control group, follow-up, research questions and findings, and quality score were presented. Details of the population were lacking and ranges of characteristics across all studies were not reported.
7. Was the scientific quality of the included studies assessed and documented?	Yes	Study design was not pre-specified in the inclusion criteria. The quality of the evidence provided by each article was assessed using a rating system adapted from another review article, itself based on recommendations from the literature (references supplied). The lead author rated the articles on a scale from 0 to 10, on the basis of randomization, control group, sampling, analysis of main effect variables, follow-up and content. The quality score was reported separately for each included study.
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?	Unclear	The authors commented that studies with a low quality score were less informative because of their study design, and that the use of control groups, randomization and follow-up data collection in some studies strengthened their findings. The quality of the included studies was not taken into consideration when drawing conclusions, but the value of using no-treatment control groups and long-term follow-up data collections in future studies was highlighted.
9. Were the methods used to combine the findings of studies appropriate?	Yes	The authors stated that a meta-analysis was not feasible due to the variety of data collection methods and outcomes in the studies. Instead they provided a narrative description of their findings.
10. Was the likelihood of publication bias assessed?	No	Publication bias was not reported to have been assessed.
11. Was the conflict of interest stated?	No	Funding and conflicts of interest (none declared) were reported for the systematic review but not the individual included studies.

Study name: Lustria 2013 **Reference: Lustria ML, Noar SM, Cortese J, *et al.* A meta-analysis of web-delivered tailored health behavior change interventions. Journal of Health Communication. 2013;18(9):1039-69.**		
AMSTAR criteria	**Assessed**	**Explanation**
1. Was an 'a priori' design provided?	Unclear	The review did not state any overall research objectives, although it did pose research questions relating to an exploration of moderators that may influence the effects of tailoring. Inclusion criteria were reported. However, there was no reference to a protocol, ethics approval or pre-determined a priori published research objectives.
2. Was there duplicate study selection and data extraction?	Unclear	Citations and studies were screened in several stages. Two independent coders evaluated articles for eligibility and coded eligible studies. Operational definitions were summarized in a codebook to ensure accuracy and consistency throughout the coding process. Two coders tested and modified this codebook using an iterative process of data review, consultation, and consensual validation. It was not reported how any disagreements were resolved beyond the testing of the codebook.
3. Was a comprehensive literature search performed?	Yes	MEDLINE and PsycINFO were searched from Jan 1999 to Dec 2009; the search terms were provided. In addition, review articles and reference lists of selected articles were examined.
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?	No	The authors included studies published in English-language peer-reviewed journals.
5. Was a list of studies (included and excluded) provided?	No	The authors listed the included studies but did not provide a list of those excluded.
6. Were the characteristics of the included studies provided?	Unclear	Study focus, sample characteristics, intervention characteristics and comparison conditions were summarised in a table. Some summary characteristics for included studies were also tabulated, but not ranges of characteristics across all studies.
7. Was the scientific quality of the included studies assessed and documented?	Unclear	Study design was pre-specified, but the quality of the studies was not assessed.
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?	No	The quality of the studies was not assessed. Study design was not considered when drawing conclusions or formulating recommendations.
9. Were the methods used to combine the findings of studies appropriate?	No	Meta-analysis was conducted using a fixed-effect model. However, there was significant heterogeneity in the effect sizes, as found using the Q statistic.
10. Was the likelihood of publication bias assessed?	Yes	Publication bias was assessed by calculating fail-safe N values and applying the trim and fill procedure.
11. Was the conflict of interest stated?	No	Funding and conflicts of interest were neither reported for the systematic review nor the individual included studies.

Study name: McCormack 2013[15] **Reference: McCormack L, Sheridan S, Lewis M, *et al.* Communication and Dissemination Strategies To Facilitate the Use of Health-Related Evidence. Evidence Report/Technology Assessment No. 213. Rockville, MD: Agency for Healthcare Research and Quality; November 2013.**		
AMSTAR criteria	**Assessed**	**Explanation**
1. Was an 'a priori' design provided?	Yes	The research questions were stated and the inclusion/exclusion criteria were reported. A draft scope was finalized with input from a panel of experts and the research team and a final protocol was drafted following public comment. The methods for this review were reported to follow the AHRQ Methods Guide for Effectiveness and Comparative Effectiveness Reviews.
2. Was there duplicate study selection and data extraction?	Unclear	Paired investigators independently screened each title and abstract to exclude non-eligible studies, and then assessed the full-text of candidate articles to select studies for inclusion. At both stages, any disagreements regarding article inclusion were resolved by consensus, or by consulting a third reviewer. One reviewer extracted the data and a second reviewer confirmed the first reviewer's data abstraction for completeness and accuracy. Disagreement resolution at the data extraction stage was not reported.
3. Was a comprehensive literature search performed?	Yes	Five electronic databases, including Cochrane CENTRAL, were searched separately for each key question; the search dates and search strategies were reported for each review. The searches were limited by date and additional searches for grey literature were not carried out. The bibliographies of included studies and reference lists from landmark studies and related background articles were hand searched for additional studies that might have been missed.
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?	No	The authors stated that they did not conduct additional searches for grey literature. The inclusion criteria specified complete articles in English published between set dates; these were supported by documented exclusion criteria (exclusion of non-English publications)
5. Was a list of studies (included and excluded) provided?	No	For each review the authors noted the reference numbers of included articles, but did not provide a definitive list of the included studies. An overall list of excluded studies was provided in the appendices, with studies grouped according to reason for exclusion. However, studies excluded from each individual systematic review were not listed separately.
6. Were the characteristics of the included studies provided?	Yes	Information on the included studies was provided in tables summarising the design, setting, sample size, follow-up, strategy, population, intervention groups and outcomes. Further details of the populations were provided in the evidence tables
7. Was the scientific quality of the included studies assessed and documented?	Yes	Eligible study designs were pre-specified in the inclusion criteria. The risk of bias of individual studies (low, medium, or high) was assessed using criteria from the AHRQ "Methods Guide for Effectiveness and Comparative Effectiveness Reviews" and questions adapted from the RTI Item Bank, the Cochrane Risk of Bias tool and prior work by the USPTF. The potential for selection bias,

[15]This AHRQ report presented three separate systematic reviews – one for communication, one for dissemination and one for uncertainty – due to the complexity of the topic – all of which were conducted independently (each had their own research question, search strategy and inclusion/exclusion criteria). The details and scoring for each criterion of the AMSTAR checklist were identical for all three reviews, thus only one quality assessment has been tabulated here.

Study name: McCormack 2013[15] **Reference: McCormack L, Sheridan S, Lewis M, *et al.* Communication and Dissemination Strategies To Facilitate the Use of Health-Related Evidence. Evidence Report/Technology Assessment No. 213. Rockville, MD: Agency for Healthcare Research and Quality; November 2013.**		
AMSTAR criteria	**Assessed**	**Explanation**
		measurement bias, confounding, and inadequate power was assessed, in addition to potential biases in reporting. Reviewers resolved all disagreements about risk-of-bias ratings by discussion and consensus or by consulting a third, senior member of the team. The strength of the evidence supporting recommendations was graded on the basis of guidance established for the EPC Program. The risk of bias judgments for each item were tabulated for each included study. The authors also provided tables summarizing the strength of the evidence according to intervention for each review question.
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?	Unclear	The authors stated that they did not retain studies of high risk of bias for analysis, presentation in the results sections or strength of evidence grading. The quality of the individual studies was not specifically addressed within the narrative synthesis, or when drawing conclusions and making recommendations, although methodological considerations were highlighted within the discussion. However, risk of bias is a factor in grading the strength of evidence, and the strength of the evidence was reported and taken into consideration when discussing key points.
9. Were the methods used to combine the findings of studies appropriate?	Yes	The authors stated that the studies included in their reviews compared a wide range of interventions and a plethora of outcomes, and were sufficiently heterogeneous to preclude meta-analysis. A qualitative synthesis of the data was presented for each review.
10. Was the likelihood of publication bias assessed?	No	Publication bias was not reported to have been assessed.
11. Was the conflict of interest stated?	No	Funding was reported for the systematic review but not for the individual included studies. The report provided details of when conflicts of interest should be disclosed, but did not report any per se.

Study name: Sheeran 2014 **Reference: Sheeran P, Harris PR, Epton T. Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies. Psychological Bulletin. 2014;140(2):511-43.**		
AMSTAR criteria	**Assessed**	**Explanation**
1. Was an 'a priori' design provided?	Unclear	The objectives of the review were stated in the form of key questions to be answered. Inclusion criteria were also reported. However, there was no reference to a protocol, ethics approval or pre-determined a priori published research objectives.
2. Was there duplicate study selection and data extraction?	Unclear	Following an initial screening, the full-text articles of potentially relevant records were assessed for eligibility. All study characteristics were coded by one author and by one of five independent coders, and intercoder reliabilities were calculated. Any disagreements were resolved by discussion. The number of reviewers undertaking the study selection process was not reported.
3. Was a comprehensive literature search performed?	Yes	Web of Knowledge (incorporating Medline, Science Citation Index, Social Science Citation Index), PsycINFO, PubMed, and Dissertation Abstracts databases were searched for all available years to July 30, 2010; the search terms were reported. Ancestry and descendancy approaches were used to supplement the computerized literature searches. In press articles and unpublished studies were obtained by posting notices about the meta-analysis on relevant LISTSERVs and through personal contacts.
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?	Yes	The authors searched for unpublished literature. No restrictions (e.g. language) to the searches were reported.
5. Was a list of studies (included and excluded) provided?	No	A list of included and excluded studies was not provided, although it is possible that citations marked with an asterisk in the reference list compiled at the end of the article were those included in the meta-analysis.
6. Were the characteristics of the included studies provided?	No	Only the authors, behaviour studied and effect sizes were tabulated for the included studies; no other study characteristics were reported.
7. Was the scientific quality of the included studies assessed and documented?	Unclear	Some study design components were pre-specified in the inclusion criteria. The quality of the study was assessed using six indices addressing study design, control condition, adherence to protocol, randomization, blinding and treatment of attrition. The latter three indices were rated using the scoring criteria developed by Chalmers; it was unclear how the other three indices were rated. The quality scores of the included studies were not reported.
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?	No	The authors did not report or consider the quality of the included studies either when reporting their results or when drawing conclusions and making recommendations. They did, however, note the paucity of studies available to test particular hypotheses.
9. Were the methods used to combine the findings of studies appropriate?	Yes	Meta-analyses were conducted with a random-effects model, using the I^2 statistic to indicate the extent of heterogeneity. In their discussion, the authors highlighted the high level of heterogeneity that characterized the effect sizes, and stated that they had anticipated this issue by coding numerous potential moderator variables and assessing their impact on the effect sizes observed for intentions

Study name: Sheeran 2014 **Reference: Sheeran P, Harris PR, Epton T. Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies. Psychological Bulletin. 2014;140(2):511-43.**		
AMSTAR criteria	**Assessed**	**Explanation**
		and behavior.
10. Was the likelihood of publication bias assessed?	No	Publication bias was not reported to have been assessed.
11. Was the conflict of interest stated?	No	Funding was reported for the meta-analysis but not for the individual included studies.

Study name: Visschers 2009 **Reference: Visschers VH, Meertens RM, Passchier WW, *et al.* Probability information in risk communication: a review of the research literature. Risk Anal. 2009 Feb;29(2):267-87. doi: 10.1111/j.1539-6924.2008.01137.x. Epub 2008 Nov 5.**		
AMSTAR criteria	**Assessed**	**Explanation**
1. Was an 'a priori' design provided?	Unclear	The authors stated the purpose of their review and also provided the criteria that governed the selection of eligible studies. However, there was no reference to a protocol, ethics approval or pre-determined/a priori published research objectives.
2. Was there duplicate study selection and data extraction?	Unclear	Articles were initially screened on the basis of their title and abstract. The full-text articles of potentially eligible were then evaluated using the same criteria applied in the initial screening. Details of how many reviewers were involved in the study and data extraction processes were not reported.
3. Was a comprehensive literature search performed?	Unclear	Four electronic databases were searched in March 2006 and again in April 2007; the search years were not stated. The search strategy was described in the text with the search terms tabulated in terms of topics and items. Additional items were located by the 'snowball' method (pursuing interesting references based on their description in the articles already identified).
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?	Unclear	There was no specific mention of the review searching for reports regardless of their publication type, although unpublished reports may have been identified given that the authors used the 'snowball' method to identify further studies.
5. Was a list of studies (included and excluded) provided?	No	A list of included and excluded studies was not provided.
6. Were the characteristics of the included studies provided?	Unclear	Tables summarized some details of the study design, sample size, type of respondents, dependent and independent variables, and subject of the risk communications ("risk") reported in the included studies, with studies grouped according to topics of interest. However, the ranges of characteristics in all the studies analysed were not reported.
7. Was the scientific quality of the included studies assessed and documented?	No	Other than stipulating a research article, study design was not considered in the inclusion criteria and the quality of the included studies was not assessed. The quality of the evidence was given a star rating on the basis of the number of contributing studies, the number of different risks, and the strength of the findings obtained, but the quality of the individual studies does not appear to have been assessed.
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?	No	The quality of the included studies was not assessed. In addition, the quality of the evidence supporting each recommendation was not considered within the narrative synthesis, or when drawing conclusions and making recommendations. Instead, the author noted that using a star system to indicate the strength of the evidence allows the reader to easily evaluate the empirical basis of a certain recommendation and see whether empirical evidence is still lacking.
9. Were the methods used to combine the findings of studies appropriate?	Unclear	The studies were categorized according to presentation format. Recommendations within each category were only formulated when sufficient studies provided evidence relating to it. For each recommendation, the studies on which it was based were described, with studies backing the recommendation being discussed in more detail.
10. Was the likelihood of	No	Publication bias was not reported to have been assessed.

Study name: Visschers 2009 **Reference: Visschers VH, Meertens RM, Passchier WW, *et al.* Probability information in risk communication: a review of the research literature. Risk Anal. 2009 Feb;29(2):267-87. doi: 10.1111/j.1539-6924.2008.01137.x. Epub 2008 Nov 5.**		
AMSTAR criteria	**Assessed**	**Explanation**
publication bias assessed?		
11. Was the conflict of interest stated?	No	Conflicts of interests and financial support were not declared for this review, or for the individual studies it included.

Study name: Wanyonyi 2011 **Reference: Wanyonyi KL, Themessl-Huber M, Humphris G, *et al.* A systematic review and meta-analysis of face-to-face communication of tailored health messages: implications for practice. Patient Education and Counseling 2011;85(3): 348-355.**		
AMSTAR criteria	**Assessed**	**Explanation**
1. Was an 'a priori' design provided?	Unclear	The authors stated the objective of the review and provided clear inclusion criteria. However, there was no reference to a protocol, ethics approval or pre-determined/a priori published research objectives.
2. Was there duplicate study selection and data extraction?	Unclear	Four reviewers screened abstracts of identified records according to PRISMA guidelines, and publications meeting the inclusion criteria were further screened. The data extraction form was based on the CONSORT statement. No other details of the study selection and data extraction processes were reported.
3. Was a comprehensive literature search performed?	Yes	At least four electronic databases, including Cochrane CENTRAL, were searched; the search dates and a generic search strategy were given. The search strategies for individual databases were said to be available on request. Only English papers were included. In addition, the reference lists of related systematic reviews were handsearched, and requests were made for information of any unpublished data or additional information on the topic.
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?	No	The searches were restricted to English language papers.
5. Was a list of studies (included and excluded) provided?	No	A list of included and excluded studies was not provided.
6. Were the characteristics of the included studies provided?	Unclear	Tables summarizing the duration of follow-up, population characteristics, interventions, theoretical models, comparisons, outcome measures and results, and quality of the included studies, were presented. However, ranges of characteristics were not reported consistently for all studies.
7. Was the scientific quality of the included studies assessed and documented?	Yes	Eligible study designs were pre-specified in the inclusion criteria. The quality of the studies was assessed using the Cochrane Bias Assessment Tool, which comprises the following components:(i) adequate sequence generation, (ii) allocation concealment, (iii) blinding, (iv) to confirm if incomplete data was acknowledged, (v) selective reporting and (vi) various other biases (e.g. contamination). The criteria are based on a three category ordinal scale ranging from 'No' for low risk of bias, 'Unclear' for unknown risk of bias and 'Yes' for high risk. A table presenting the individual criterion scores for each included study was presented.
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?	No	The authors discussed the quality of the studies and highlighted the potential impact of self-reporting biases and selection biases, which were evident in many studies. However, they did not consider the quality of the studies when drawing conclusions and making recommendations.
9. Were the methods used to combine the findings of studies appropriate?	Yes	All six papers were deemed suitable for inclusion in a meta-analysis. The authors conducted a meta-analysis using a random-effects model having found the studies to be heterogeneous, as demonstrated by the Q statistic. The authors also commented in their discussion that the limited number of studies available for a comparison of the use of tailored messages alone vs. in combination with brief advice or

Study name: Wanyonyi 2011 **Reference: Wanyonyi KL, Themessl-Huber M, Humphris G, *et al.* A systematic review and meta-analysis of face-to-face communication of tailored health messages: implications for practice. Patient Education and Counseling 2011;85(3): 348-355.**		
AMSTAR criteria	**Assessed**	**Explanation**
		follow-up clinician–patient contact did not warrant meaningful statistical analysis.
10. Was the likelihood of publication bias assessed?	No	Publication bias was not reported to have been assessed.
11. Was the conflict of interest stated?	No	Funding was reported for the systematic review but not for the individual included studies.

APPENDIX C

Excluded Studies

Excluded studies

Excluded studies (of those identified by database searches)	
1	Aalbers T, Baars MAE, Rikkert MGMO. Characteristics of effective Internet-mediated interventions to change lifestyle in people aged 50 and older: a systematic review. Ageing Res Rev. 2011;10(4):487-97.
2	Adriaanse MA, Vinkers CDW, De Ridder DTD, Hox JJ, De Wit JBF. Do implementation intentions help to eat a healthy diet? A systematic review and meta-analysis of the empirical evidence. Appetite. 2011;56(1):183-93.
3	Anderson P, de Bruijn A, Angus K, Gordon R, Hastings G. Impact of alcohol advertising and media exposure on adolescent alcohol use: a systematic review of longitudinal studies. Alcohol Alcoholism. 2009;44(3):229-43..
4	Birdsall KM, Vyas S, Khazaezadeh N, Oteng-Ntim E. Maternal obesity: a review of interventions. Int J Clin Pract. 2009;63(3):494-507.
5	Bish A, Michie S, Yardley L. Principles of effective communication: scientific evidence base review. London: Department of Health; 2011.
6	Brendryen H, Johansen A, Nesvag S, Kok G, Duckert F. Constructing a Theory- and Evidence-Based Treatment Rationale for Complex eHealth Interventions: Development of an Online Alcohol Intervention Using an Intervention Mapping Approach. JMIR Res Protoc. 2013;2(1):e6.
7	Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. Obes Rev. 2009;10(1):110-41.
8	Chapman K. Can people make healthy changes to their diet and maintain them in the long term? A review of the evidence. Appetite. 2010;54(3):433-41.
9	Cole-Lewis H, Kershaw T. Text messaging as a tool for behavior change in disease prevention and management. Epidemiol Rev. 2010;32(1):56-69.
10	Diaz JH. Updates for responsible sun exposure behavior and photoprotection in the south. J La State Med Soc. 2013;165(5):277-82.
11	Di Noia J, Prochaska JO. Dietary stages of change and decisional balance: a meta-analytic review. Am J Health Behav. 2010;34(5):618-32.
12	Downs SM, Thow AM, Leeder SR. The effectiveness of policies for reducing dietary trans fat: a systematic review of the evidence. Bull World Health Organ. 2013;91(4):262-9H.
13	Enwald HPK, Huotari M-LA. Preventing the obesity epidemic by second generation tailored health communication: an interdisciplinary review. J Med Internet Res. 2010;12(2):e24.
14	Fjeldsoe BS, Marshall AL, Miller YD. Behavior change interventions delivered by mobile telephone short-message service. Am J Prev Med. 2009;36(2):165-73.
15	Gallagher KM, Updegraff JA. Health message framing effects on attitudes, intentions, and behavior: a meta-analytic review. Ann Behav Med. 2012;43(1):101-16.
16	Garcia-Retamero R, Okan Y, Cokely ET. Using visual aids to improve communication of risks about health: a review. ScientificWorldJournal. 2012;2012:562637.
17	Garside R, Pearson M, Moxham T. What influences the uptake of information to prevent skin cancer? A systematic review and synthesis of qualitative research. Health Educ Res. 2010;25(1):162-82.
18	Guyer B, Ma S, Grason H, Frick KD, Perry DF, Sharkey A, et al. Early childhood health promotion and its life course health consequences. Acad Pediatr. 2009;9(3):142-49.e1-71.
19	Hildon Z, Allwood D, Black N. Impact of format and content of visual display of data on comprehension, choice and preference: a systematic review. Int J Qual Health Care. 2012;24(1):55-64.
20	Jaime PC, Lock K. Do school based food and nutrition policies improve diet and reduce obesity?. Prev Med [serial on the internet]. 2009; (1): 45-53.
21	Kaner EFS, Dickinson HO, Beyer F, Pienaar E, Schlesinger C, Campbell F, et al. The effectiveness of brief alcohol interventions in primary care settings:

	a systematic review. Drug and Alcohol Review. 2009;28(3):301-23.
22	Hayes DP. Cancer protection related to solar ultraviolet radiation, altitude and vitamin D. Med Hypotheses. 2010;75(4):378-82.
23	Krishnaswami J, Martinson M, Wakimoto P, Anglemeyer A. Community-engaged interventions on diet, activity, and weight outcomes in U.S. schools: a systematic review. Am J Prev Med. 2012;43(1):81-91.
24	Latimer AE, Brawley LR, Bassett RL. A systematic review of three approaches for constructing physical activity messages: What messages work and what improvements are needed? International Journal of Behavioral Nutrition and Physical Activity. 2010;7:36..
25	Michie S, Abraham C, Whittington C, McAteer J, Gupta S. Effective techniques in healthy eating and physical activity interventions: a meta-regression. Health Psychol. 2009;28(6):690-701.
26	Michie S, Jochelson K, Markham WA, Bridle C. Low-income groups and behaviour change interventions: a review of intervention content, effectiveness and theoretical frameworks. J Epidemiol Community Health. 2009;63(8):610-22.
27	Neville LM, O'Hara B, Milat AJ. Computer-tailored dietary behaviour change interventions: a systematic review. Health Educ Res. 2009;24(4):699-720.
28	Ni Mhurchu C, Aston LM, Jebb SA. Effects of worksite health promotion interventions on employee diets: a systematic review. BMC Public Health. 2010;10:62.
29	O'Keefe DJ, Wu D. Gain-framed messages do not motivate sun protection: a meta-analytic review of randomized trials comparing gain-framed and loss-framed appeals for promoting skin cancer prevention. International Journal of Environmental Research and Public Health [Electronic Resource]. 2012;9(6):2121-33.
30	Olsen JM, Nesbitt BJ. Health coaching to improve healthy lifestyle behaviors: an integrative review. Am J Health Promot. 2010;25(1):e1-e12.
31	Oude Luttikhuis H, Baur L, Jansen H, Shrewsbury Vanessa A, O'Malley C, Stolk Ronald P, et al. Interventions for treating obesity in children. Cochrane Database Syst Rev [serial on the internet]. 2009; (1): Available from: http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD001872.pub2/abstract.
32	Salmela S, Poskiparta M, Kasila K, Vahasarja K, Vanhala M. Transtheoretical model-based dietary interventions in primary care: a review of the evidence in diabetes Health Educ Res [serial on the internet]. 2009; (2): 237-52.
33	Scanfeld D, Scanfeld V, Larson EL. Dissemination of health information through social networks: twitter and antibiotics. Am J Infect Control. 2010;38(3):182-8.
34	Van Cauwenberghe E, Maes L, Spittaels H, van Lenthe FJ, Brug J, Oppert J-M, et al. Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents: systematic review of published and 'grey' literature. Br J Nutr. 2010;103(6):781-97.
35	Watson MC, Blenkinsopp A. The feasibility of providing community pharmacy-based services for alcohol misuse: a literature review. Int J Pharm Pract. 2009;17(4):199-205.
36	Webb G, Shakeshaft A, Sanson-Fisher R, Havard A. A systematic review of work-place interventions for alcohol-related problems. Addiction. 2009;104(3):365-77.
37	White A, Kavanagh D, Stallman H, Klein B, Kay-Lambkin F, Proudfoot J, et al. Online alcohol interventions: a systematic review. J Med Internet Res. 2010;12(5):e62.
Excluded potential reviews (of those suggested by experts)	
1	Fischhoff B, Brewer NT, Downs JS. Communicating Risks and Benefits: An Evidence Based User's Guide. MD: Food and Drug Administration, US Department of Health and Human Services; 2012.
2	Krebs P, Prochaska JO, Rossi JS. A meta-analysis of computer-tailored interventions for health behavior change. Preventive Medicine. 2010;51(3-4):214-21.
3	Latimer AE, Brawley LR, Bassett RL. A systematic review of three approaches for constructing physical activity messages: What messages work and what improvements are needed? International Journal of Behavioral Nutrition and Physical Activity. 2010;7:36.

4	Spiegelhalter D, Pearson M, Short I. Visualizing uncertainty about the future. Science. 2011;333(6048):1393-400.
5	Trevena LJ, Zikmund-Fisher BJ, Edwards A, Gaissmaier W, Galesic M, Han PK, et al. Presenting quantitative information about decision outcomes: a risk communication primer for patient decision aid developers. BMC Medical Informatics and Decision Making. 2013;13 Suppl 2:S7.
6	Van 't Riet J, Cox AD, Cox D, Zimet GD, De Bruijn GJ, Van den Putte B, et al. Does perceived risk influence the effects of message framing? A new investigation of a widely held notion. Psychology & Health. 2014.
7	Williams AL, Grogan S, Clark-Carter D, Buckley E. Appearance-based interventions to reduce ultraviolet exposure and/or increase sun protection intentions and behaviours: a systematic review and meta-analyses. British Journal of Health Psychology. 2013;18(1):182-217.

APPENDIX D

Included Studies

Characteristics of the included reviews

Study name	Objectives	Communication type/strategy	Risk topic or scenario in the included studies	Intervention	Comparator	Key outcomes	Type of participants	Number and design of included studies.
Akl 2011a (2)	To evaluate the effects of attribute (positive versus negative) framing and of goal (gain versus loss) framing of the same health information, on understanding, perception of effectiveness, persuasiveness, and behaviour of health professionals, policy makers, and consumers.	Framed messages on health[16] information: attribute framing and goal framing.	Various cancers (breast, cervical, colorectal, prostate, skin), cardiovascular health, contraception, diet, HIV, lack of exercise, oral health, pregnancy, smoking, and vaccination (childhood diseases, flu).	Positively-framed messages or gain-framed messages of health information. Messages addressed screening (19 comparisons), prevention (19 comparisons), treatment (8 comparisons) and other issues (5 comparisons relating to harm, diagnosis, public health, abortion) through the use of brochures, letters, 'information', multimedia formats, print media pamphlets, videos, websites, and other means (not described).	Negatively-framed messages or loss-framed messages of the same health information.	The primary outcome was actual decisions or behaviours. The surrogate outcomes of understanding, perception of effectiveness, persuasiveness and behaviour were also of interest. The outcome had to relate to the health behaviour of interest.	Health professionals, policy makers and consumers were eligible; no studies were conducted with health professionals or policy makers.	35 included studies: 30 RCTs, four quasi-RCTs and one non-randomized crossover study.

16 Attribute framing is the positive versus negative description of a specific attribute of a single item or a state. For example, “the chance of survival with cancer is 2/3” versus “chance of mortality with cancer is 1/3”.
Goal framing is the depiction of the consequences of performing or not performing an act as a gain versus a loss. For example, “if you undergo screening for cancer , your survival will be prolonged” versus “ if you don’t undergo screening for cancer, your survival will be shortened”.

Study name	Objectives	Communication type/strategy	Risk topic or scenario in the included studies	Intervention	Comparator	Key outcomes	Type of participants	Number and design of included studies.
Akl 2011b (18)	To evaluate the effects of using alternative statistical presentations of the same risks and risk reductions on understanding, perception, persuasiveness and behaviour of health professionals, policy makers, and consumers.	Statistical formats for presenting health information.	Diagnosis, prevention, prognosis, screening, treatment and funding.	Statistical presentation of a risk (natural frequency) or risk reduction (relative risk reduction (RRR) or absolute risk reduction (ARR)). There were 8 comparisons of natural frequencies vs probabilities, 31 comparisons of RRR vs ARR, 23 comparisons of RRR vs number needed to treat (NNT),, and 21 comparisons of ARR vs NNT.	Statistical presentation of a risk (probability) or risk reduction (ARR, the NNT or the number-needed-to-screen) of the same evidence about health.	The primary outcome was actual decisions and behaviour. Secondary outcomes were understanding, perception of effectiveness, and persuasiveness.	Health professionals, policy makers, and consumers (patients, the general public and students, including students of health professions) were eligible; no study was conducted with policy makers.	35 included studies: 3 RCTs, 13 randomized parallel studies and 19 crossover studies.
Fry 2009 (4)	To investigate the effectiveness of limited contact interventions targeting weight loss, physical activity, and/or diet that provided periodic prompts regarding behaviour change for	Periodic prompts, defined as messages, reminders, or brief feedback communicated to participants multiple times over the duration of an intervention.	Nutrition, physical activity, weight.	Periodic prompts (messages, reminders, or brief feedback) used as a stand-alone intervention or as part of a larger programme. Prompts could be delivered at various intervals such as daily, weekly, or monthly, and sent using email, telephone and mail.	Not pre-specified. The included studies compared the intervention vs control, usual care, treatment without prompts, and before/after the use of prompts.	Biological or behavioural outcome measures.	Not reported.	19 included studies: 13 RCTs, two randomised non-controlled studies and four observational studies.

Study name	Objectives	Communication type/strategy	Risk topic or scenario in the included studies	Intervention	Comparator	Key outcomes	Type of participants	Number and design of included studies.
	health promotion, and to identify specific characteristics of these interventions that may be associated with superior results.							
Lustria 2013 (16)	Overall research objectives not stated. An exploration of moderators that may influence the effects of tailoring. It assessed the efficacy of web-based, computer-tailored health behaviour change intervention studies using meta-analysis; compared the efficacy of tailored web-based health	Computer-tailoring strategies using the web as the primary delivery mechanism.	Physical activity, nutrition/diet, smoking/tobacco, drinking, medication adherence (asthma), stress management, faecal soiling. The majority of the studies (n=29, 73%) were single behaviour studies. Most frequently studied behaviours were physical activity (42% of all behaviours), nutrition/diet (25%), and smoking/tobacc	Online health interventions with at least one web-based component (delivered over the Internet, e.g. by e-mail or website) and used a computer algorithm for tailoring. Web-based components comprised one or more of: online magazines, activities, educational sites, newsletters, specific advice, assessment + personalized feedback, instruction intervention, information intervention, enhanced toilet training intervention, interactive information, tailored information + tailored feedback, advice + stage-based	Non-tailored interventions. The comparators do not appear to have been restricted to web-based non-tailored behavioural interventions: general online resources, online advice, standard health education, standard classes, generic/standard websites, general or brief advice, assessment (no feedback),	Health behaviours or clinical outcomes.	Primarily targeted patients or general health consumers. The included studies involved children, adolescents, students, adults, online consumers, patients, healthy adults.	40 included studies (reported in 39 articles): 31 RCTs and 9 quasi-experimental studies.

Study name	Objectives	Communication type/strategy	Risk topic or scenario in the included studies	Intervention	Comparator	Key outcomes	Type of participants	Number and design of included studies.
	behaviour change interventions to standard or generic approaches; and explored several sets of moderators that may influence the effects of tailoring.		o (18%).	reinforcement, website + human e-mail counselling, website + computer-automated feedback individualized training, website + peer support, commercial weight loss intervention, websites.	minimal contact, generic print material, generic information, counselling, information-only website, web-based general training, weight loss manual, waitlist control, no-treatment control, usual/routine care.			
McCormack 2013a (13)	a. What is the comparative effectiveness of communication strategies to promote the use of health and health care evidence by patients and clinicians?	Techniques involving tailoring the message, targeting the message to audience segments, using narratives, and framing the message.	Cancer screening, influenza/flu vaccination and dietary behaviours.	Strategies to communicate evidence-based information[18] used either alone or in combination: individually-tailored messages; messages targeted to audience segments; use of narratives; and use of framing to convey messages to various	Single strategies: tailored messages, targeted messages, use of narratives and framed messages.	Not specifically reported. The included studies investigated effects on behaviour (e.g. persuasiveness) and outcome (e.g. screening rate)	Adults (≥19 years), specifically the general public and patients, and clinicians were eligible; none of the studies involved clinicians.	7 included studies: all RCTs

18 The communication strategies were defined as: (a) Tailoring the message—Communication designed for an individual based on information from the individual; (b) Targeting the message to audience segments—Communication designed for subgroups based on group membership or characteristics such as age, sex, race, cultural background, language, and other "psychographic" characteristics such as a person's attitudes about a particular subject matter; (c) Using narratives—Communication delivered in the form of a story, testimonial, or entertainment education; (d) Framing the message—Communication that conveys the same messages in alternate ways (e.g., what is gained or lost by taking an action or making a choice).

Study name	Objectives	Communication type/strategy	Risk topic or scenario in the included studies	Intervention	Comparator	Key outcomes	Type of participants	Number and design of included studies.
	b. How does the comparative effectiveness of communication strategies vary by patients and clinicians? [17]			end-users.				
McCormack 2013b (14)	a. What is the comparative effectiveness of dissemination strategies to promote the use of health and health care evidence for patients and clinicians? b. How does the comparative effectiveness of	Dissemination approaches aiming to increase reach to a variety of audiences, increase motivation to use and apply such information, and increase ability actually to use and apply evidence.	Dietary behaviour, dispensing practice, exercise, general practice management, health care, guidelines, infant development, physical therapy, physician recommendations, practice of evidence-based	Active dissemination strategies.[19] Strategies aimed to increase reach through postal, electronic and digital media, social and media, interpersonal verbal group or individual outreach. Strategies aimed to motivate recipients through champions/cheerleaders, opinion or thought leaders, peer and social networks. Strategies aimed to enhance	Other active dissemination strategies	Not specifically reported. The review reported health-related decisions and behaviour outcomes, clinical outcomes and knowledge outcomes for a range of health-related or clinical problems in the included studies.	Adults (≥19 years), specifically the general public and patients, and clinicians (physicians, nurses, midlevel providers, and pharmacists).	38 studies (reported in 42 articles) were included. These comprised RCTs and cluster RCTs (unclear how many of each).

17 The authors stated that none of the trials that met their review addressed using the four communication strategies with clinicians; therefore, they were unable to address KQ 1b.

19 Active dissemination strategies were defined as those that involve efforts to spread evidence-based information via specific strategies and channels. Designed to:

- Improve reach of evidence —Distributing evidence widely to many audiences and across many settings extends the numbers and types of recipients
- Motivate recipients to use and apply evidence —Using a variety of authoritative experts or spokespersons to increasing interest in or acceptability of the evidence or related recommendations may promote enthusiasm or action on the part of clinicians or patients
- Enhance recipients' ability to use and apply evidence (regardless of delivery mode) -Providing additional resources about evidence or recommendations based on evidence, such as how they can be incorporated into current practice, or giving specific suggestions for change enhances a traditional dissemination strategy.

Study name	Objectives	Communication type/strategy	Risk topic or scenario in the included studies	Intervention	Comparator	Key outcomes	Type of participants	Number and design of included studies.
	dissemination strategies vary by patients and clinicians?		care, primary care, screening, smoking cessation, treatment.	recipients' ability (regardless of delivery mode) by providing supporting "how-to" materials (tracking sheets given to patients or risk calculators to clinicians; tailored toolkits that explain how to implement evidence-based recommendations in specific settings) or skills training, capacity building, and problem solving. Multicomponent strategies using several of these strategies in concurrent combination or in sequence. Head-to-head comparisons between strategies, within comparisons of different strategies with the same broad aims and multicomponent strategies with several dissemination strategies in concurrent combination or in sequence were also considered.				

Study name	Objectives	Communication type/strategy	Risk topic or scenario in the included studies	Intervention	Comparator	Key outcomes	Type of participants	Number and design of included studies.
McCormack 2013c (15)	To answer the question: What is the comparative effectiveness of different ways of explaining uncertain health and health care evidence to patients and clinicians?	Strategies used to communicate uncertainty through the concepts of overall strength of the evidence, risk of bias, consistency, precision, directness, net benefit, applicability, overall strength of recommendation.	Cancer, guideline-supported behaviour, screening, survival, treatment choice, treatment side effects.	Strategies used to communicate uncertainty about any type of evidence: non-numeric presentations (words or sentences). numeric presentations (numbers) visual presentations (graphs, images, or figures). Framed presentations (messages that present uncertainty in alternate contexts or as alternate consequences of uncertainty). Multicomponent strategies using several communication strategies in concurrent combination or in sequence to increase understanding were also considered.	Strategies used to communicate uncertainty.	Not specifically reported. The outcomes studied in the included studies were knowledge, perceived risk, accuracy of perceived risk, appropriate choices regarding care (e.g., selecting medications, obtaining screening, guideline-concordant care), and decision satisfaction.	Adults (≥19 years), specifically the general public and patients, and clinicians (physicians, nurses, midlevel providers, and pharmacists).	9 studies (reported in 10 articles): 2 RCTs, 4 factorial RCTs, 1 non-controlled trial and 2 quasi-experimental studies.

Study name	Objectives	Communication type/strategy	Risk topic or scenario in the included studies	Intervention	Comparator	Key outcomes	Type of participants	Number and design of included studies.
Sheeran 2014 (3)	To meta-analyse experimental evidence to answer the question: "Does heightening risk appraisals change people's intentions and behaviour?"	Messages that heighten elements of risk appraisal, an important component on behavioural change. This meta-analysis did not study specific methods or approaches to communicating risk, but studied the impact of heightened risk appraisal on subsequent intentions (217 tests) and behaviour (93 tests), drawing on the results of experimental studies comparing treatments and controls.	Alcohol consumption, caffeine consumption, conservation, dental hygiene, diagnosis, diet, driving, financial, firearms, environmental, exercise, health behaviours, illegal drugs, natural disasters, occupational health, safety, self-defence, sexual, smoking, stress, sun protection (17 articles), treatment, vaccination.	Interventions (unspecified) that heightened risk appraisal variable (risk perception, anticipatory emotions, anticipated emotions and perceived severity). Tailored, targeted and narrative presentations were also eligible but no studies of these were identified.	Controls (unspecified).	Intention and behaviour.	Adults, students and children.	208 studies (reporting 239 tests) were included.

Study name	Objectives	Communication type/strategy	Risk topic or scenario in the included studies	Intervention	Comparator	Key outcomes	Type of participants	Number and design of included studies.
Visschers 2009 (19)	To come to general recommendations about the presentation of probability information in risk communication, and also to find a theoretical explanation for the findings and indicate areas for future research.	Presentation formats for probability information related to medical, health, technological, and accident risks.	Wide range of risks: well-known causes of death (e.g. heart disease, cancer, AIDS), contraception, diet, hazardous activities, health problems, household accidents, hypothetical disease, infections, medical risks, natural hazards, screening, traffic risks, treatment, work environments, vaccination.	Various formats for communicating risk information. The included studies reported frequencies versus percentages, base rates and proportions (6 studies); absolute versus relative risk reduction and related formats (11 studies); cumulative probabilities (2 studies); verbal expressions of probability information (4 studies); numerical versus verbal probability information (11 studies); graphs (7 studies) and risk ladders (3 studies).	Not reported.	What kind of probability information people prefer and the effects of different presentation formats on comprehension, risk perception, and related measures (e.g., willingness to pay). The authors made general recommendations about presentation formats based on outcomes reported in the included studies.	Lay-people (i.e. general public).	Unclear. From tables, 44 included papers (each reporting 1-5 investigations): 38 reported experimental studies (unspecified design), 3 reported quasi-experimental studies (unspecified design) and 3 reported focus group/interview studies.
Wanyonyi 2011 (17)	To present an overview and synthesis of the effect of face-to-face delivered tailored health	Face-to-face delivered tailored health messages.[20]	Alcohol consumption, diabetes, dietary behaviour, mammography screening, smoking	Interventions that involved health education that promoted health behaviour change, health education based on evidence-based	Controls.	Change in health behaviour.	Patients. One study included only African American females.	6 included studies: 5 RCTs and one study with a quasi-randomized before-and-

[20] Tailored messages are based on the individual assessment of people and the subsequent construction of a health message matched to the individual's health needs and psycho-social characteristics

Study name	Objectives	Communication type/strategy	Risk topic or scenario in the included studies	Intervention	Comparator	Key outcomes	Type of participants	Number and design of included studies.
	messages, with and without follow-up, on patient behaviour and its application for practice.		cessation, weight management.	behaviour change model, and use of tailored messages based on participant assessment, and were delivered face-to-face by a health care professional. The included studies all used a combination of behaviour change models in the process of tailoring health messages.				after design where participants served as their own controls.