

Using alternative statistical formats for presenting risks and risk reductions

Review question

What are the effects of alternative statistical presentations of the same risks and risk reductions on understanding, perception, persuasiveness and behaviour of health professionals, policy makers, and consumers?

What are alternative statistical formats?

There are a number of ways in which risks and risk reductions can be presented. For example, a study analysing the effects of an osteoarthritis drug may find that 10% of the untreated people had a hip fracture at three years, compared with 5% of the people who took the osteoporosis drug every day for three years. This result could be described as:

- The drug “cuts the risk of fracture by 50%” (relative risk reduction, RRR)
- “5% less people had a fracture (absolute risk reduction, ARR) or
- “Twenty patients need to take the osteoporosis drug over 3 years for an additional patient to avoid a hip fracture” (number needed to treat, NNT).

Another study may find that the risk of suffering a hip fracture over a three-year period among people not taking any osteoporotic drug is 10%; this risk could be expressed as:

- 100 of 1000 people not taking any osteoporotic drug will suffer a hip fracture over a three year period (frequency), or
- 10% of people not taking an osteoporotic drug suffered a hip fracture (percentage).

Key findings

Based on the results of 35 studies the authors concluded that:

- The risk of a health outcome is probably better understood when presented as a frequency rather than a percentage for diagnostic and screening tests
- For communicating risk reductions, relative risk reduction (RRR), compared with absolute risk reduction (ARR) and number needed to treat (NNT), may be perceived to be larger and is more likely to be persuasive
- It is uncertain whether presenting RRR is likely to help people make decisions most consistent with their own values, and, in fact, it could lead to misinterpretation
- These results were consistent across consumers and professionals

Full citation for this review:

Akl EA, Oxman AD, Herrin J, Vist GE, Terrenato I, Sperati F, Costiniuk C, Blank D, Schünemann H. [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.

This summary is relevant to:

This evidence bulletin can be used by researchers and policy makers and clinicians who are interested in how to present evidence results to clinicians and consumers.

This summary includes:

- Key findings from research based on a systematic review
- Considerations about the relevance of this research to decision makers and clinicians

Not included:

- Additional evidence
- Recommendations

What is a systematic review?

A systematic review aims to locate, appraise and synthesise all of the available evidence related to a specific research question. Authors adopt rigorous methods to minimise bias as a way of producing reliable findings with the ultimate goal of making the evidence more useful for practice. See navigatingeffectivetreatments.org.au for more information

Relevance to the health care context in Victoria, Australia

<p>The broader policy and clinical context</p>	<p>Statistical information is used to inform health care decisions across all areas of the health system, and broader media. The results from this review show the way risks and risk reductions are presented can impact on the way the information is perceived. Victorian health professionals have a responsibility to incorporate shared decision-making and informed decision-making into practice. This responsibility is highlighted in a number of policy documents including the National Safety and Quality Health Service Standards, Australian Commission for Safety and Quality in Health Care and Health Priorities Framework 2012-2022. A recent consultation paper on consumers and health literacy by the Australian Commission on Safety and Quality in Healthcare, includes the presentation of risk information as part of clear and useable health information (see section 7.1).</p>
<p>What populations and settings in which this is relevant</p>	<p>This review is most relevant for settings in which consumers are presented with statistical data to assist with the decision making process. While this could happen across clinical and public health practice, the evidence in this review draws from studies with people considering diagnostic or screening tests. Based on this review, it is unclear if people with low health literacy, or with differing cultural or communication needs, would respond in the same way to differing statistical presentation of risk data.</p>
<p>Implications for decision makers</p>	<p>The results of the review indicate that to ensure data is best understood by consumers and health professionals, information should be presented in natural frequencies (i.e. 10 out of 100) as opposed to percentages. When presenting risk reductions, relative risk reductions (RRR) appear to be the most persuasive format and were perceived as larger than ARR or NNT. However, the implications of these findings for clinical practice are limited by a lack of research on how these findings affect actual behaviour. Of importance too is the finding that there is no difference in ability to interpret this data between clinicians and consumers, as it would be reasonable to expect that clinicians have a higher level of understanding of statistics than consumers. This may indicate that further training is required for clinicians and those preparing detailed risk information for consumers.</p>
<p>Implications for clinicians</p>	<p>It is important that clinicians are able to explain risk data to patients in a number of forms to ensure that patients have a clear understanding and accurate perception of the risks and benefits of treatment and tests. It is also important that clinicians understand the implications of different risk presentations on their own and their patients' understanding and perceptions of effect. Further training in alternate risk presentations may be of benefit to clinicians (see Related resources).</p>

Related resources

Systematic reviews

- Akl et al (2011) [Framing of health information messages](#)
- Stacey et al (2011) [Decision aids for people facing health treatment or screening options](#)
- Edwards et al (2013) [Personalised risk communication for informed decision making about taking screening tests](#)

Evidence bulletins

- See www.latrobe.edu.au/aipca/about/chcp/health-knowledge-network/bulletins to access the systematic reviews listed here as evidence bulletins

Alternative statistical presentation resources

- Alternate risk presentation explained: Akl 2011, see [Appendix 1](#)
- Trevena et al 2006. [Communicating with patients about evidence](#)

Background

Recent efforts have focussed on better integrating research results into clinical practice. This has coincided with a growing consensus that researchers, clinicians and consumers should participate in decisions about health care at all levels. The success of these efforts depends on clear and effective communication of research evidence, including the size of risks and risk reductions.

A number of studies have shown that presenting statistical information, in particular risks or risk reductions, using different formats leads to different decisions. For example, people have more difficulty with probabilities than natural frequencies. In addition, risks may appear larger and more convincing depending on the way in which they are depicted (see RRR, ARR and NNT on p.1). As such the authors of this review aimed to analyse the effects of different statistical presentations on understanding, perception, and decision-making of health professionals, policy makers and consumers.

Information about the review

The authors conducted a detailed search for studies published up until October 2007. The following inclusion criteria were used to guide study selection:

Types of Studies

- Randomised controlled trials
- Controlled trials
- Cross-over studies

Participants

- Health professionals, policy makers and consumers (i.e. patients, general public and students)

Types of interventions

- Presentation of a risk (frequencies, percentages or probabilities) or of a risk reduction (RRR, ARR or NNT) of the same evidence about health.

Outcomes

The following outcomes were examined:

- Understanding
- Perception (of the efficacy of an intervention)
- Persuasiveness (how likely participants would be to make a decision favouring the intervention)
- Actual decision or behaviours

Main results

The review included 35 studies. Of the included studies 20 were conducted with consumers, 14 with health professionals and 1 with both consumers and professionals. No studies were found analysing the effects in policy makers.

The majority of studies were conducted in high-income countries (11 in Australia). Studies assessed decisions relating to chronic diseases (mainly cancer and cardiovascular), genetic testing and vaccinations.

The 35 studies reported on 83 individual comparisons, including

- 8 comparisons of natural frequencies vs percentages
- 31 comparisons of RRR vs ARR
- 23 comparisons of RRR vs NNT
- 21 comparisons of ARR vs NNT

Summary of results

Participants in the included studies understood risks better when exposed to natural frequencies compared to percentages (see Results table line 1).

Patients perceived interventions to be more effective when exposed to RRR compared to ARR and NNT (see Results table, lines 3 & 6). RRR conveyed better understanding than NNT (large effect size) but not ARR (see Results table, lines 2 & 5)

Participants perceived interventions to be more effective and showed better understanding when exposed to ARR compared to NNT; there was little or no difference in being persuaded to prescribe or accept an intervention (see Results table, lines 7 to 9)

For more detailed results, see the Results table on p.4.

What this review does not show

This review included only studies assessing hypothetical healthcare decisions. As such, no study could assess actual behaviour in response to message presented in alternative statistical formats. Further research assessing what effect changes in understanding and persuasion have on actual behaviour is needed.

Results table:

Outcome	Effect*	No of Participants (studies)	Evidence quality (GRADE)#
Natural frequencies compared to percentages			
Understanding	0.69 SD higher (0.45 to 0.93 higher)	642 (7 comparisons)	Moderate
Relative risk reductions (RRR) VS Absolute risk reductions (ARR)			
1 Understanding	0.02 SD higher (0.39 lower to 0.43 higher)	469 (3 comparisons)	Moderate
2 Perception	0.41 SD higher (0.03 to 0.79 higher)	1116 (5 comparisons)	Low
3 Persuasiveness	0.66 SD higher (0.51 to 0.81 higher)	11221 (27 comparisons)	Moderate
Relative risk reductions (RRR) compared to number needed to treat (NNT) for presenting risk reductions			
4 Understanding	0.73 SD higher (0.43 to 1.04 higher)	182 (1 comparison)	Moderate
5 Perception	1.15 SD higher (0.8 to 1.5 higher)	970 (3 comparisons)	Moderate
6 Persuasiveness	0.65 SD higher (0.51 to 0.8 higher)	9582 (22 comparisons)	Moderate
Absolute risk reductions (ARR) compared to number needed to treat (NNT) for presenting risk reductions			
7 Understanding	0.42 SD higher (0.12 to 0.71 higher)	182 (1 comparison)	Moderate
8 Perception	0.79 SD higher (0.43 to 1.15 higher)	949 (3 comparisons)	Moderate
9 Persuasion	0.05 SD higher (0.04 lower to 0.15 higher)	9024 (20 comparisons)	Moderate

For more information on the working group's rating of quality of evidence go to www.gradeworkinggroup.org

* Relative effect is measured as Standardised Mean Difference (SMD), followed by a 95% confidence interval (95% CI)

This evidence bulletin draws on the format developed for SUPPORT summaries (for more information on SUPPORT summaries see www.supportsummaries.org). It replaces the previous version of this bulletin (2009) which is based on the 2009 version of this review.

Health Knowledge Network

The Health Knowledge Network is the knowledge transfer function of the Centre for Health Communication and Participation. The Centre is funded by the Quality, Safety and Patient Experience Branch, Department of Health, Victoria, Australia.

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