

Absolutely Relative: The impact of data framing on behavioural intentions and perceptions of benefit of reducing processed meat intake

By

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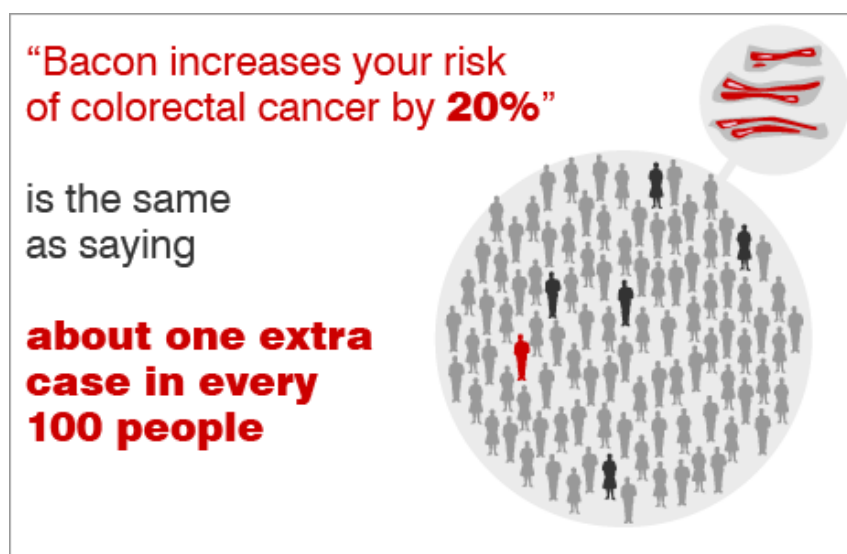


Figure 1.
WCRF data.
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BBC 2007.

Introduction

Quantifiable data on the risks or benefits associated with food can be presented in numerous different ways. The style of presentation is referred to as the frame. The frame could be a graph or in words and numbers. A fact could be presented as the risk of eating something or the benefit of not eating it. Can the presentation style actually make a difference to the decisions individuals make? Earlier studies from other areas of healthcare suggest that it could and therefore has the potential to be a useful tool for promoting healthier diets. However, as a recent example shows, there is a delicate line between presenting data that in a way that encourages positive changes and potentially misrepresenting the extent of the risk/benefit.

When the World Cancer Research Fund (WCRF) published data on the association between processed meat intake and colorectal cancer in 2007 some reports in the media suggested it was presented in a misleading way because of the frame they had selected. The risk was published as part of the evidence to support a series of recommendations on diet, physical activity and

weight to reduce risk of cancer. What the WCRF actually said in their press pack was "There is "convincing" evidence that processed meats, including ham and bacon, increase the risk of colorectal cancer. People who consume them are advised to do so sparingly." The quantified risk was tucked away in a table in the body of the full scientific report which shows the relative risk of colorectal cancer as 1.21 per 50g processed meat/day. In other words for every 50g of bacon, ham or sausages eaten daily someone's risk of getting colorectal cancer increases by 21%. They gave no indication of the absolute risk i.e. the number of people who would be affected. There was nothing particularly unusual about the WCRF's presentation of the data, scientific papers commonly use this format. What was unusual was that their choice of format became part of the news story itself. Figure 1 is taken from a BBC magazine article which criticised the WCRF's data presentation.

As figure 1 suggests the relative risk increase of 21% for every 50g of processed meat eaten daily is equivalent to an absolute increase of 1 in 100 or 1%. That quantity of processed meat could be a couple of rashers of bacon, a sausage or the topping of a

12 inch meat feast pizza. With a little basic maths this can also be viewed as a relative risk reduction (RRR) of 17% or an absolute risk reduction (ARR) of 0.8% for a 50g daily reduction in processed meat intake.

Earlier research suggested presenting RRRs was more effective in influencing decisions on pharmaceutical and medical treatment options than ARR. More people took on board the risk reduction message if it was given in the RRR format. This was found to be true for both patients and health care professionals. However, no studies had specifically examined the impact on dietary choices. A Dutch team of psychologists and risk experts have argued that general theories on risk taking and decision making may not be sufficient to explain food risk behaviour due to food's place in daily life. Perhaps it would not matter which way the data was presented as alternative factors from daily life would be central in any decision. This study aimed to examine whether or not presenting data in the form of RRRs or ARRs altered perceptions of health benefits. Specifically, of reducing processed meat intake and intentions to change dietary behaviour. By taking two separate indicators from behaviour change models it was hoped that the stages of the decision making process that could be influenced would be identified.

Methods

The WRCF data was reformatted in two statements on the benefits of reduced intake of processed meat. One contained the RRR and the other ARR (see below). Over 100 participants were recruited in two locations in Nottingham.

RRR: A diet lower in processed meat is associated with a 17% lower reduction in the chances of developing bowel cancer.

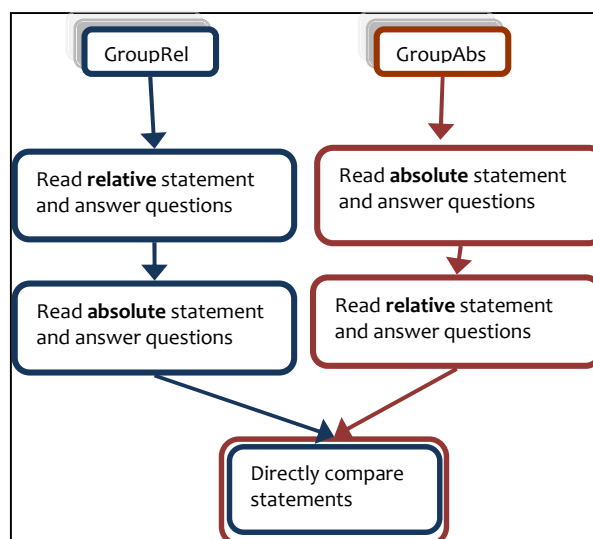
ARR: If a group of 1,000 people reduced the amount of processed meat they eat we would expect 8 fewer of them would develop associated bowel cancer.

Two sets of data were collected from the study. Firstly, participants were shown both statements one at a time and asked to indicate perceived benefit and their intention to change their behaviour (Figures 2 & 3). Participants were randomly selected to receive either the absolute or

relative frame first before seeing the alternative version. Secondly, the participants were asked to directly compare the two statements and consider if they would change their diet in response (Table 1).

The survey took place at two locations in Nottingham in October 2009. Participants were excluded from the study if they were under 25 or if any of their family had been affected by colorectal cancer. Youth and awareness of a condition are known to affect feelings of vulnerability to conditions like colorectal cancer. If participants did not eat processed meat most of the questions were not applicable so they were also excluded.

Fig 2 Study Design

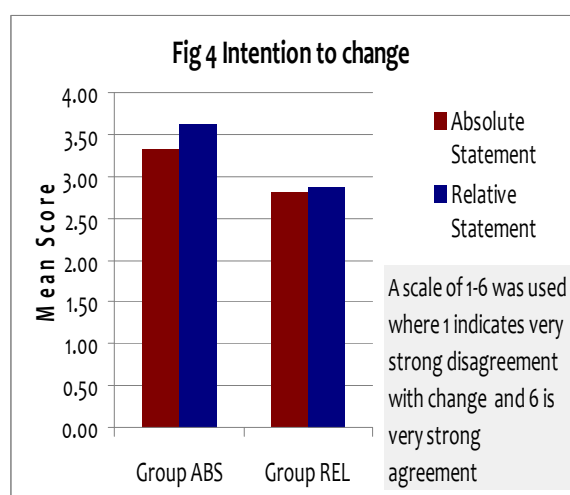
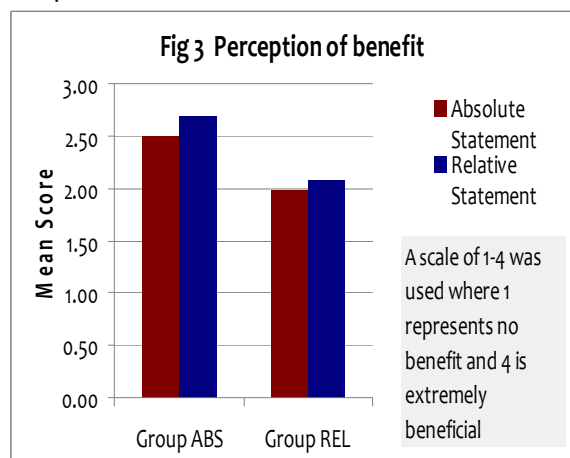


Results

In line with previous research when direct comparisons of the two statements were made the relative statement was perceived to represent a greater benefit by 87% of subjects, this was statistically significant ($p < 0.001$), see Figures 2 & 3. This finding was highly consistent regardless of any identifiable characteristics such as age group or gender.

The order in which subjects saw the risk reduction statements had a significant impact on perceptions of benefit and intention to change behaviour. Although the group who saw the ARR first were more positive about making changes than the group who had only seen the RRR both groups were most positive in response to the RRR. This suggests either that the group that saw the ARR first was generally more positive or that the RRR

was only more influential when viewed in comparison with the ARR.



Following advice from those working with behaviour change models a 6 point scale was used initially. Analysis of the 6 point scale data did not highlight particular significant results. However, when the data was simplified to a two point scale for greater comparison with other health related studies a significant difference in intention to change was seen, with the ARR promoting greater change when only one frame was available. This is not in line with earlier studies. The results in Table 1 support the argument that the position of food in daily life may limit the impact of factors such as framing as the overall uptake of the advice was low compared with two out of three comparable studies.

Table 1 Impact of ARR/RRR on uptake of advice when seen in isolation

Topic covered	Measure of uptake of advice	RRR % uptake	ARR % uptake
Earlier studies			
Lipid lowering therapy ¹	Consent to treatment	88%	42%
Screening test choices ²	Acceptance of test	80%	53%
Chemotherapy ³	Endorsement of treatment	51%	39%
This study			
Colorectal cancer & processed meat	Intention to change diet	30%	52%

Discussion

This study can be criticised for the choice of statement for the ARR. With hindsight it would have been preferable to present the ARR as:

“If everyone reduced their intake of processed meat then 0.8% of the population would avoid developing bowel cancer”

At the time of the questionnaire development it was thought that the multiple use of percentages would lead to too much confusion. Hence, the ARR was presented as a frequency out of a thousand people rather than as a percentage of the population. Earlier research suggests that using frequencies such as 1 out of ten rather than 10% promotes a phenomenon known as optimism bias. Optimism bias is a tendency for individuals to believe the outcome they desire will happen to them. It has been documented amongst people who play the lottery and in relation to numerous health issues including colorectal cancer. The alternative ARR presented above, makes it clear that the outcome i.e. avoiding colorectal cancer is not universal and therefore allows the reader to question whether or not they would benefit from change. The RRR on the other hand suggests that

the outcome is much more uniform but that outcome, a reduction in risk, is much less tangible.

With frequencies another element that could have affected the findings was the selection of the denominator. In this study the question was framed using 1000 people but it would have been equally possible to use a much larger value, such as the population of Nottingham. If the group size is increased then the numbers of individuals affected also increases. The magnitude of numbers may be an important factor affecting perceptions of the data (see below). Other studies have shown that the more the reader can relate to the population group described in the denominator the more influence that data will have.

When ARR is presented as a percentage of the population rather than a frequency, the numbers involved are always less than or equal to the RRR. Studies have found that if the percentages involved were very small ($<0.1\%$) they would be dismissed as insignificant. Although the numbers in this case were above that magnitude, size still potentially had an impact when comparisons were being made. A participant in a focus group on risk presentation said they preferred ARR because RRR was “too alarming because the risk appeared bigger”⁴.

Understanding the distinction between RRR and ARR requires numeracy skills. A recent ranking of numeracy elements according to complexity and comprehension placed relative risk at the top followed by the relative versus absolute numeracy element⁵. Using fewer and simpler mathematical constructs has been recommended to aid comprehension for those with lower levels of numeracy. This suggests neither of the formats is ideal for conveying messages to the general public.

Research has shown that despite their education levels many medical students and healthcare professionals are not good at assessing risk and probability. It is important for the provider of such information to have at least basic statistical literacy skills in order for them to aid patient understanding.

The use of frames by WCRF and other groups

Like a large number of medical research studies the design of the WCRF's research generated relative data. The finding was then presented for a worldwide audience and due to the lack of reliable global incidence rates for colorectal cancer there was no option to convert it to absolute data. There

is no suggestion that the continued use of a relative frame in early UK press releases was a deliberate choice to influence the audience's actions. It was only following debate in the media which suggested that the WCRF's choice of frame might be misleading that they began to actively reframe the original data. It appears that the use of a relative data frame without providing at least a baseline incidence rate may have damaged the credibility and trust in the WCRF information. Research from Cornell University on healthcare communication shows that credibility and trust are key factors in the success of any communication.

WCRF are not the only group who use framing. It is common for articles in medical journals to contain only relative data giving no indication of the incident rates of conditions⁶. Dietitians and Public Health Nutritionists need to understand risk presentation in scientific papers in order to understand its relevance and make sound clinical decisions.

It has already been suggested that pharmaceutical companies make use of influential framing techniques when promoting their products. Commercial uses of framing could also be expected within the food industry and in the promotion of nutritional supplements. Unlike marketing specialists, when healthcare professionals use frames to influence decision making, a range of ethical considerations need to be taken into account.

Ethical considerations for frame selection

The media debate was triggered by comments from two academic risk experts with a particular interest in increasing public understanding of risk. Their perspective on the information fits neatly with ethical arguments on the respect for autonomy. Presenting only RRR without any indication of the baseline risk level arguably does not present the patient or member of the public with enough information to make their own informed decision. It has been argued that although withholding absolute data may violate the principle of respect for autonomy any decision needs to take into account both respect for autonomy and beneficence (doing good in the interest of the patient). In this case the results suggest dietitians and public health nutritionists are in the fortunate position of one frame selection, the ARR, being associated with both increased respect for autonomy and beneficence. However, if a different version of the ARR had been selected or

if another food risk was presented this may not be the case

Conclusion

In the case of the risk of colorectal cancer from processed meat, using absolute frequencies to present the possible risk reduction had greater potential to encourage health promoting dietary change than relative data but only when seen in isolation. When the two statements were seen together the relative data was perceived to represent a greater benefit by almost 90% of participants. This is likely to be due the combined effects of optimism bias resulting from the absolute frame and misinterpretation of the data when making comparisons between frames.

It is important for dietitians and public health nutritionists to understand the impact that data presentation can have on dietary decisions and to consider how frame selection might affect understanding and perception of risks and benefits. It is also important for them to be aware of how the use of relative and absolute frames by others might be affecting their own perceptions of dietary health risks.

Further Reading

<http://info.cancerresearchuk.org/healthyliving/introducingcancerprevention/whatisrisk/index.htm>

<http://understandinguncertainty.org/>

<http://www.wcrf-uk.org/>

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Author Profile

“Melissa was a mature student at Nottingham. She developed an interest in the impact of data presentation during her previous career as a government statistician and was keen to build on this experience within the field of dietetics and public health nutrition. Since graduating she has started her new career as a dietitian in Glasgow.”