The perception of risk in charity health communications

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Abstract

The primary objective of this dissertation was to discover whether in the light of recent interest in graphical representation of statistics, graphics are more or less effective at promoting a useful level of risk perception than other modes of statistical representation. This dissertation particularly focuses on their use in a health context. Recent theories of risk perception and the biases risk perception is subject to are discussed, and the literature from two major health charities are examined.

In order to investigate the main hypothesis, a survey was produced which tested graphical representations in the form of pictograms against numerical ratios and numerical percentages.

The survey also investigated correlation between numeracy, education levels and ability to understand these three methods of displaying statistical risk, and examined whether emotional connection to a risk, or in this case the conditions of heart disease and cancer, has an effect on perception of risk.

223 participants completed the survey.

The paper concludes that the form of graphical representation used in the survey was categorically less easy to understand than other forms of numerical representation. It also found that there is a correlation between numeracy levels and understanding but not to any great extent with education, and that there is in all probability no likely connection between risk perception and condition.

Contents

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Introduction

> “Greater access to information about risk has empowered people to enact positive lifestyle changes, especially in relation to fitness, health and diet. Yet the expansion of information has also caused conflicts over the meaning and impacts of risk amongst competing interest groups… the implicit bargain for techno-scientific development and heightened risk consciousness might well be the amplification of insecurity.”

Ulrich Beck, A Critical Introduction to the Risk Society

> “It will be as necessary to be able to compute, to think in averages and maxima and minima, as it is now to be able to read and write.”

H G Wells, Mankind in the Making

Understanding risk is important in many ways. The world requires us to make many decisions based on our perception of risk, some of which could essentially mean the difference between life and death. We take out insurance policies based on our assessment of whether our house will be burgled or flooded, whether we’ll be hit by an earthquake, blown away in a hurricane or taken ill.

Otherwise rational people may decide to take part in risky activities, such as driving to work in the snow, jumping out of aeroplanes, and eating food past its sell-by-date. Many routinely invest their money in the stock market. Every one of these involves taking a decisions based on analysing risk.

This dissertation will discuss the way people interpret risk according to the current models, what factors influence the way people interpret risk, how good or bad people

are at understanding risk, and the dangers and misinterpretations common when interpreting risk. It will examine in detail the factors specific to communicating health risk. These include the effects of numeracy, relative fear of various events, the intricacies of the minds' internal judgement systems, and how external events can affect judgement and decision making when it comes to risk.

Examining the effect of numeracy on risk perception is especially crucial. The health information examined in this dissertation and available to the public in general has to cater for a range of numeracy levels. As Slovic et al[1] make clear, low numeracy levels can have far reaching effects for a patient's ability to accurately perceive health risk:

"Fewer numeric skills [are] associated with lower comprehension and less use of health information. Many patients cannot perform the basic numeric tasks required to function in the current health care environment."

Slovic points to a study where 26 percent of participants were "unable to understand information about when an appointment was scheduled". Another experiment found that "16 percent of highly educated people incorrectly answered straightforward questions about risk magnitudes." Slovic goes on to conclude that "understanding numeric information in real health situations is often much more difficult than in hypothetical situations."

This dissertation will also consider more factors more widely applicable to risk-perception in general that, regardless of numeracy levels, affect risk perception. For example, Slovic[2] and Gigerenzer also both conclude that the degree of risk perception one has for a particular event or occurrence is strongly motivated by your relative fear of that event. Collating previous research, Gigerenzer[3] divides decision-affecting fears

1 Peters, E et al. Numeracy Skill And The Communication, Comprehension, And Use Of Risk-Benefit Information, *Health Affairs*, 2007, 26(3), pp.741-748.

2 Slovic, Paul. *The Perception of Risk*. London: Earthscan, 2004. pg. xxxi.

3 Gigerenzer, Gerd. *Reckoning with Risk: Learning to Live with Uncertainty*. London: Penguin, 2003. pg. 237-8

into three categories. The first category is preparedness – the extent to which evolution-driven instincts influence our fears – for example those of "snakes, spiders, large cats, darkness, being alone, and being exposed in an open place". The second is the potential for disaster – mainly with "catastrophic potential", that is, for example, a plane crash or nuclear holocaust – an event with the capacity to harm many people simultaneously. Although more likely and causing vastly more harm, events like car accidents or habits such as cigarette smoking "do not evoke similar levels of fear." Thirdly, Gigerenzer talks about fear generated by the "new and unknown" including "genetic engineering and nuclear technology" but not more familiar but demonstrably more risky activities like "drinking alcohol."

Another area for consideration is the relative ubiquitous of information and specifically health information. Reyna, one of the foremost proponents of the current major model of risk perception, comments on the "increasing amounts of health information are being made available to the public, with the expectation that people can use it to reduce their risks and make better medical decisions." And in the main introductory quote above, Ulrich Beck emphasises the point that we now live in an information-driven society. Given the right tools and access to the Internet, a large proportion of the world's population now has the ability to get almost immediate access to material explaining everything from the simple to the complex This includes information on health risks, the sources for which are widely varied, and occasionally conflicting .

This relatively new phenomenon has transformed how health information is transmitted. Patients in the last century traditionally had only one or two sources of health information – usually limited to their doctor, family and friends. In this information age, the general population are not only routinely expected to make frequent decisions about their health risks, but also about the trustworthiness of their information source. The amount of information available creates a minefield for health consumers and patients. Add to this an extensive amount of media coverage for health issues giving what can

often be conflicting information on health and treatment risks, and the potential for confusion or inaccurate judgement of the risks only increases.[4]

And while newspapers have no particular need for consistency in their portrayal of health risks, for most health charities, successfully communicating the relative seriousness, risk of and importance of the conditions they support is a significant challenge and can potentially play a large part in connecting successfully with their intended audiences, either to persuade them to change habits or to recruit them as potential donors.

This dissertation will explore the ways in which two health charities in particular currently communicate risk – the British Heart Foundation which raises money to deal with the prevention, treatment and care of cardiovascular disease, and Cancer Research UK, the second largest charity in the United Kingdom, which raises money to investigate the prevention and treatment of a wide range of cancers.

Heart disease and overall cancers diagnoses have very similar levels of risk in the general population. The average citizen of the western world has an approximately one in four[5] chance of suffering from heart disease and heart conditions over their lifetime. The risks for cancers of all sorts, put together, are slightly lower, but with rounding come to the same figure – one in four[6].

Using the current theories and literature around risk perception, including how they apply specifically to communicating health risks, this dissertation will examine how best to communicate health risks of this sort to the general public. It will also look in general at how different methods of delivering information influence risk perception,

4 Heroku, Kill or cure? [online], 2012. [Accessed 26 August 2012], available from: http://kill-or-cure.heroku.com/a-z/a

5 Lloyd-Jones, D.M. et al. Lifetime risk of developing coronary heart disease. *The Lancet*, 1999, 353, pp.89-92.

6 The American Cancer Society, *Lifetime risk of developing or dying from cancer* [online], 2011, available from: http://www.cancer.org/Cancer/CancerBasics/lifetime-probability-of-developing-or-dying-from-cancer

how people receive and process risk information, and how they consolidate that with external and internal influences to their understanding.

This thesis will then move on to exploring the various ways of communicating health risk currently available – by comparing and analysing the methods the two specific health charities employ. The external factors that influence understanding of risk in the case of two particular medical conditions, namely heart disease and cancer, will be examined, and the effectiveness of various ways of presenting statistical risk information in a health context will be analysed. The question of whether infographics are an effective way of communicating health risk will be examined, as will whether education levels, numeracy and other demographic factors influence that effectiveness.

This dissertation sets out to deal primarily with the potential effectiveness of infographics because while they have been employed sporadically in health publications designed to influence public understanding since Otto Neurath started promoting the Isotype system in the 1930s, they are currently experiencing a resurgence in popularity and are increasingly used as a communication tool in the media and online. As such, how effective they are needs to be examined more closely, and analysed in conjunction with the comparatively well tested numerical methods of communicating risk.

This dissertation will also look at whether knowledge and experience of the particular medical conditions examined here – heart disease and cancer – have any noticeable affect on risk perception ability.

Definitions

> “Studies of risk perception examine the judgements people make when they are asked to characterize and evaluate hazardous activities and technologies.”

Slovic, Perception of Risk, 1987

As the concept of risk perception applies to a wide variety of contexts. Therefore it is important to define some general terms before beginning detailed analysis. Based on Slovic’s analysis above, by itself, risk perception is the action of examining an event or piece of information, and upon finding that it contains the potential to put oneself, ones loved ones, or valued possessions in danger, then being able to accurately judge the extent or likelihood of that danger and act accordingly.

Health risk

This dissertation will mostly focus on perception of health risks. Health risks fall into two categories. The first type of health risk conveys an individual or general risk of contracting or suffering from a particular disease, at some point in the future. Decisions arising from understanding this risk may include taking action to change or minimise that risk. The second type is usually applied in specific circumstances and involves informing a patient of the risks and benefits of certain medical treatments or procedures. This dissertation will mostly discuss the former type of health risk.

The act of understanding risk, including health risk, involves a person using known or estimated numerical calculations about that risk, which are either provided by an external source, or otherwise learned or assumed. They then weigh them, subconsciously or consciously, against other factors both external and internal – for example personal feelings or experiences – and then come to a decision about the risk of a certain event

occurring. They can then choose whether or how to act upon the information available to them.

Numeracy

Slovic defines numeracy in a health context very simply as "an element of health literacy that refers to the ability to understand numbers." As numbers can be presented to patients in a variety of ways and contexts, Golbeck et al[7] further define the ability to understand as: "The degree to which individuals have the capacity to access, process, interpret, communicate, and act on numerical, quantitative, graphical, biostatistical, and probabilistic health information needed to make effective health decisions."

Communication of risk

Communicating risk refers to the act of expressing risk to an audience through different media, including speech (direct or indirect) delivered by various interlocutors, written text, numbers, diagrams and combinations of the latter. For the purpose of this dissertation, charity health communications are further framed as methods of communication including printed literature and online text used for the purpose of raising awareness about the general risks of a particular health condition, in this case heart disease and cancer.

7 Golbeck A.L, Ahlers-Schmidt C.R, Paschal A.M, Dismuke S.E. A definition and operational framework for health numeracy. *Am J Prev Med*, 2005, 29, pp.375-6.

This dissertation will pay particular attention to the use of numerical means of communicating risk, including attempting to demonstrate the particular effectiveness, or otherwise, of simple infographics specifically designed to help communicate risk.

Infographics

Information graphics come in many forms and differ in purpose, design and complexity. Throughout this dissertation, when referring to infographics the intended definition is that of simple representation of numerical data through the use of graphics, including percentages, ratios and simple numbers. Typical examples of the graphical method referenced by this dissertation would include the methods of representing population figures employed by early designers in the field such as Neurath's Isotype system.

How the mind processes risk

Models of risk perception

Over the last four decades as cognitive psychology has matured as an academic field, theories of risk perception have undergone a radical shift. They have moved from what was known as the Rational Model, which was based on applying the principles of scientific rigour to the human through the thought process, through more flexible models which have proven more willing to accept the frailty and context-reliant nature of thought, to the current dual-processing model, also known as fuzzy-trace theory, where the mind's capability for reasoning is thought to function on two levels – gist processing and rational thought.

The Rational Model

> "The 'rational actor' chooses what options to pursue by assessing the probability of each possible outcome, discerning the utility to be derived from each, and combining these two assessments."

Gilovich & Griffin, Heuristic and Biases

Early forays into the academic study of risk perception were based on assuming total rationality when a person comes to judge risk, including health risk.

The rational model proposed that the human mind, given all the relevant information and possessing the necessary interpretative capability, was infinitely capable of reaching not only a good solution in any decision-making process, but the best solution.

While it eventually became a less fashionable approach for psychology researchers and public health advisers whose experiences jarred with the assumption that the rational approach was always the most effective way of communicating risk, the model's

usefulness to and popularity in economics and the scientific method sustained interest in the theory. This led to it running side by side with competing models for some time. The first approach challenging perfect rationality was that of Herbert Simon in 1957, who developed a adjunct to the theory known as 'bounded rationality'.

Bounded rationality

Simon's theory was an extension of the rational model that imposed limits on the capacity of the human brain for rational thought, due to the mind's "limited search and computational capacities". While he still held up the rational model as the gold standard, he recognized flaws in the general population's ability to consistently live up to it, and modified the theory accordingly.

The theory of bounded rationality hypothesised that the human mind's imperfections could be overcome by being presented with a series of simplified options. Through these options, they should then be able to come to the correct conclusion about which decision would have the most satisfying outcome for them.

This approach had a formative effect on government health campaigns, resulting in the development of educational programmes aimed at achieving the "effective transmission of medical knowledge." [Baric, 1979].

Early health and safety films are a prime example of the practical application of this theory. In public information exercises such as the series of television adverts known collectively as 'Charley Says'[8], where a child and cat are exposed to a potentially dangerous situation. The central messages are very black and white – an appeal to rationality and socially correct behaviour. The audience is warned against getting into a particular situation, and there is no expectation that they would question that advice. In the 1967

8 National Archives, *Films* [online]. Accessed [6 September 2012]. Available at: http://www.nationalarchives.gov.uk/films/1964to1979/filmpage_strangers.htm

film 'A Cruel Kindness' by the British Medical Association / British Life Assurance Trust for Health Education[9], health and obesity are explored. The causes, consequences of and advice on how to avoid obesity are calmly and clearly presented, with the expectation that the audience's rationality and the simple presentation of solutions will cause them to conclude the correct course of action.

The societal model

The undercurrent of disagreement with the inflexible nature of the rational and bounded rationality models came to a head in the late 1970s, when public health academics started to turn more firmly towards advocating a "societal approach to health education". One of the leading lights of this movement, John Cohen[10], put forward that there were a "complexity and variety of possible individual outcomes which could not possibly all be covered by a health education intervention." This was the beginning of a more multi-faceted approach to the public understanding of risk and the cognitive psychology involved.

Recognition that human thought was likely to be influenced by external as well as internal prompts was an important step in establishing the fallibility of the rational model. In Bell's work, he argues that Suchman[11] was the first to emphasise the potential importance of education level in reasoning, by stating that the less well educated of the general populace were more likely to be influenced by and rely on personal experience,

9 Wellcome Collection, *A Cruel Kindness* [online], 1967. [Accessed 22 August 2012], available from: http://www.wellcomecollection.org/whats-on/events/quacks-and-cures-2/public-information-films.aspx

10 Cohen, J. *Behaviour in Uncertainty and Its Social Implications*. London: Allen & Unwin, 1964.

11 Bell, C. R. *Uncertain Outcomes*. Lancaster: M.T.P. Press, 1979.

popular belief and the opinion of friends and family over more authoritative sources such as doctors or government bodies.

In his early studies Slovic realised[12] that any model of health intervention needed to acknowledge that "knowledge as such is not in most cases sufficient to initiate the desired action." He noticed that some people require different or deeper levels of understanding in order to be prompted into action effectively. These insights precipitated a change in understanding the process of reasoning and decision making – key parts of risk perception – as scientists and investigators started to move from more philosophical models into the nascent field of cognitive science.

Early cognitive theory

In the mid 1980s and early 90s, researchers started to develop theories of decision making and risk perception which involved analysing in more depth the influence of 'intuition' on the act of reasoning. Reyna[13] explains that these early experiments were characterized by "two standard hypotheses about the relationship between memory and cognitive development…memory necessity (accurate memory is a precondition for good reasoning) and constructivism (memory is shaped by reasoning)." The essential idea was that what we remember is subordinate to the way we think about it, and that only our ability to think rationally that allows memory to hold its shape. This theory was backed up by a series of experiments on false memory recognition, testing adults[14] and children (Paris and Carter, 1973) with a series of sentences and seeing whether it was the sentence

12 Slovic, Paul. *The Perception of Risk*. London: Earthscan, 2004.

13 Reyna, V.F, Brainerd, C.J. Fuzzy-trace theory: An interim synthesis. *Learning and Individual Differences*, 1995, 7(1), pp.1-75.

14 Bransford, J, Franks, J. The abstraction of linguistic ideas. *Cognitive Psychology*, October 1971, 2(4), pp.331-350.

itself they remembered specifically, or the meaning. The results seemed to show that people's recognition of meaning was superior to their ability to recall perfectly.

However, these experiments were not a complete demonstration of the theory – their central issue was that they assumed the hypothesis (that memory was controlled by reasoning) was correct, and did not attempt to isolate the variables to determine whether they could also act separately, or influence each other the other way round – that is, that reasoning could be controlled by memory. As such, they could only claim that their results correlated memory and reasoning – neither could be called causative.

Fuzzy trace theory

As cognitive psychology advanced, later experiments[15] found that memory and reasoning could indeed be separated from each other. Brainerd and Kingma first coined the term 'fuzzy-trace theory' as a possible hypothesis that would explain the results of these experiments.

'Fuzzy-trace theory' refers to the idea that reasoning and memory are imperfectly linked. While people are capable of both remembering an entire sequence of events verbatim, and of precise mathematical reasoning, the more likely outcome when requiring a calculation from someone – including risk calculation – was that the gist of our memories would, correctly or incorrectly, inform our reasoning.

As a theory establishing the cognitive basis of reasoning and decision-making, it is the most comprehensive one yet, attempting to bring the various contradictory elements of previous theories under one roof. This theory has implications for many of the fundamental cognitive processes involved in risk perception. As Reyna[16] says "attitude

15 Brainerd, C.J., Kingma, J. Do children have to remember to reason? A fuzzy-trace theory of transitivity development. *Developmental Review*, 1984, 4(4), pp.311–377.

16 Reyna, V.F, Brainerd, C.J. Fuzzy-trace theory: An interim synthesis. *Learning and Individual Differences*, 1995, 7(1), pp.1-75.

change… discourse processes… metaphorical interpretation… *judgement and decision making*, mathematical and scientific problem solving" are all influenced by this theory, which hypothesises a 'hierarchy of gist' – that the most common reaction to a reasoning problem is to use the least power-intensive means of solving that problem.

As Reyna and Brainerd developed the theory further, they hit upon evidence that suggested even doing strictly numerical calculations – like those involved in health risk – could be influenced by something more than pure rationality. They found that with risk judgements in particular, how the question was framed was a key factor for decision-making. Particularly relevantly for health risk communication, subjects were presented with the well known 'dread disease problem' first instigated by Tversky and Kahneman (1981). The groups were told of a disease that will strike the country, potentially killing 600 people. One group is presented with the positively framed option to certainly save 200 people, or a 2/3 chance that everyone will be saved versus a 1/3 chance that everyone will die. Another group receives two more negatively framed options – either 400 people will certainly die, or there is a 2/3 chance everyone will die versus a 1/3 chance they will be saved.

In reality, both the certain choices were the same – either way, 400 would die. However, in the positively framed version of the problem more people chose the certain option – that 200 would be saved, and in the negatively framed version more people opted for the risky, chance-based option. The theory is that by 'framing' a calculation you move it from an objective act to a subjective one, affected by more than just clinical rationality.

Medical risk information is often presented as a probability-based judgement, whether that's a percentage chance, or a ratio of people affected. Reyna and Brainerd found that ratio choices in particular were subject to a strong form of numerical bias. In ratios, probabilities are expressed as a number (for example, one) out of a denominator

(for example, 100). Reyna's experiments showed that when comparing different ratios, evidence suggests that the denominator tends to be ignored. 10 out of 1000, for example would be commonly construed as higher than one out of 100, despite technically being the same probability.

Along with these potential sources of bias, some of Reyna's recent papers set out the various compounding factors that influence reasoning and risk perception in a medical context with more clarity, saying "factors such as knowledge and experience, beliefs about plausibility, and exposure to causal narratives influence meaning making."

The dual processing theory has resulted in significant insights into risk perception, including health risk perception. However, if the majority of risk-based decisions are made using gist understanding due to the cognitive energy saved by the process, what are the rules that govern gist processing? The next section of this dissertation will explore these rules, and the biases gist perception is subject to, in more detail.

Understanding risk in action

The risk perception toolbox

Various theories of cognition attribute certain problem-solving tools – accurate or otherwise – to adults,[17] which they can use when confronted with a choice, including those that require perception of risk. Younger people whose brains are still in the process of developing, or those with evidence of mental decline may possess only some of these same tools, or all of them but with varying degrees of sophistication. The idea is that when presented with the need to make a choice, we can employ several strategies – either separately or together. These strategies are designated as:

- Dominance – the process whereby either the best option or the worst is easily dismissed. This tool is only useful when there is one alternative that is clearly dramatically more or less attractive than all the others.

- Additive linear – all the options are examined thoroughly, one at a time, and their overall global 'usefulness' calculated. This decision-making tool is behind most economic theories which emphasise rational choice, and is the closest equivalent to the Rational Model.

- Additive difference – two alternatives at a time are compared, and overall differences estimated. The winner is then carried over and goes through another comparative round. Use of this cognitive tool is common in everyday consumer choice, for example in the purchase of goods.

17 Hastie, Reid, and Robyn M. Dawes. *Rational Choice in an Uncertain World: An Introduction to Judgement and Decision Making*. London: SAGE, 2001.

- Satisficing (conjunctive) – the chooser sets cut-off points for acceptability of choice across the board, and dismisses those below the line, then sets further cut-off points until satisfied. Again common in consumer choice, this tool is roughly analogous to Simon's theory of bounded rationality – from which the term 'satisficing' originates.

- Disjunctive – a tool whereby the decision-maker sets cut off points for one variable at a time, for example first on cost, second on quality, and dismiss choices which do not fall into those categories as they go along.

- Lexicographic – attributes are reviewed and the decision-maker choose the most important attribute for them (price, for example). They then choose best option for that attribute. The decision-maker then applies the same process to the next most important attribute.

- Elimination by aspects – the decision-maker chooses a useful or appealing attribute at random, and eliminates potential choices in rounds until their chosen attributes are exhausted.

- Recognition heuristics – an intuitive tool based on recognition of the name or other attribute, this is the strategy which most closely resembles pure gist cognition.

A person may use one or more of these strategies when engaged in decision making that involves risk perception. The difficulties of choosing the best option are further compounded by the natural biases the human mind is susceptible to. Indeed, one of the keys to understanding people's perception of risk is to examine the thought patterns

we most often fall into when examining risks, and the behaviours, positive or negative, which may result.

Heuristics and bias in risk perception and decision-making

In the dual-processing model described in fuzzy-trace theory, gist processing requires less mental power than reasoning, and when not based on inaccurate rules, can be a particularly efficient use of mental resources. These rules for gist processing are called heuristics, and at a base level they allow a person to consistently estimate useful values that are close enough to the true value, without the cognitive costs that are associated with more rigorous, rational analysis. Psychological research has qualified several distinct heuristic forms, and also seeks to quantify the conscious and unconscious biases that contribute to these heuristics.[18]

The anchoring heuristic

Anchoring refers to the effect processing related information has on decision-making and risk perception. For example, if someone is asked to estimate how common an event is, such as the possibility of having a heart attack, and directly prior to that is given information about a rarer event such as the incidence of spider bites, this has the effect of lowering their perception of how common heart attacks are.

So associated numbers – whether they're associated by proximity as in the example above – or memory – can subconsciously 'anchor' perceptions of risk as higher or lower than they may have been without this cognitive interference. In 1974, Tversky and Kahneman ran a series of experiments which demonstrated that experimental subjects, when first given a simple cue number with no relevance to the experiment and then subsequently asked an unrelated question – in this case 'how many African countries are

18 Fischhoff, Baruch, Ann Bostrom, and Marilyn Jacobs Quadrel. Risk Perception and Communication. *Annual Review of Public Health*. 1993. 14(1). pp.183-203.

in the United Nations', those given the higher number came up with a higher percentage value on average than those given the lower number.

In a more health related context, Benjamin, Dougan and Buschena[19] carried out an experiment where they asked their subjects to estimate the likelihood of death from two events – a car accident or electrocution. When given a figure for electrocution (the lower risk event) the participants underestimated the frequency of car accidents, and when given information about car accident frequency they overestimated the possibility of the less common electrocution. The evidence consistently suggests that when asked to think about events that are perceived as rare, subsequent risk analysis of more common events is given a lower value, and vice versa.

The availability heuristic[20]

Regarded by some as a subset of anchoring bias as it exhibits a similar effect, availability bias is potentially more pervasive now than it has ever been. Kahneman and Tversky (1973) describe it thus: "it appears that whenever some aspect of the environment is made disproportionately salient or 'available', that aspect is given more weight in causal attribution."

The availability bias refers, both directly and indirectly, to the effect exposure to information can have on the ability to judge risks and make decisions. The increasing ease with which information can be consumed through all kinds of media – newspapers, television, the Internet – means that more assumptions are anchored in the unconscious mind than may be immediately apparent. The constant flow of often contradictory media commentary can serve, for example, to strengthen internal prejudices, or reinforce or

19 Benjamin, Daniel K., Dougan, William R., Buschena, David. Individuals' Estimates of the Risks of Death: Part II—New Evidence. *Journal of Risk and Uncertainty*, 2001, 22(1), pp.35-27.

20 Tversky, A, Kahneman, D. Judgment under Uncertainty: Heuristics and Biases. *Science*, 27 September 1974, 185 (4157), pp.1124-1131.

lead to the dismissal of previous perceptions of events and situations, and so potentially have a misleading effect on the mind's ability to accurately perceive risk.

The representativeness heuristic

Research has shown that the human mind lacks an instinctive grasp of probability and demonstrates a tendency to cling to or even create observed patterns in data.[21] There is an expectation that a data set – no matter how small – will conform to an existing mental model. Because this effect could in some cases be attributed to a lack of understanding about the reliability of large sets of numbers versus the relative unreliability of small sets, the original experiments on representativeness were carried out on individuals with a demonstrably firm grasp of statistics in order to demonstrate the universality of the rule.

As Kahneman[22] puts it, this heuristic refers to when "a difficult question is answered be substituting an answer to an easier one."

One of the more famous examples of this is the imaginary case of student Tom W. Given a description of Tom containing certain general characteristics, one set of experimental subjects were asked to estimate, given 9 different subjects, how much Tom resembles a typical student of those subjects. Similarly, another set of participants were asked to estimate the likelihood of Tom specialising in the same set of subjects. A third set were asked what percentage of the student body did what subjects – the results of which established that the experimental subjects had a relatively firm grasp of how many students did various subjects.

Despite the wide possibilities of the situation – given the size of the student body and the way they were distributed between subjects, Tom was just as likely to be a typical

21 Fischhoff, Baruch, Ann Bostrom, and Marilyn Jacobs Quadrel. Risk Perception and Communication. *Annual Review of Public Health*. 1993. 14(1). pp.183-203.

22 Kahneman, D., Frederick, S. Representativeness revisited, In: Gilovich, Thomas, Dale W. Griffin, and Daniel Kahneman eds. *Heuristics and Biases: The Psychology of Intuitive Judgment*. Cambridge, U.K.: Cambridge University Press, 2003.

student of or specialize in a different subject to the one the majority of experiment participants choose for him – engineering. However, although this was the subject people chose most consistently chose as Tom's potential speciality, the university concerned in fact only had a small engineering department – so any given student was less likely to be an engineering student. The experiment participants focused on the mental model created by certain traits in the description of Tom – such as introversion, intelligence and lack of creativity. They made the assumption that he fitted the profile of an engineering student or was likely to specialize in the subject despite the available evidence pointing to an alternative result.

To paraphrase Kahneman above, the question they answered was not the more difficult 'Using your knowledge of the make-up of the student body, what is Tom likely to study', but the easier 'In your experience, with which subject do you associate introverted, intelligent men who are lacking in creativity?' To which the participant's mental models provided the answer of 'engineering student.'

When asked to estimate the probability of an event, we are likely to gather or bunch data along intuitive, heuristic lines.

Connected to the representativeness heuristic is the idea of the base rate fallacy. This refers to the rule that without knowing or being able to estimate the base rate of an event occurring, a person given the percentage risk of that event has no way of understanding the true value of that percentage. When presented with a percentage risk value without knowing the base-rate, over-estimating the likelihood of an event is common[23]. However, we also know from Reyna's experiments as referenced above that

23 Gilovich, T, Griffin, D.W, Kahneman, D. *Heuristics and Biases: The Psychology of Intuitive Judgment*. Cambridge, U.K.: Cambridge University Press, 2003.

how the base rate is expressed is also important. The size of the base rate can affect risk judgement adversely as well.

Conjunction fallacy[24]

As the representativeness heuristic above demonstrates, when asked to make calculations the mind subconsciously or consciously refer back to a mental model of the situation, fitting it into a representative or unrepresentative category. Another part of this phenomenon is that if multiple variables overlapping are presented together, if only one of them fits a preexisting mental model - even if it's less likely than other options - research participants are more likely to believe more strongly in that option.

One of the most well-known demonstrations of this form of bias is the logic problem of Linda the feminist bank-teller. Given a description of Linda[25] as "31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice and also participated in antinuclear demonstrations." Those studied were more likely to identify Linda as a 'feminist bank teller' than a 'bank teller', despite the latter group including the former. The subjects' attribution of 'feminist' to Linda fitted into an existing mental model more easily than the over-arching criteria of 'bank teller'.

24 Gilovich, Thomas, Dale W. Griffin, and Daniel Kahneman. *Heuristics and Biases: The Psychology of Intuitive Judgment*. Cambridge, U.K.: Cambridge University Press, 2003.

25 Ibid.

The dread factor

> “The characteristic most highly correlated with perceived risk was the degree to which a hazard evoked feelings of dread.”

Slovic, Perceptions of Risk: The Affect Heuristic, (pg. xxxi)

As described in the introduction to this dissertation, one of the most significant factors affecting risk perception is the level of fear or dread that can be ascribed to any given situation. Gigerenzer describes these factors as dividing into three scenarios:

- Preparedness – how traditional fears, such as those of the dark, snakes and strangers. Risk judgements made under these circumstances are likely to result in cautious decision-making.

- Disaster potential – inflated perceptions of the risk of events that have the potential to harm large groups of people.

- Fear of the unknown – perception of new ideas as posing a greater danger to personal and public safety than more established and more familiar risks – no matter how harmful they may actually be.

One type of bias that may be connected with the dread factor is the idea of involuntary and voluntary risk. According to Slovic, which of the latter categories an event falls under affects the mind’s perception of the risk involved. Snowboarding, parachuting, travelling by car and other high-risk activities are regarded as less threatening because they are done voluntarily. Events such as cancer or genetically modified foods are not regarded as events which people have full control over, and are therefore regarded as more threatening than they really are – risk perception levels are raised. As Slovic says[26],

26 Slovic, Paul. *The Perception of Risk*. London: Earthscan, 2004. p. 94.

"if risks were adjusted to an acceptable level, then higher risk levels would be tolerated for old, voluntary activities with well-known and immediate consequences."

Communicating risk

While some or all of the biases and heuristic tools above may be employed by those asked to make a decision about their health, there are still further elements to consider that are concerned with larger elements of personality, such as perception of self, and perception of social relationships. Both of these can affect how the risks of engaging in a particular behaviour or receiving a certain treatment are perceived, and therefore affect any decisions that follow.

Intrapersonal communication

Dianne Berry[27] describes the former as 'intrapersonal communication' and refers to the patient's psychological desire to fit in. This applies not only to how a patient might think other people see them and the desire to appear appealing to others, but also how they see themselves, and the need to check their self-perception against what the rest of the world sees.

According to Burton and Dimbleby[28] at the most basic level intrapersonal communication is made up of five aspects: decoding, integration, memory, schemata and encoding.

27 Berry, Dianne. *Health Communication: Theory and Practice*. Maidenhead: Open University Press, 2007.

28 Ibid.

Steinberg[29] defines these aspects as the way we "give meaning to the positive and negative images that influence our image of ourselves."

- Decoding – the process by which information is received by the brain.
- Integration – information is given context by comparing it against and matching it with preexisting information held in the brain.
- Memory – where we store and arrange our experiences, attitudes and beliefs into our concept of self. Storage and retrieval of memories are both subjective processes, and as such rarely involve accurate recall.
- Schemata – the frameworks we build up over time to help us store and process information.
- Encoding – the process of formulating our internal response to the initial input.

According to Berry, as key aspects of how messages are processed by the brain, memory, schemata and encoding are affected by self-perception, and therefore the mind's ability to process risk is also affected.

29 Steinberg, Sheila. *An Introduction to Communication Studies*. Cape Town, South Africa: Juta, 2007.

Interpersonal communication

> “If you trust the risk manager, communication is relatively easy”

P Slovic, Perceptions of Risk: The Affect Heuristic, (pg. xxxv)

While the factors described above are to do with self-perception, when information is processed by the brain it is also influenced by the method of delivery. While this idea of interpersonal communication is generally more applicable to situations where an interlocutor such as a doctor or nurse is present, they serve to illustrate the importance of adopting a suitable tone of voice in any form of communication and being sensitive to the needs and background of a patient.

Berry categorises interpersonal communications as involving the person doing the talking and their effect on who they’re communicating to. A person’s perception of risk might be influenced, for example, by whether they hold the deliverer of the message in high esteem, or otherwise.

The medium also influences the effectiveness of interpersonal communication. This includes how a message is presented, the place and circumstances, how much noise or distraction is in the vicinity, and the technology used. Berry also emphasizes that interpersonal communication involves learned skills – reading, visualizing, listening, and more – and that as such, patients can be more or less skilled at receiving and interpreting information, potentially requiring adjustment of the message or approach.

Both physicians and patients need to be able to understand and communicate their understanding of risk in order to gain the most benefits from treatment or preventative measures.

Reyna's investigations into medical decision-making showed that for physicians and patients alike:

> "Contrary to conventional wisdom, satisfaction has been shown to be higher when people choose from a smaller set of options, even when a larger set includes the smaller set and the same option is selected in both situations. Decision quality has also been argued to be worse with more options."

VF Reyna, Theories of Medical Decision Making and Health: An Evidence-Based Approach, Med Decis Making. 2008; 28(6): 829–833.

Choice is the benchmark of most political thinking on public health in the United Kingdom[30]. There has been a move over the last few decades to give patients greater freedom to choose their health care providers and methods of treatment. However, as Reyna shows, excessive levels of choice can be detrimental to decision-making – both for the physician and the patient.

The optimism effect

In four separate studies of perception of health risk, Weinstein and Klein[31] found that in general, participants were slightly too optimistic about their own health risks – even if they were objective about health risks in general. Using obesity and alcoholism as their

30 Royal College of Psychiatrists, *Health policy comparison* [online], 2010. [Accessed 11 September 2012]. Available from: http://www.rcpsych.ac.uk/policy/parliamentandpublicaffairs/healthpolicycomparison.aspx

31 Weinstein, N.D., Klein, W M. Resistance of personal risk perceptions to debiasing interventions, In: Gilovich, Thomas, Dale W. Griffin, and Daniel Kahneman. *Heuristics and Biases: The Psychology of Intuitive Judgment*. Cambridge, U.K.: Cambridge University Press, 2003.

conditions, they investigated possible strategies for combatting this natural optimism, with variable results.

The first study asked participants to state their own risk before and after reading about the major risk factors. There was no noticeable change in their judgement of their risk.

The second experiment, unlike typical health questionnaires which usually require participants to compare themselves against unfavourable examples of behaviour, those taking part in the study were asked questions based on 'perfect' behaviour – an imaginary person who exercised 4 times a week, or never got drunk. Far from encouraging better behaviour, this technique in fact increased optimism about current personal lifestyle choices.

In the third study, participants were specifically asked to project a mental image of the worst and best case scenarios for these conditions, then combine them onto a single individual who was 'like' themselves. Study participants had problems visualising the best case scenario, and tended more towards the worst case. Once again, this resulted in more optimism about the participants' personal behaviours.

In the final study, participants were asked to come up with their own list of activities that would raise or lower their risk factor for the conditions in question. Those asked to formulate risk-lowering activities became more optimistic about their current level of behaviour, and listing risk-increasing activities had no noticeable effect on their original slightly inflated optimism.

Another aspect to the study of optimism is that according to Armor and Shelley[32] "people… appear to be more optimistically biased under conditions of greater uncertainty." They concluded that when the risk of an adverse event happening is closest to fifty-fifty – when uncertainty is at maximum – optimism is greater than for those who experience more certainty.

There also appears to be a tendency for people to become more pessimistic – or perhaps realistic – about their chances closer to a risky event[33]. Two possible theories that could account for this are firstly anxiety management – the participant could be preparing for failure. Secondly, there seems to be a willingness to be more accurate when personal judgement is about to be put to the test publicly – connecting with Berry's theories above on the intrapersonal need to fit in and be judged favourably by peers.

Gender and race

> "About 30 per cent of the white male population saw the risks as extremely small."

P Slovic, Perceptions of Risk: The Affect Heuristic, (pg. xxxiv)

Slovic's research into whether any aspects of bias could be attributed to gender or race found only one significant effect on risk perception, as outlined above. The same study noted no appreciable difference between nonwhite males and females of all races.

32 Armor, D.A., Taylor, S.E. When predictions fail: the dilemma of unrealistic optimism, In: Gilovich, Thomas, Dale W. Griffin, and Daniel Kahneman. *Heuristics and Biases: The Psychology of Intuitive Judgment*. Cambridge, U.K.: Cambridge University Press, 2003.

33 Ibid

Charity communication of health risk

Health charities have a vested interest in communicating the risks of the conditions they focus on effectively to the general public. Their interest is two-fold; firstly, they have prevention of the condition or conditions in mind. This is particularly the case with the two charities this dissertation focuses on – Cancer Research UK and the British Heart Foundation. To effectively prevent cancer or heart disease, these charities need to first get across the message that these conditions are preventable, and then inform the public effectively on how to avoid them. Secondly, both charities are supported by donations from the public. Improving risk perception of the conditions they deal with could help convince the public of the worthiness of their cause, and potentially increase donations.

In this dissertation we will examine two types of communications regularly employed by health charities, and the way they communicate health risks. As this dissertation deals primarily with text-based media, the analysis will be concentrated on printed material – booklets and leaflets freely available from those charities, and on the relevant websites of the two charities in question.

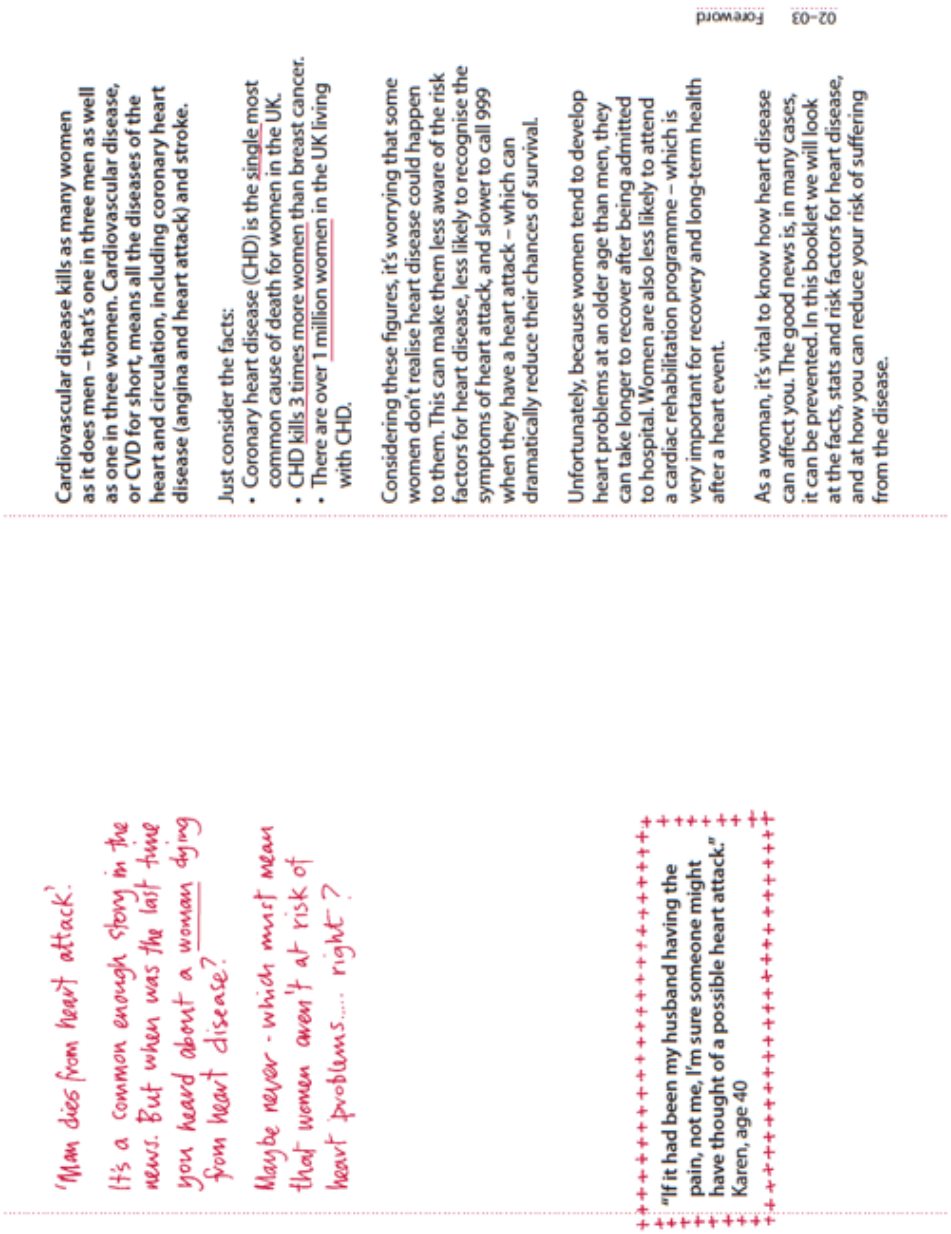
Booklets and leaflets

The printed publications produced by health charities have several potential contexts for distribution. Some are more medically orientated and are specifically designed to be handed out directly to patients by medical professionals; others are placed in medical situations such as hospital waiting rooms or doctor's surgeries and are designed to be picked up and understood by patients on a voluntarily basis.

Some are used in direct mail or targeted campaigns, and tend to be more audience specific. Others are more general in tone and content, and are meant for placement in charity shops and to be distributed at events as appropriate.

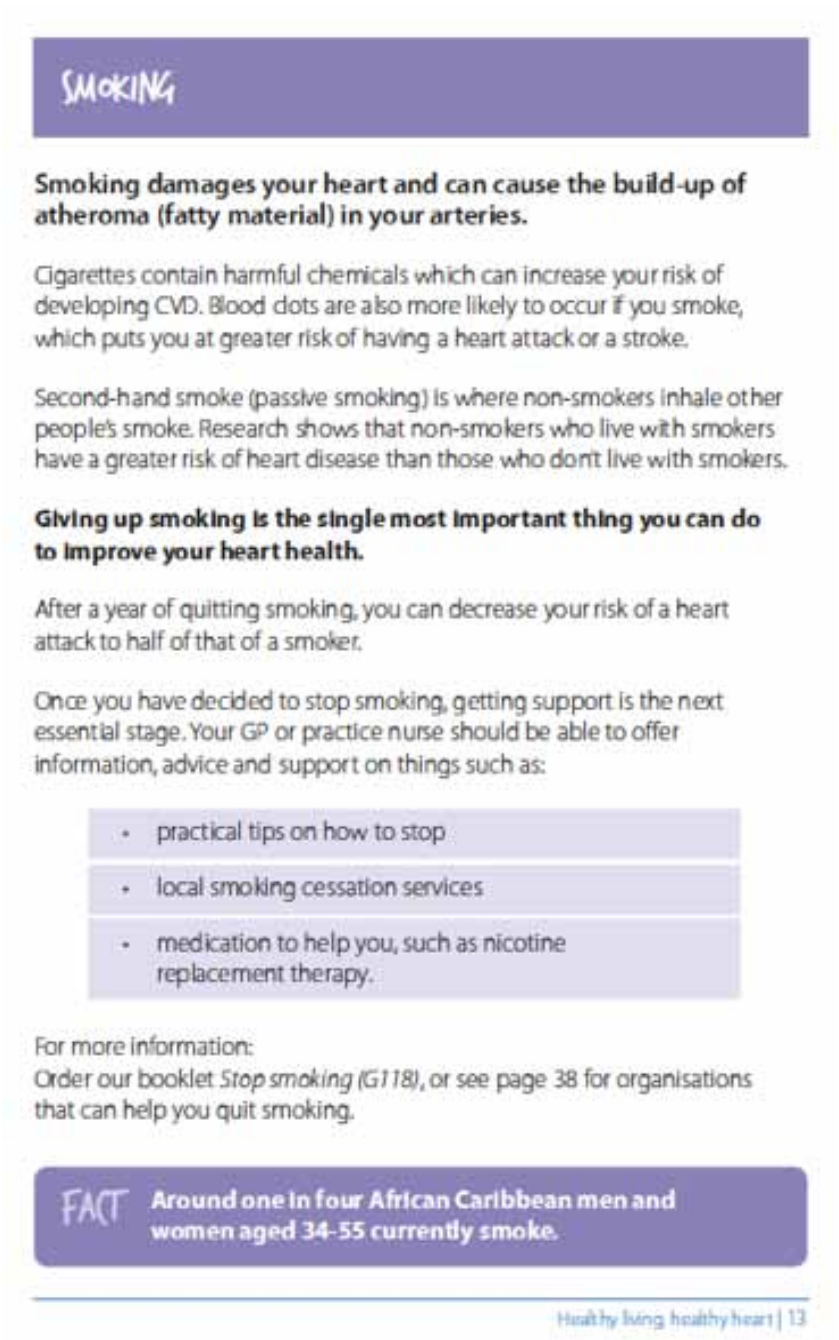
From investigating the publication libraries of the two charities this dissertation is concerned with, the most likely medium in which these charities employ statistical representations of risk seems to be through audience-specific communication – that is, materials developed for, targeted groups such as gender, ethnicity and condition.

Image 1.1 British Heart Foundation, Women and Heart Disease



This leaflet uses three forms of number representation: real numbers such as "1 million women," ratios like "one in three men," and the comparative "3 times more women."

Image 1.2 British Heart Foundation, Healthy Living, Healthy Heart for African Caribbean communities



SMOKING

Smoking damages your heart and can cause the build-up of atheroma (fatty material) in your arteries.

Cigarettes contain harmful chemicals which can increase your risk of developing CVD. Blood clots are also more likely to occur if you smoke, which puts you at greater risk of having a heart attack or a stroke.

Second-hand smoke (passive smoking) is where non-smokers inhale other people's smoke. Research shows that non-smokers who live with smokers have a greater risk of heart disease than those who don't live with smokers.

Giving up smoking is the single most important thing you can do to improve your heart health.

After a year of quitting smoking, you can decrease your risk of a heart attack to half of that of a smoker.

Once you have decided to stop smoking, getting support is the next essential stage. Your GP or practice nurse should be able to offer information, advice and support on things such as:

- practical tips on how to stop
- local smoking cessation services
- medication to help you, such as nicotine replacement therapy.

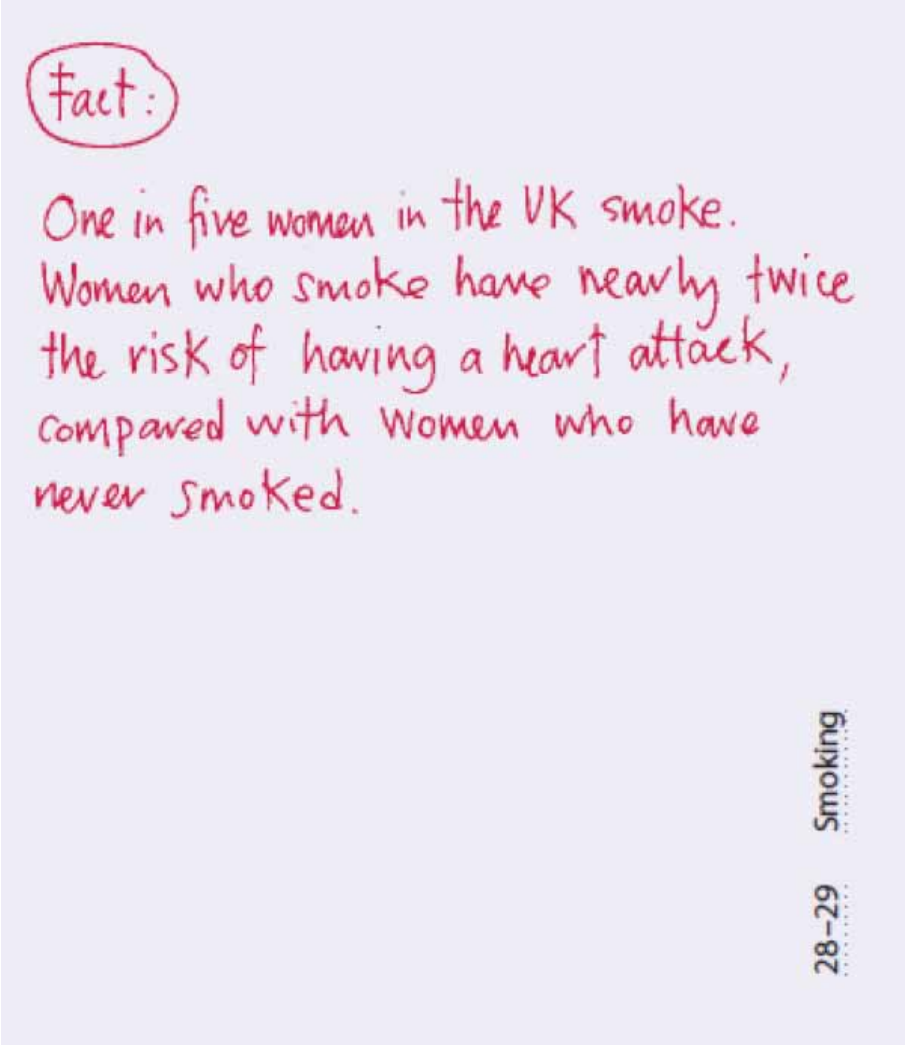
For more information:
Order our booklet *Stop smoking (G118)*, or see page 38 for organisations that can help you quit smoking.

FACT **Around one in four African Caribbean men and women aged 34-55 currently smoke.**

Healthy living, healthy heart | 13

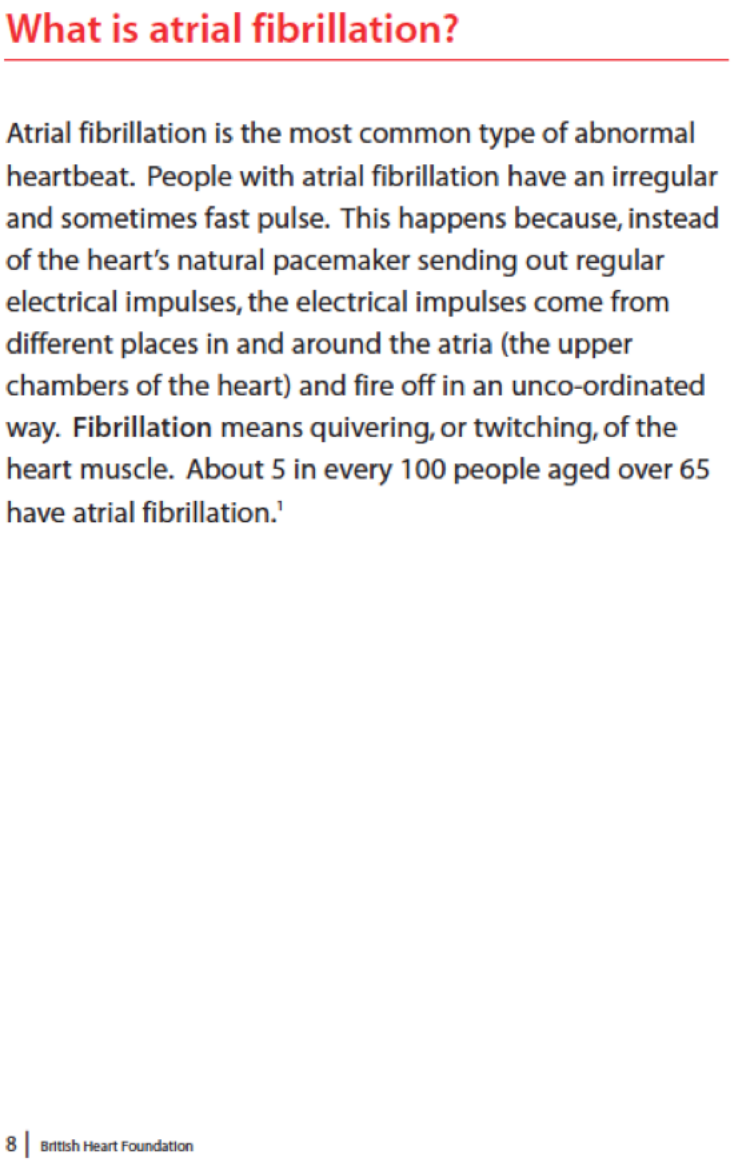
This image uses ratio presentation "One in four African Caribbean men and women… currently smoke"

Image 1.3 British Heart Foundation, Women and Heart Disease



This booklet uses two forms of numerical presentation – ratios in "one in five women in the UK smoke" and the comparative "nearly twice the risk."

Image 1.4 British Heart Foundation, Atrial Fibrillation

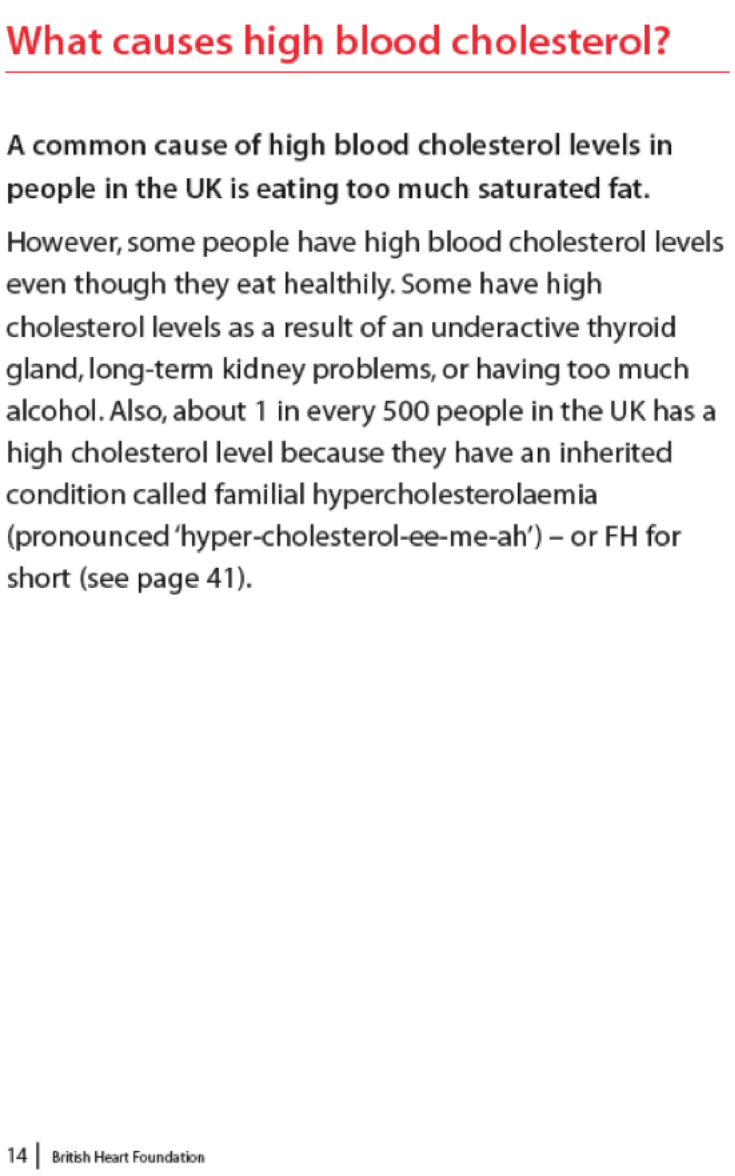


What is atrial fibrillation?

Atrial fibrillation is the most common type of abnormal heartbeat. People with atrial fibrillation have an irregular and sometimes fast pulse. This happens because, instead of the heart's natural pacemaker sending out regular electrical impulses, the electrical impulses come from different places in and around the atria (the upper chambers of the heart) and fire off in an unco-ordinated way. **Fibrillation** means quivering, or twitching, of the heart muscle. About 5 in every 100 people aged over 65 have atrial fibrillation.[1]

This booklet extract uses a ratio with large numbers "about 5 in every 100 people" to convey statistical information.

Image 1.5 British Heart Foundation, Reducing High Cholesterol



What causes high blood cholesterol?

A common cause of high blood cholesterol levels in people in the UK is eating too much saturated fat.

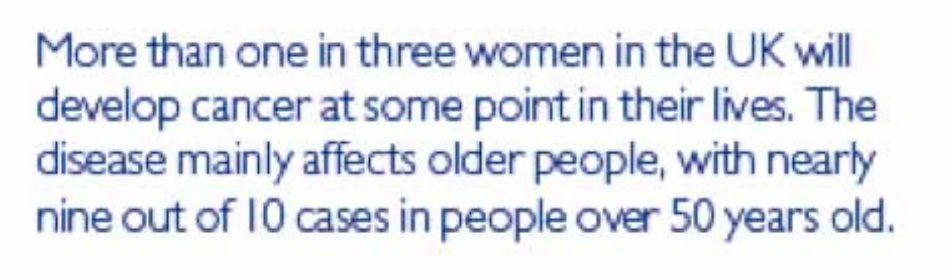
However, some people have high blood cholesterol levels even though they eat healthily. Some have high cholesterol levels as a result of an underactive thyroid gland, long-term kidney problems, or having too much alcohol. Also, about 1 in every 500 people in the UK has a high cholesterol level because they have an inherited condition called familial hypercholesterolaemia (pronounced 'hyper-cholesterol-ee-me-ah') – or FH for short (see page 41).

14 | British Heart Foundation

This booklet extract also uses a ratio with large numbers to convey statistical information, for example "about 1 in every 500 people."

Image 1.6 Cancer Research UK, Reducing cancer risk: what men can do

Image 1.7 Cancer Research UK, Spotting the signs of cancer: for women



These extracts from two leaflets use ratios to display statistical data, saying "More than one in three men [and women]" and "nearly nine out of ten cases in people over 50 years old."

Websites

Both charities possess a number of different websites, however for the purpose of this dissertation I will focus on the use of numerical statistics on their primary websites – www.cancerresearchuk.org and www.bhf.org.uk.

Cancer Research UK

All quotes were taken from the main Cancer Research UK website on 6 September 2012.

This quote uses ratios to impart statistical information:

> "Anyone can develop cancer but it's more common as we get older – nine out of 10 cases are in people aged 50 or over. There are more than 200 different types of cancer with lots of different symptoms."[34]

This quote uses comparative ratios, real numbers and percentages:

> "The most serious type of skin cancer is malignant melanoma, and the most important factor affecting a person's chances of surviving is how thick the cancer is at the time it is diagnosed. If the melanoma is less than 1mm thick, 92 out of 100 people survive at least ten years after diagnosis. But if the melanoma is more than 4mm thick at the time it's diagnosed, far fewer people survive for ten years – just 50 out of 100 people.

> "Lung cancer is the second most common cancer in the UK, with more than 40,000 people diagnosed each year. For some types of lung cancer if it is caught at the earliest stage, more than

34 Cancer Research UK, Spot Cancer Early [online], 2012 [Accessed 6 September 2012]. Available from: http://www.cancerresearchuk.org/cancer-info/spotcancerearly/

70% of people survive their disease for at least 5 years. But lung cancer currently has one of the lowest survival outcomes of any cancer because over two-thirds of patients are diagnosed at a late stage when successful treatment is not possible."[35]

This quote uses ratios and real numbers:

> "In the UK, more than one in three people will develop cancer at some point in their lives. Every year, around 309,500 people are diagnosed with the disease.
>
> "But experts estimate that more than four in 10 cancer cases could be prevented by lifestyle changes."[36]

This quote uses percentages, ratios and fractions:

> "Half the people diagnosed with cancer today will still be alive in five years' time. And more than 40% will still be alive in ten years' time. The average ten-year survival rate for cancer has doubled over the past 30 years.
>
> "More than nine out of ten men with testicular cancer are now effectively cured.
>
> "And now more than three quarters of children with cancer survive, compared with only a quarter back in the 60s."[37]

35 Ibid.

36 Cancer Research UK, Cancer Information [online], 2012 [Accessed 6 September 2012]. Available from: http://www.cancerresearchuk.org/cancer-info/healthyliving/introducingcancerprevention/

37 Cancer Research UK, Spot Cancer Early [online], 2012 [Accessed 6 September 2012]. Available from: http://www.cancerresearchuk.org/cancer-info/spotcancerearly/cancersignandsymptoms/whyisearlydiagnosisimportant/

The British Heart Foundation

All quotes taken from the main British Heart Foundation website on 6 September 2012.

This quote uses real numbers:

> "Your support can give hope to hundreds of thousands of people across the UK."[38]

This quote uses ratios and real numbers together:

> "Around 800,000 people in the UK have AF – roughly one in 100 – and mostly aged 55 and over."[39]

This quote uses fractions and real numbers:

> "Cardiovascular disease – also known as heart and circulatory disease – is the biggest killer in the UK. In 2009, around one third of all deaths

38 British Heart Foundation, Mending Broken Hearts [online], 2011 [Accessed 6 September 2012]. Available from: http://www.bhf.org.uk/research/mending-broken-hearts-appeal.aspx

39 British Heart Foundation, Conditions [online], 2012 [Accessed 6 September 2012]. Available from: http://www.bhf.org.uk/heart-health/conditions/atrial-fibrillation.aspx

in the UK were due to CVD. Of these, over 82,000 deaths were caused by coronary heart disease, and about 49,000 were caused by stroke."[40]

This quote uses ratios:

> "It's an enduring myth that heart disease affects men more than women, but the truth is, heart and circulatory disease kills 1 in 3 women, as well as 1 in 3 men."[41]

40 British Heart Foundation, Conditions [online], 2012 [Accessed 6 September 2012]. Available from: http://www.bhf.org.uk/heart-health/conditions/cardiovascular-disease.aspx

41 British Heart Foundation, Conditions [online], 2012 [Accessed 6 September 2012]. Available from: http://www.bhf.org.uk/heart-health/conditions/women-and-heart-disease.aspx

Analysis

The approaches used by both charities seem quite different. Cancer Research UK uses a wider amount of methods to convey statistical information and mixes them together more often. Cancer Research UK also uses numbers displayed as ratios and fractions significantly more often, and is the only user of percentages to display information.

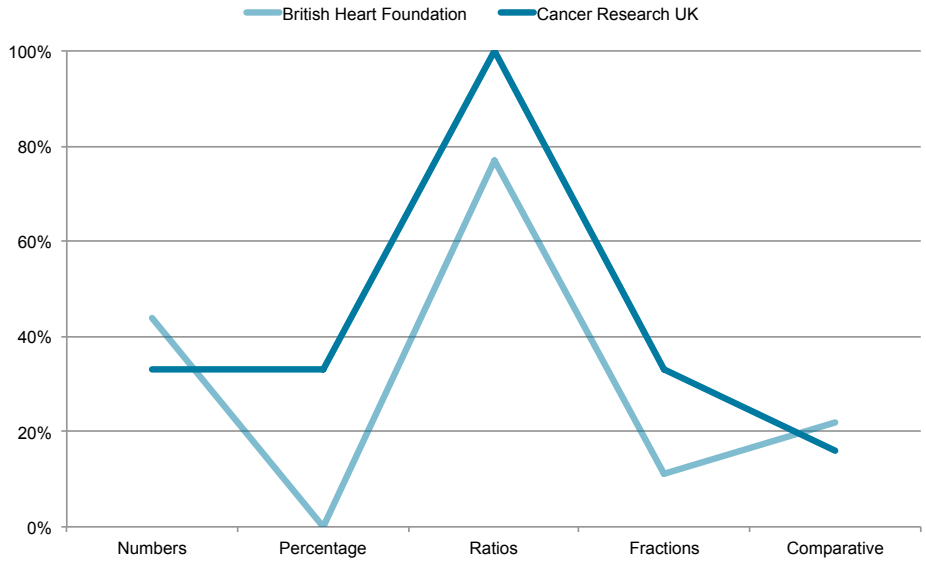
Table 1.1 Tactics used by charities when communicating risk

Charity / Tactics	Numbers	%	Ratios	Fractions	Compare
British Heart Foundation	Yes	No	Yes	Yes	Yes
Cancer Research UK	Yes	Yes	Yes	Yes	Yes

Table 1.2 Frequency of tactics used in media examined

Tactics / Charity	British Heart Foundation	Cancer Research UK
Numbers	4/9 (44%)	2/6 (33%)
Percentage	0/9 (0%)	2/6 (33%)
Ratios	7/9 (77%)	6/6 (100%)
Fractions	1/9 (11%)	2/6 (33%)
Comparative	2/9 (22%)	1/6 (16%)

Chart 1.1 Line diagram of tactic frequencies used



However, these figures give little insight into the effectiveness of these various means of communicating statistical figures – and specifically statistical risk. As such, the remainder of this dissertation will deal with testing which methods might be most effective for helping the reader or user understand risk and be able to more confidently and accurately make decisions based on that understanding.

Survey

Hypothesis

Reyna et al have widely tested the efficacy of representing statistical information through ratios and percentages, demonstrating that percentage values have the most success for facilitating understanding[42] and are most successful at cutting through the various issues posed by numeracy and education levels.

The main hypothesis of this dissertation is that at base level, graphical ratios are no easier to understand than numerical ratios, and that when percentage is used, this method will have a significantly higher understanding rate than either option.

Following this, the secondary hypothesis is that ability to understand all three forms of statistical representation will correlate with education and numeracy levels.

Finally, based on Slovic's theory of how the voluntary and involuntary nature of an event influences risk perception, there is a further hypothesis that there will be a difference in ability to understand between groups demonstrating particular loyalty towards the separate conditions of cancer and heart disease.

Methodology

To test these hypotheses, a survey was instigated to investigate which, if any, of three methods of displaying health risk – numeric ratio, numeric percentage and graphical ratio – were the most effective at communicating that risk. The survey also aimed to

42 Reyna, V. F., & Brainerd, C. J. Numeracy, ratio bias, and denominator neglect in judgments of risk and probability. *Learning and Individual Differences*, 2008,18(1), pp.89-107.

investigate whether the condition the health risk is for affects perception of risk, using heart disease and cancer as the conditions.

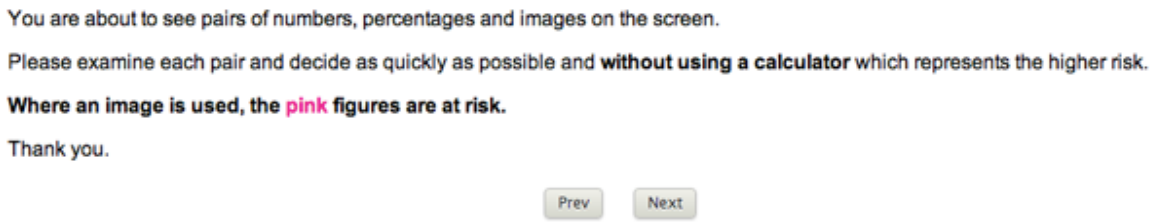
The results will enable firmer establishment of whether people have a tendency to have a better or worse grasp of graphical representations of risk than their numerical counterparts, or whether there is no difference. The survey will also help establish whether the two particular conditions, heart disease and cancer, affect the subject's answers , and therefore their perception of risk, in any way - or if they remain objective.

The first part of the survey gathered demographic information establishing age, gender, educational status and self-reported numeracy. It also established the subject's prior knowledge of and experiences with heart disease and cancer, and their relationship with heart disease and cancer charities.

The main part of the survey was a side by side comparison of sets of ratios, percentages, and graphical representations, with each question asking the subject to choose which of the two figures they thought represented the highest risk as quickly as possible. According to the latest dual-processing theories of decision-making and understanding, the human mind uses gist comprehension the majority of the time, but also has a more rational track. Asking for a quick answer was one way of judging, as far as possible, gist comprehension rather than verbatim reasoning.

After the demographic questions, participants were first given the instructions for completing the risk perception task, and then taken to the relevant questions. The order of the questions, and the order of answers inside those questions were randomised to eliminate bias and pattern recognition wherever possible.

Image 1.8 Screenshot of main survey task introduction



They were then asked to compare pairs of figures in the following combinations:

Image 1.9 Percentage and ratio

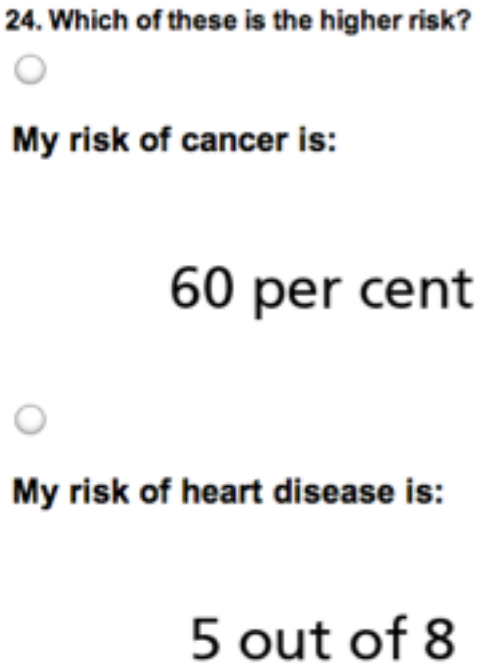


Image 1.10 Percentage and graphic

Image 1.11 Percentage and percentage

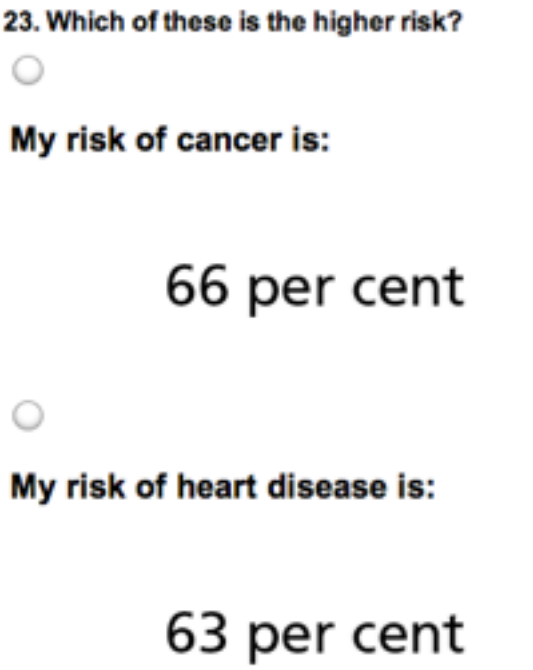


Image 1.12 Ratio and graphic

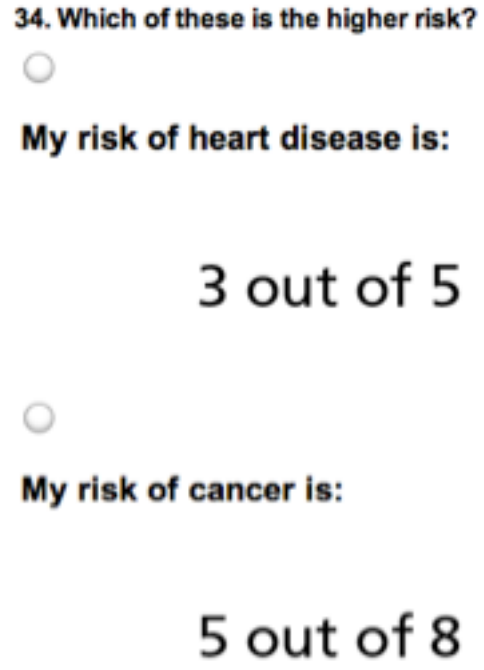


Image 1.13 Ratio and ratio

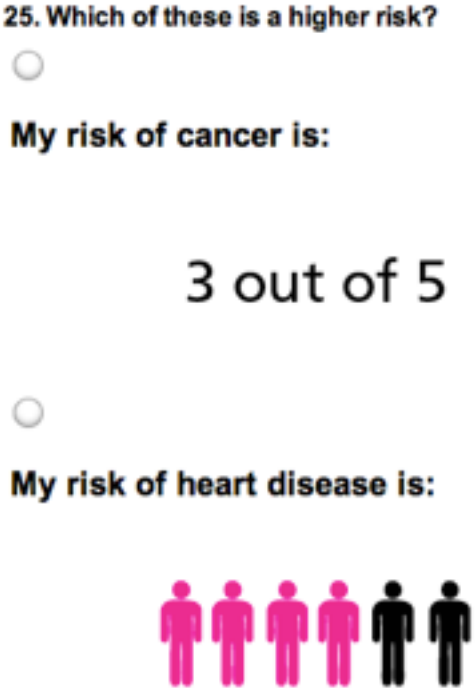


Image 1.14 Graphic and graphic

Overall, the survey contained 53 questions and took place online, so participants could carry out the survey from anywhere via smartphone or computer.

The optimum minimum sample size for any survey is 100 overall samples and at least 30 per applicable demographic[43]. The aim was to gather at least 200 samples, but to try for more. This would mean that the survey results could be extrapolated to cover the whole population of the UK, and if enough information is gathered for each demographic the results could be split further to apply to individual population groups.

The survey was advertised online on the website www.simplyunderstand.com, through social media on Twitter, Facebook and Google plus, and through email via friends, family, the university and the workplace. Volunteers were requested to pass on the survey to their own friends and family.

43 National Audit Office, *A practical guide to sampling* [online], 2001, [Accessed 9 September 2012]. Available from: http://www.nao.org.uk/publications/0001/sampling_guide.aspx

Results

The survey received 326 replies, 223 of which completed the whole survey, reaching and then exceeding the target set in the methodology above. The results presented below are based on calculations from the 223 completed surveys alone in order to increase accuracy.

Demographics

The majority of respondents were female (64 per cent). The majority also self-assessed their numeracy level as above average (57 per cent). The vast majority (85 per cent) had graduated from an undergraduate university programme or higher. A significant number were also in the 25-34 age bracket.

Chart 1.2: Age range of survey participants

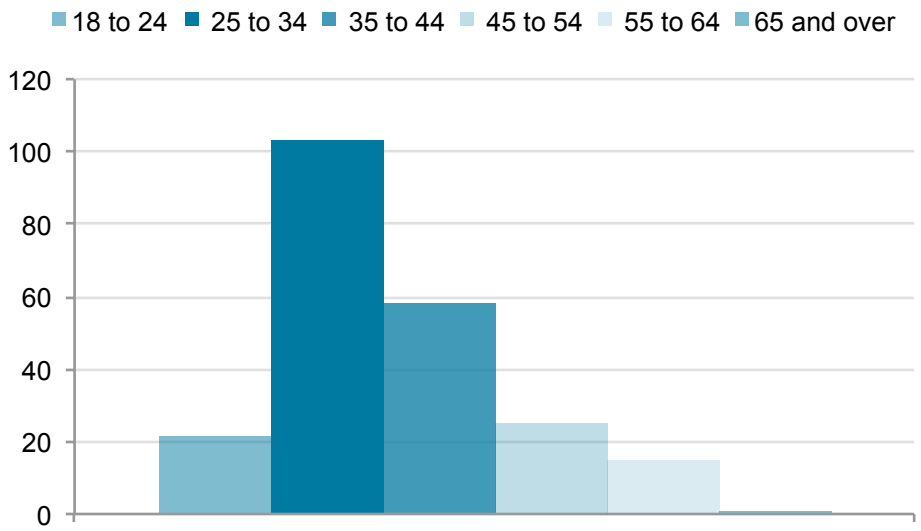


Chart 1.3: Education level of survey participants

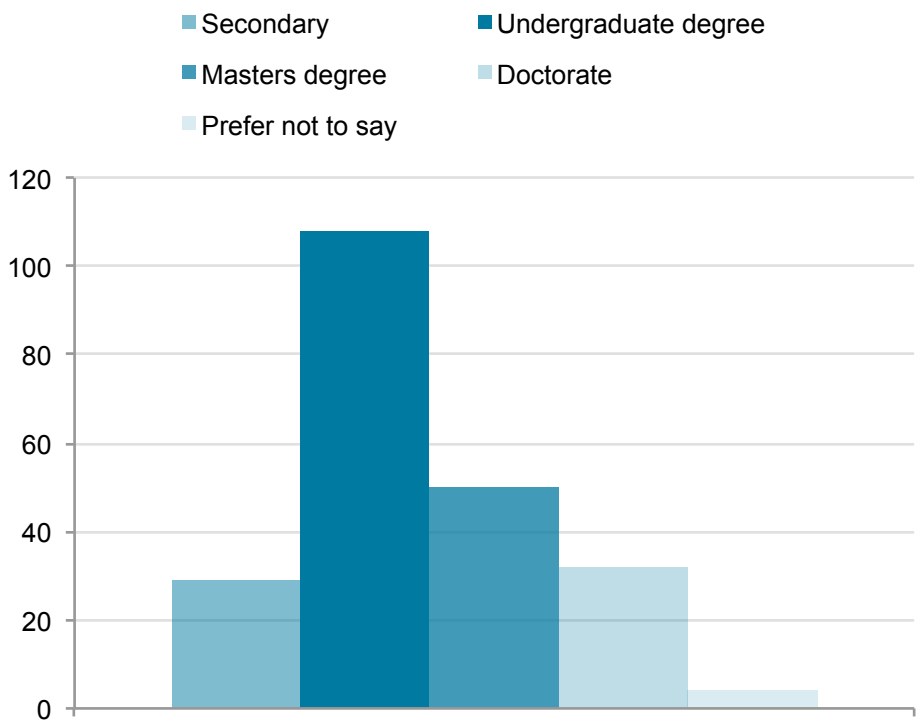


Chart 1.4: Self-reported numeracy levels

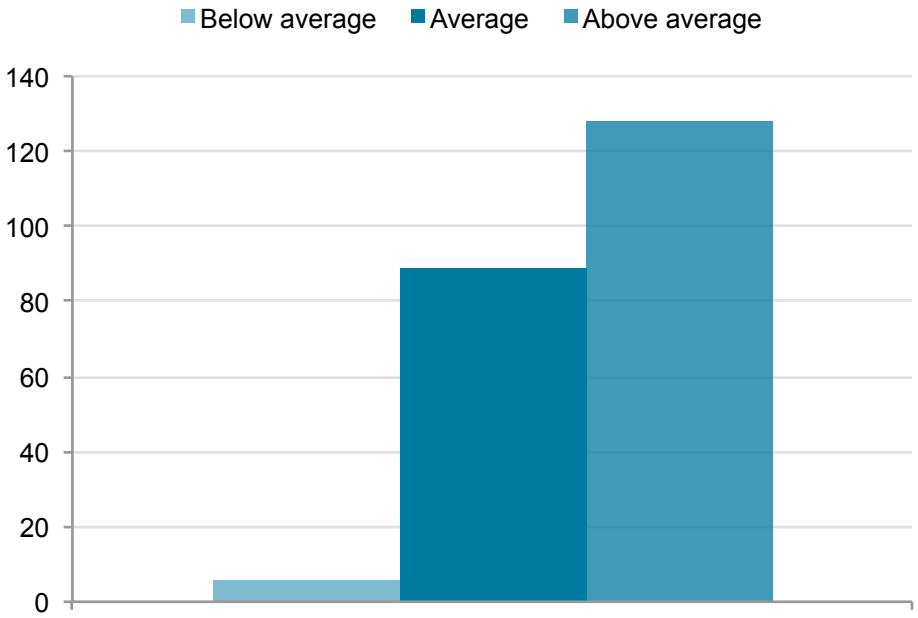
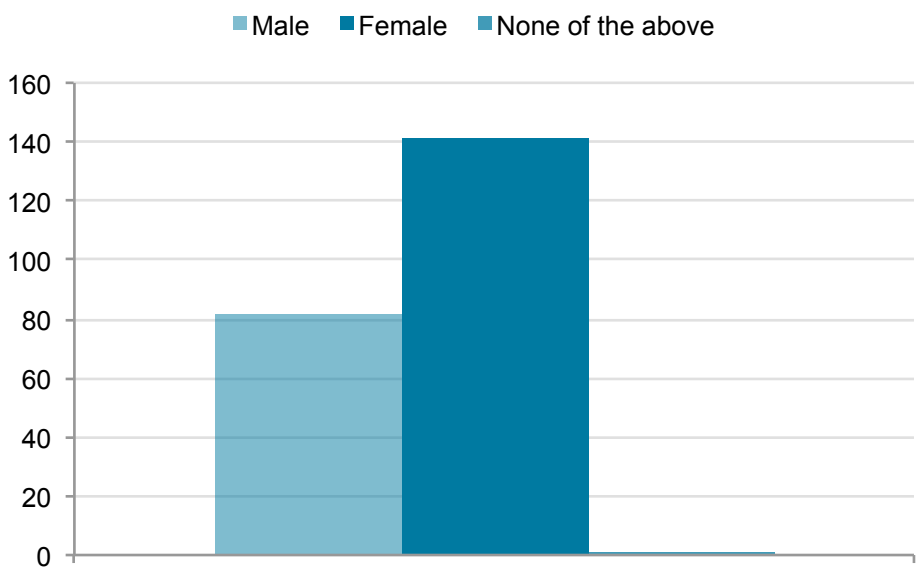


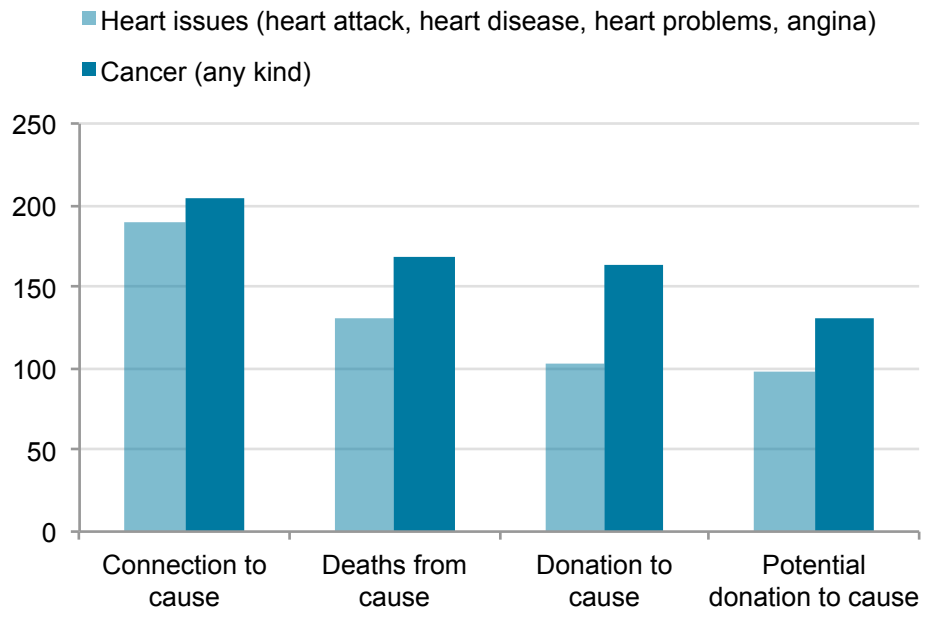
Chart 1.5: Gender of survey participants



Establishing connections to heart disease and cancer

The survey also asked participants to reveal their knowledge about heart disease and cancer, and to declare their connections to either cause. Participants were asked whether they knew of a close friend or relative suffering from either disease, and they were also asked if they knew of anyone who had died from either condition. They were also asked whether they had donated to either cause or were considering donating to them in the future. In both cases participants could select one or both options.

Chart 1.6: Connections to heart disease and cancer

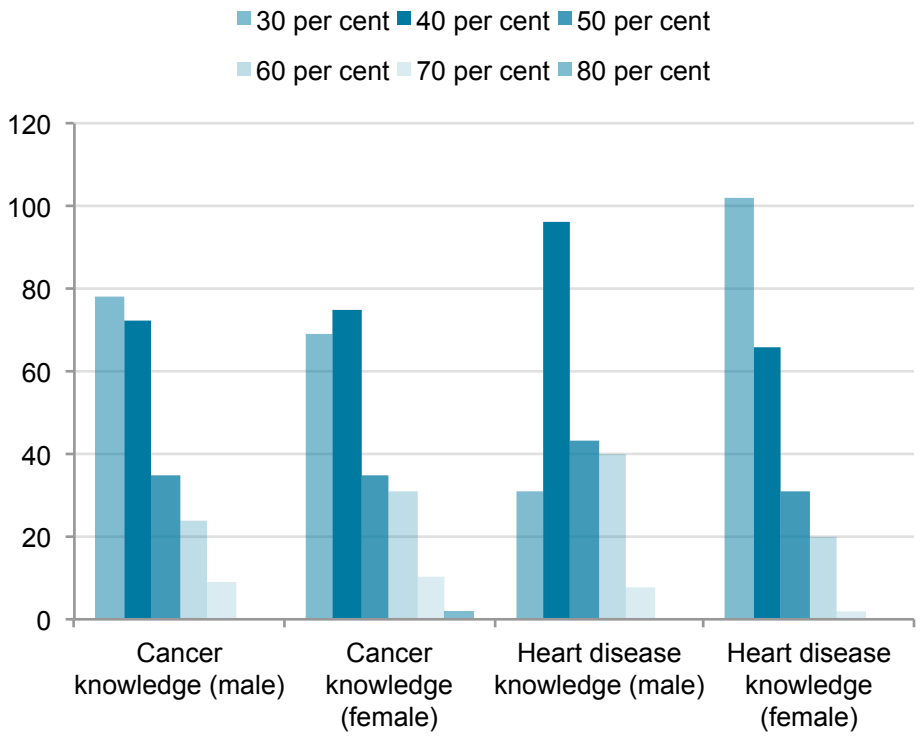


Participants were asked to estimate the overall lifetime risk of the heart disease and cancer for the different genders. The 'correct' overall lifetime risk figures for heart disease are approximately 40 per cent for men and 30 per cent for women[44] – the majority of participants selected the correct answer. For cancer, the risk is a little under 40 per cent for women, and a little over that for men[45]. The results are very equally divided between the 30 and 40 per cent markers, suggesting participants were less sure of the overall risk.

44 DM Lloyd-Jones et al. Lifetime risk of developing coronary heart disease. *The Lancet*, 1999, 353, pp.89-92.

45 The American Cancer Society, *Lifetime risk of developing or dying from cancer* [online], 2011, available from: http://www.cancer.org/Cancer/CancerBasics/lifetime-probability-of-developing-or-dying-from-cancer

Chart 1.7: Knowledge of heart disease and cancer: overall lifetime risk



Understanding risk

The substantive part of the survey was concerned with the understandability of percentages, numeric ratios and graphic ratios where health risk is concerned.

Table 1.3: Risk perception questions: overall results

Type	No. correct answers	No.of incorrect answers	Percentage correct
Overall	5310	1754	75.17%
Graphics	1237	553	69.11%
Ratio	1554	581	72.79%
Percentage	1962	566	77.61%

There was a clear amount of variance in these results, suggesting that graphics in the style and method presented in the survey are potentially less effective, at least in isolation, for understanding risk.

Table 1.4: Risk perception questions: percentage correct by gender

Type	Percentage correct (male)	Percentage correct (female)
Overall	80.56%	72.04%
Graphics	75.31%	65.53%
Ratio	82.00%	67.72%
Percentage	79.73%	76.34%

The variation between male and female participants shows that men seem to have an overall firmer grasp of statistical understanding than women, and have greater understanding across the different types of ways statistics were displayed in the survey.

Table 1.4: Risk perception questions: percentage correct by numeracy level

Type	Percentage correct (below average)	Percentage correct (average)	Percentage correct (above average)
Overall	49.21%	69.24%	80.45%
Graphics	45.00%	62.28%	74.93%
Ratio	24.64%	63.38%	82.43%
Percentage	70.00%	75.05%	79.55%

On the face of it, there appears to be a clear relationship between numeracy levels and ability to understand statistical risk for the participants in this survey.

Table 1.5: Risk perception questions: percentage correct by education level

Type	Percentage correct (secondary)	Percentage correct (undergraduate)	Percentage correct (masters)	Percentage correct (doctorate)
Overall	74.52%	74.50%	73.25%	81.59%
Graphics	70.4%	67.54%	67.35%	76.17%
Ratio	71.48%	73.26%	69.49%	83%
Percentage	76.05%	77.58%	76.18%	81.32%

Perhaps surprisingly, those participants who had only completed secondary education showed a small gain over those who had gone through an undergraduate degree – and those with masters degrees seemed to demonstrate slightly less capacity for answering these types of questions correctly.

Analysis

In order to evaluate the hypotheses above to the fullest extent the data allows, we need to analyse how significant the differences mentioned above really are.

The three underlying questions this dissertation is attempting to answer are:

- Which of the three methods of displaying risk – percentage, ratio, and graphical ratio – are most effective?
- What factors significantly affect whether someone will be able to accurately understand risk for these three media?
- Does knowledge or experience of a particular condition affect ability to accurately perceive risks, and if so, how?

To answer the first question, this dissertation must examine whether there are any underlying similarities – or differences – between how survey participants perceived the different answer options.

Since the survey asked participants to pick the correct answer out of just two options, the best statistical model to apply to the data is binomial distribution. The binomial distribution model allows us to test what is called the null hypothesis.

The first question on our list suggests a null hypothesis that there is no difference between the three methods of displaying risk.

The test compares the ratio of overall answers to correct answers for survey questions involving a numerical ratio or percentage, to the overall percentage of people who got graphical questions correct. This statistical model can then tell us the likelihood that the results achieved by the survey occurred entirely by chance. The smaller the number, the more likely it is that the null hypothesis is incorrect. Results that show a less than 0.05% probability of occurring by chance are moderately supportive of the null hypothesis not being correct. Those with a less than 0.01% probability are strongly supportive of the null hypothesis being false – that is, the results did not occur by chance.

Table 1.6 Percentage performance vs graphics

Total number of answers (percentage)	2528
Total number of correct answers (percentage)	1962
Percentage of correct answers (graphics)	69.11%
Probability that results occurred by chance	Less than 0.01%

Table 1.7 Ratio performance vs graphics

Total number of answers (ratio)	2135
Total number of correct answers (ratio)	1554
Percentage of correct answers (graphics)	69.11%
Probability that results occurred by chance	Less than 0.01%

Table 1.8 Ratio performance vs percentage

Total number of answers (percentage)	2528
Total number of correct answers (percentage)	1962
Percentage of correct answers (ratio)	72.79%
Probability that results occurred by chance	Less than 0.01%

The results from the binomial distribution model show there is a strong probability that the original results were not achieved by chance. Therefore it can be said with relative confidence that the evidence strongly suggests graphical ratios are in this context a less reliable means of conveying risk information than numerical ratios, which are in turn much less effective than percentages.

This reinforces the work of Reyna et al, whose experiments found that understanding of percentages was greater than understanding of ratios. The most significant result from this survey is the comparison between the results for numerical and graphical ratios, which strongly suggest that graphical ratios result in even poorer understanding than numerical ones.

Part of the reason for this might be that when graphical forms are used, according to the dual processing model of cognitive reasoning they potentially have to go through two or more levels of gist analysis in the mind – one level to 'translate' the graphics into comparable numbers, and then on the next level performing the comparison. This may increase the effect of or add further bias to the participant's answer.

One way to test this hypothesis using the survey data is to compare the questions answered by participants where one form of numerical and one form of graphical answer were employed, with the questions which compared like with like – graphical with graphical.

According to the survey results, when comparing numerical percentage or numerical ratios with and graphical representations, 73.84 per cent of participants got them right. When comparing graphical representations only, 63.01 per cent got the right answer.

Table 1.9 How graphics vs other performs against graphics vs graphics

Total number of answers (graphic)	3093
Total number of correct answers (graphic)	2284
Percentage of correct answers (graphic vs. other)	63.01%
Probability that results occurred by chance	Less than 0.01%

The above graph demonstrates that the null hypothesis – of whether a question was posed as a graphic versus a numeral or a graphic versus a graphic is immaterial – has a strong likelihood of being false. Not only do graphical ratio representations pose more difficulty in general for understanding graphical versus numerical differences, they actually pose even more difficulty when comparing graphics with like.

The second question this dissertation sets out to answer is whether various demographic factors, such as gender, age, self-described numeracy levels and education level have an effect on understanding risk.

Gender

The general demographic numbers above demonstrated that men seem to have the edge over women in their perception of risk through percentages, ratios and graphical ratios. To establish if this difference is actually significant, another binomial distribution calculation can be used.

Table 1.10 Men vs women

Total number of answers (men)	2582
Total number of correct answers (men)	2080
Percentage of correct answers (women)	72.04%
Probability that results occurred by chance	Less than 0.01%

This calculation demonstrates that the evidence shows it is a strong probability that the differences between the survey results for men and women are not down to chance. Further close examination of the results yields that self-described numeracy has the expected effect on accuracy of answers, with those with lower numeracy levels being

less likely to answer correctly. However, overall women still consistently answered fewer of the statistical risk perception questions correctly.

As this survey demonstrates a lack of correlation with education levels for both genders, the consistency of and the causes for this effect are difficult to speculate upon. One likely explanation is that the survey did not have the required granularity to successfully analyse education experiences. The survey did not separate A-level and GCSE achievement in the demographics, or ask participants if they pursued mathematical subjects at the various levels, both of which might have been helpful for obtaining further detail on any gender differences.

National figures for the United Kingdom do show a significant difference in numeracy between men and women, with "One in three men achieved Level 2 or above in the numeracy assessment, compared to one in five women. At the other end of the scale, more than half of all women (53%) scored at Entry 3 or below, compared to 40% of men." This means that more women than men only have the numeracy skills expected of an 11 year old, and more also have extremely poor numeracy skills, which could account for some of the differences. Another factor is in education subjects. The figures reveal that mathematics and physics are disproportionately popular with boys[46].

One of the demographics that seems to correlate differently for men and women is age. Although the sample numbers are smaller in this survey for older people and therefore calculations on them will be less accurate, women aged 45 and over seem significantly less able to answer the survey questions correctly than men of the same age range.

46 Department for Education and Skills, *Gender and education: the evidence on pupils in England* [online], 2007, [Accessed 10 September 2012], available from: http://www.education.gov.uk/rsgateway/DB/RRP/u015238/index.shtml

Numeracy and education levels

Overall, for self-described numeracy levels, the results from the survey show a clear positive progression in the number of questions answered correctly for those who assessed their numeracy from below average, through average, to above average.

The stand-out variable for numeracy was the particularly low percentage of correct answers for interpretation of graphical representations of statistics by those who self-attributed as below average in numeracy.

Table 1.11 Self declared numeracy levels and correct graphical representations

Numeracy level	Correct answers for graphical representations
Below Average	45%
Average	62.28%
Above Average	74.93

With education levels, this progression is less clear, with a slight but observable drop in accurate answers for those graduated from a Masters programme. To examine this more closely, the probability of the null hypothesis that there is no difference between secondary, undergraduate or masters degree performance was calculated using the binomial distribution model.

Table 1.12 Participants with masters qualifications vs. undergraduates

Total number of answers (undergraduate)	3428
Total number of correct answers (undergraduate)	2554
Percentage of correct answers (masters)	73.25%
Probability that results occurred by chance	4.56%

Table 1.13 Participants with masters qualifications vs. secondary school leavers

Total number of answers (secondary)	891
Total number of correct answers (secondary)	664
Percentage of correct answers (masters)	73.25%
Probability that results occurred by chance	18.46%

From these results, we can say it is more probable that our hypothesis of there being no difference between secondary, undergraduate and masters performance is true than an alternative explanation. Of all those surveyed, only those with doctorate qualifications showed a significant differences in their statistical understanding.

The third question this dissertation seeks to answer is whether knowledge or experience of the conditions the charities examined are concerned with – heart disease and cancer - affects statistical understanding. Starting with the null hypothesis that knowledge and experience do not make a significant difference to the accuracy of answers to the survey, we find that at first glance, high awareness of male lifetime and overall heart disease risk seem to result in more correct answers overall.

Table 1.14 Differences in knowledge of heart disease and cancer

Survey question	% overall correct
Heart disease male percentage risk	75.81
Heart disease female percentage risk	72.07
Cancer male percentage risk	70.94
Cancer female percentage risk	74.1
Heart disease risk	76.62
Cancer risk	71.93
Overall	75.17

The binomial distribution model will help determine whether these figures are statistically significant.

Table 1.15 Male percentage risk of heart disease correct answers vs. overall correct answers

Total number of answers (Male percentage risk)	3055
Total number of correct answers (Male percentage risk)	2316
Percentage of correct answers (Overall)	75.17%
Probability that results occurred by chance	20%

Table 1.16 Overall risk of heart disease correct answers vs. overall correct answers

Total number of answers (Heart disease risk)	2643
Total number of correct answers (Heart disease risk)	2025
Percentage of correct answers (Overall)	74.88%
Probability that results occurred by chance	1%

From these results, the null hypothesis is more likely to be true than the alternative – so it is more probable that knowledge of a subject does not make a difference to the participants' ability to answer risk perception questions.

The second part to this final question is whether experience of either heart disease of cancer has any effect on the ability to answer risk perception questions correctly.

Table 1,17 Differences in experience of heart disease and cancer

Affected by / condition	Close to someone who died from condition	Close to someone who suffered from condition	Donated to condition associated cause	Considering donating to condition associated cause
Cancer	75.14	76.5	75.59	73.19
Heart disease + cancer	74.68	74.76	74.08	73.71
Heart disease	76.26	77.34	79.75	79.84

However, as the table above shows, even when only comparing percentage values, compared with the general overall correct answer rate of 75.15 per cent there appears to be very little difference between the number of correct answers for those affected by different or even multiple conditions. The slightly larger values for heart disease are most likely to be a reflection of the smaller sample size. Significantly greater numbers of participants declared experience of heart disease and cancer together, and cancer alone, than heart disease alone.

Table 1.18 Comparative sample sizes for participants with experience of heart disease and cancer

Affected by / condition	Close to someone who died from condition	Close to someone who suffered from condition	Donated to condition associated cause	Considering donating to condition associated cause
Heart disease	53.64%	84.24%	55.61%	65.38%
Cancer	85.85%	94.36%	96.79%	93.20%

This table shows that only 53.64 per cent of people who took part in the survey and declared that someone close to them had died of either condition gave that condition as heart disease. People were slightly less likely to know someone who had suffered from heart disease, and significantly less likely to have donated to or be considering donating to a cause associated with heart disease.

While it is not verifiable via these survey results as the required data was not gathered, the significant lack of support in donations and expected future donations for heart disease compared to cancer – which has very similar risks – may be partially explained by Slovic's theories on familiarity and voluntariness lowering perceived risk. Though there are likely to be many other factors, heart disease has been explained and promoted as a preventable disease for more than 50 years. Due to the lowering effect of the heuristic of voluntary activity for risk perception, the continued emphasis on heart disease's preventability may now have moved it to a culturally voluntary status, whereas cancer remains a dangerously unpredictable unknown, and still fits readily into Gigerenzer and Slovic's 'dread factor', which raises perceptions of risk.

Survey limitations

While the survey carried out for this dissertation was comprehensive in many ways and achieved a sturdy sample size, there were limitations to its effectiveness that should be noted.

Software limitations

The surveymonkey internet software used in this experiment had several useful features, including the ability to randomise questions which was used to help eliminate bias in the risk perception part of the survey. However, the ability to randomise the questions and answers provided to participants further would have helped the survey be even more effective.

The software also does not allow the imposition of time limits on answering questions. A 10 or 15 second time limit per question would have been especially useful for increasing the likelihood that a participant would use gist processing rather than verbatim reasoning when answering the risk perception questions.

Data limitations

The final data set was lacking in some key demographics that would result in bias when compared to the UK population. The most problematic of these are the age ranges captured, which were not representative of the UK population in that the majority of survey respondents were between 25 and 34, while the majority of the UK population is between 45 and 54.

In the education levels used to split the survey, school leavers after GCSE and A-level were not distinguished between, meaning that some of the granularity of results which

might have been desired could not be achieved. Further granularity by subject would also have been potentially helpful.

Less strongly, no participants had left school before starting secondary school. However, as this an increasingly rare occurrence in UK society, this isn't necessarily problematic for the survey results.

Context limitations

As the survey was conducted in isolation and did not involve the use of composite data that would be more likely to occur in booklets and websites – where as the analysis of available documentation showed, combinations of percentage and ratio are common.

The survey was not designed to study the influence of environment on understanding. Further research into the influence of place – doctor's surgeries, hospital waiting rooms, people's homes – may be needed.

Conclusion

The most important finding from this paper and survey is that when used in isolation, graphical representations of statistical numbers were found to not be nearly as effective a tool for helping the general population interpret health statistics as the other methods of representing numbers tested. Numerical ratios were slightly more effective, and percentages were noticeably more easily interpreted than either of the former. Infographics of the form tested therefore have little potentiality to improve risk perception in the general population.

The next most significant result is that up to and including a masters level of education, there appears to be no perceivable difference in statistical reasoning ability, and therefore it is possible to conclude that audiences with this level of education can potentially be targeted about health risks using similar methods.

This dissertation has also reinforced evidence that women in general, and women over 45 in particular appear less able to interpret statistics correctly. This is also useful information for effective targeting of statistical health risk information.

Finally, the evidence shows that low numeracy in particular results in an even poorer understanding of graphical statistical representations.

Contributions to research

This paper has demonstrated that large scale testing of the effectiveness of graphical communication is necessary to advance our understanding of the medium, as while intuition may suggest that graphics are easier to read than numbers, the results of this test have shown a strong negative correlation between graphical representations of this type and statistical understanding.

This paper has also collected together a proportion of the available research on the heuristics, biases and cognitive tools specifically applicable to health risks. This research highlights that some of the methods employed in health risk communications may not always be the most effective.

Future research

Suggested avenues for future research and links to other research relevant to this paper include:

- Combinatory information – analysing the effectiveness a combination of graphical, numerical and textual information may have on conveying risk.

- Gender, age and numeracy – further investigation into the most effective ways of helping various disadvantaged groups better understand risk.

- Types of graphic – as this survey only tested one type of graphic communication, it would be helpful to gain a greater understanding of different graphical media and the relationships between them. Significant amounts of research have already been done on pictographs,[47] icon arrays[48] and graphical risk ladders[49].

47 Hess, R, Visschers, V.H.M., Siegrist, M. Risk communication with pictographs: The role of numeracy and graph processing, Judgment and Decision Making, April 2011, 6(3), pp. 263–274.

48 Galesic, Garcia-Retamero, Gigerenzer. Using Icon Arrays to Communicate Medical Risks: Overcoming Low Numeracy, *Health Psychology*, 2009, 28(2), pp.210–216.

49 Hess, R, Visschers, V.H.M., Siegrist, M., Keller, C. How do people perceive graphical risk communication? The role of subjective numeracy, *Journal of Risk Research*, January

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Appendix

Survey questions

About this survey

This is a survey to provide data for Corinne Pritchard's dissertation for her MA in Information Design at the University of Reading. The dissertation is about the how people perceive health risk - specifically of heart disease and cancer.

The survey is aimed at the general population.

Requests to participate in this survey have been distributed through social media, email and website links.

There are 53 questions and the survey should take you between 10 and 20 minutes to complete.

This project has been reviewed by the University of Reading Research Ethics Committee and has been given a favourable opinion for conduct.

***1. I give my consent for the information I provide for this questionnaire to be used as part of Corinne Pritchard's dissertation research.**

- [ ] Yes

***2. I am over 18**

- ◯ Yes

3. I would like to receive an electronic copy of the completed dissertation.

- ◯ Yes
- ◯ No

4. I consent to the use of my email address for the sole purpose of either receiving a copy of the completed dissertation or withdrawing my consent for use of my data in this research. My email address is (leave blank if you do not wish to give your email address):

Your details

5. Please enter the time at which you started this survey:

Hour

Minute

6. Age

- ◯ Between 18 and 24
- ◯ Between 25 and 34
- ◯ Between 35 and 44
- ◯ Between 45 and 54
- ◯ Between 55 and 64
- ◯ 65 and over

7. What is the highest level of education you have completed?

- ◯ Did not attend school
- ◯ Primary
- ◯ Secondary
- ◯ Undergraduate degree
- ◯ Masters degree
- ◯ Doctorate
- ◯ Prefer not to say

8. I rate my ability to understand and interpret numbers as:

- ◯ Below average
- ◯ Average
- ◯ Above average

9. Gender

- ◯ Male
- ◯ Female
- ◯ None of the above

10. What would you say is the general percentage risk of having heart disease in your lifetime if you are male?

- ◯ 30 per cent
- ◯ 40 per cent
- ◯ 50 per cent
- ◯ 60 per cent
- ◯ 70 per cent
- ◯ 80 per cent

11. What would you say is the general percentage risk of having heart disease in your lifetime if you are female?

- ◯ 30 per cent
- ◯ 40 per cent
- ◯ 50 per cent
- ◯ 60 per cent
- ◯ 70 per cent
- ◯ 80 per cent

12. What would you say is the general percentage risk of having cancer in your lifetime if you are male?

- ◯ 30 per cent
- ◯ 40 per cent
- ◯ 50 per cent
- ◯ 60 per cent
- ◯ 70 per cent
- ◯ 80 per cent

13. What would you say is the general percentage risk of having cancer in your lifetime if you are female?

- ◯ 30 per cent
- ◯ 40 per cent
- ◯ 50 per cent
- ◯ 60 per cent
- ◯ 70 per cent
- ◯ 80 per cent

Optional information

14. I am aware that relatives or friends have suffered from:

- ☐ Cancer (any kind)
- ☐ Heart issues (heart attack, heart disease, heart problems, angina)

15. I am aware that relatives or friends have passed away as a direct result of:

- ☐ Heart issues (heart attack, heart disease, heart problems, angina)
- ☐ Cancer (any kind)

16. I have donated time or money to charities which fund research for the following health issues in the past

- ☐ Heart issues (heart attack, heart disease, heart problems, angina)
- ☐ Cancer (any kind)

17. I am considering donating time or money to charities which fund research for the following health issues in the future:

- ☐ Heart issues (heart attack, heart disease, heart problems, angina)
- ☐ Cancer (any kind)

Risk awareness

Approximately how many people would you say suffer from the following conditions overall in the UK:

18. Heart disease

- ◯ 1 in 2
- ◯ 1 in 3
- ◯ 1 in 4
- ◯ 1 in 5
- ◯ 1 in 6

19. Cancer

- ◯ 1 in 2
- ◯ 1 in 3
- ◯ 1 in 4
- ◯ 1 in 5
- ◯ 1 in 6

Understanding risk

You are about to see pairs of numbers, percentages and images on the screen.

Please examine each pair and decide as quickly as possible and **without using a calculator** which represents the higher risk.

Where an image is used, the pink figures are at risk.

Thank you.

20. Which of these is the higher risk?

◯

My risk of cancer is:

◯

My risk of heart disease is:

4 out of 6

21. Which of these is the higher risk?

◯

My risk of heart disease is:

◯

My risk of cancer is:

4 out of 6

22. Which of these is a higher risk?

○

My risk of heart disease is:

○

My risk of cancer is:

3 out of 5

23. Which of these is a higher risk?

○

My risk of heart disease is:

3 out of 5

○

My risk of cancer is:

24. Which of these is a higher risk?

○

My risk of heart disease is:

○

My risk of cancer is:

3 out of 5

25. Which of these is a higher risk?

◯

My risk of cancer is:

◯

My risk of heart disease is:

3 out of 5

26. Which of these is the higher risk?

○

My risk of heart disease is:

66 per cent

○

My risk of cancer is:

27. Which of these is the higher risk?

○

My risk of heart disease is:

○

My risk of cancer is:

66 per cent

28. Which of these is the higher risk?

○

My risk of cancer is:

66 per cent

○

My risk of heart disease is:

29. Which of these is the higher risk?

○

My risk of cancer is:

○

My risk of heart disease is:

66 per cent

30. Which of these is the higher risk?

○

My risk of cancer is:

60 per cent

○

My risk of heart disease is:

31. Which of these is the higher risk?

○

My risk of cancer is:

○

My risk of heart disease is:

60 per cent

32. Which of these is the higher risk?

○

My risk of cancer is:

60 per cent

○

My risk of heart disease is:

33. Which of these is the higher risk?

○

My risk of cancer is:

○

My risk of heart disease is:

60 per cent

34. Which of these is the higher risk?

○

My risk of heart disease is:

3 out of 5

○

My risk of cancer is:

66 per cent

35. Which of these is the higher risk?

○

My risk of heart disease is:

66 per cent

○

My risk of cancer is:

3 out of 5

36. Which of these is the higher risk?

○

My risk of heart disease is:

4 out of 6

○

My risk of cancer is:

60 per cent

37. Which of these is the higher risk?

○

My risk of cancer is:

4 out of 6

○

My risk of heart disease is:

60 per cent

38. Which of these is the higher risk?

○

My risk of cancer is:

5 out of 8

○

My risk of heart disease is:

60 per cent

39. Which of these is the higher risk?

○

My risk of heart disease is:

5 out of 8

○

My risk of cancer is:

60 per cent

40. Which of these is the higher risk?

○

My risk of heart disease is:

○

My risk of cancer is:

41. Which of these is the higher risk?

◯

My risk of cancer is:

◯

My risk of heart disease is:

42. Which of these is the higher risk?

◯

My risk of cancer is:

◯

My risk of heart disease is:

43. Which of these is the higher risk?

○

My risk of cancer is:

○

My risk of heart disease is:

44. Which of these is the higher risk?

○

My risk of heart disease is:

3 out of 5

○

My risk of cancer is:

4 out of 6

45. Which of these is the higher risk?

○

My risk of cancer is:

3 out of 5

○

My risk of heart disease is:

4 out of 6

46. Which of these is the higher risk?

○

My risk of cancer is:

3 out of 5

○

My risk of heart disease is:

5 out of 8

47. Which of these is the higher risk?

○

My risk of cancer is:

5 out of 8

○

My risk of heart disease is:

3 out of 5

48. Which of these is the higher risk?

○

My risk of heart disease is:

60 per cent

○

My risk of cancer is:

66 per cent

49. Which of these is the higher risk?

○

My risk of cancer is:

60 per cent

○

My risk of heart disease is:

66 per cent

50. Which of these is the higher risk?

○

My risk of cancer is:

63 per cent

○

My risk of heart disease is:

66 per cent

51. Which of these is the higher risk?

○

My risk of cancer is:

66 per cent

○

My risk of heart disease is:

63 per cent

Survey complete

You have now completed the survey.

52. Please enter the time at which you completed this survey:

Hour

Minute

53. If you were interrupted while completing this survey, please estimate how many minutes you were interrupted for:

Thank you very much for your participation.

If you have elected to receive a copy of the final dissertation by email, you should receive this towards the end of October 2012.

If you wish to be excluded from this survey, please email xr024156@student.reading.ac.uk stating the email address you registered when you did the survey.

Please feel free to send this questionnaire on to your friends and family.

Survey data

Demographics

Number	Time	Age	Education	Ability	Gender	Heart disease risk - male	Heart disease risk - female	Cancer risk - male	Cancer risk - female	Friends have suffered from	Friends have died from	I have donated to	I am considering donating to	Heart disease risk	Cancer risk
1	00:07:00	55 - 64	Doctorate	Average	Male	40 per cent	30 per cent	30 per cent	30 per cent	Cancer	Cancer			1 in 6	1 in 6
2	00:08:00	25 - 34	Doctorate	Average	Male	40 per cent	30 per cent	70 per cent	60 per cent	Both	Both			1 in 6	1 in 5
3	00:09:00	45 - 54	Doctorate	> Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Both	Both			1 in 3	1 in 4
4	00:09:00	35 - 44	Undergrad	Average	Male	40 per cent	40 per cent	40 per cent	40 per cent	Cancer	Cancer	Cancer		1 in 5	1 in 6
5	00:04:00	45 - 54	Doctorate	> Average	Male	40 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Cancer	Both	1 in 3	1 in 3
6	00:06:00	55 - 64	Undergrad	> Average	Male	30 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Cancer	Both	1 in 3	1 in 4
7	00:09:00	25 - 34	Masters	Average	Male	60 per cent	50 per cent	60 per cent	60 per cent	Both	Cancer			1 in 4	1 in 5
8	00:09:00	35 - 44	Doctorate	> Average	Male	40 per cent	40 per cent	40 per cent	40 per cent	Both	Heart disease	Both	Heart disease	1 in 3	1 in 3
9	00:07:00	25 - 34	Doctorate	> Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Both	Cancer	Cancer	Cancer	1 in 4	1 in 3
10	00:09:00	35 - 44	Undergrad	Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Cancer	Cancer	1 in 3	1 in 4
11	00:09:00	25 - 34	Masters	Average	Male	40 per cent	40 per cent	30 per cent	30 per cent	Both	Heart disease	Both	Both	1 in 3	1 in 5
12	00:16:00	18 - 24	Secondary	< Average	Female	50 per cent	30 per cent	30 per cent	40 per cent	Both	Cancer	Cancer	Heart disease	1 in 4	1 in 3
13	00:08:00	35 - 44	Undergrad	Average	Female	30 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Both		1 in 2	1 in 2
14	00:10:00	55 - 64	Doctorate	> Average	Female	60 per cent	50 per cent	70 per cent	70 per cent	Cancer	Cancer			1 in 2	1 in 2
15	00:06:00	45 - 54	Masters	> Average	Female	30 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Both	Both	1 in 3	1 in 3
16		55 - 64	Masters	Average	Female	50 per cent	50 per cent	50 per cent	50 per cent	Both	Cancer	Cancer	Cancer	1 in 4	1 in 4
17	00:07:00	25 - 34	Masters	> Average	Male	50 per cent	40 per cent	40 per cent	30 per cent	Both	Both			1 in 4	1 in 3
18	00:07:00	25 - 34	Doctorate	> Average	Female	50 per cent	40 per cent	50 per cent	60 per cent	Both	Both	Cancer	Cancer	1 in 6	1 in 3
19	00:06:00	25 - 34	Masters	Average	Female	50 per cent	50 per cent	50 per cent	50 per cent	Both	Both	Both	Both	1 in 3	1 in 3
20	00:08:00	25 - 34	Masters	Average	Female	70 per cent	70 per cent	60 per cent	60 per cent	Both	Heart disease	Both	Heart disease	1 in 3	1 in 4
21	00:09:00	18 - 24	Undergrad	Average	Female	40 per cent	40 per cent	30 per cent	40 per cent	Both	Cancer	Both	Both	1 in 4	1 in 4
22	00:10:00	25 - 34	Undergrad	Average	Female	60 per cent	60 per cent	50 per cent	50 per cent	Both	Heart disease	Both		1 in 2	1 in 4
23	00:05:00	25 - 34	Undergrad	> Average	Female	40 per cent	40 per cent	40 per cent	40 per cent	Both	Cancer	Cancer		1 in 4	1 in 4
24	00:09:00	45 - 54	Secondary	Average	Female	40 per cent	30 per cent	50 per cent	50 per cent	Cancer	Cancer	Cancer	Heart disease	1 in 6	1 in 5
25	00:07:00	25 - 34	Secondary	Average	Female	40 per cent	30 per cent	40 per cent	50 per cent	Both	Both	Both	Both	1 in 5	1 in 3
26	00:10:00	25 - 34	Undergrad	> Average	Female	60 per cent	50 per cent	60 per cent	60 per cent	Both	Both		Cancer	1 in 4	1 in 5

Number	Time	Age	Education	Ability	Gender	Heart disease risk - male	Heart disease risk - female	Cancer risk - male	Cancer risk - female	Friends have suffered from	Friends have died from	I have donated to	I am considering donating to	Heart disease risk	Cancer risk
27	00:12:00	35 - 44	Undergrad	> Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Cancer	Cancer	Both		1 in 3	1 in 3
28	00:08:00	35 - 44	Undergrad	> Average	Female	50 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Both	Both	1 in 3	1 in 3
29	00:12:00	25 - 34	Masters	Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Heart disease	Heart disease	Cancer	Cancer	1 in 2	1 in 3
30		45 - 54	Undergrad	Average	Female	40 per cent	50 per cent	60 per cent	70 per cent	Both	Cancer	Both		1 in 3	1 in 4
31	00:10:00	35 - 44	Masters	Average	Female	60 per cent	40 per cent	60 per cent	70 per cent	Both	Both	Both	Both	1 in 6	1 in 4
32	00:19:00	25 - 34	Masters	Average	Female	40 per cent	30 per cent	40 per cent	60 per cent	Both	Cancer	Both	Both	1 in 5	1 in 6
33	00:09:00	25 - 34	Undergrad	< Average	Female	40 per cent	30 per cent	30 per cent	40 per cent	Both	Cancer	Cancer	Both	1 in 4	1 in 4
34	00:15:00	55 - 64	Undergrad	Average	Female	40 per cent	40 per cent	40 per cent	40 per cent	Both	Both	Both	Both	1 in 6	1 in 6
35	00:06:00	55 - 64	Doctorate	> Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Cancer	Cancer	1 in 4	1 in 6
36	00:09:00	25 - 34	Doctorate	> Average	Female	30 per cent	30 per cent	30 per cent	40 per cent	Cancer	Cancer	Cancer		1 in 3	1 in 3
37	00:15:00	45 - 54	Masters	Average	Female	30 per cent	40 per cent	50 per cent	50 per cent	Both	Cancer	Cancer	Both	1 in 3	1 in 2
38	00:09:00	35 - 44	Doctorate	> Average	Female	30 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Cancer	Cancer	1 in 3	1 in 3
39	00:07:00	25 - 34	Doctorate	> Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Both	Both	1 in 3	1 in 3
40	00:34:00	35 - 44	Undergrad	Average	Female	40 per cent	30 per cent	40 per cent	50 per cent	Both	Both	Both	Both	1 in 4	1 in 6
41	00:08:00	25 - 34	Masters	Average	Female	40 per cent	40 per cent	40 per cent	40 per cent	Both	Cancer	Cancer	Both	1 in 3	1 in 3
42	00:06:00	25 - 34	Doctorate	> Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Cancer	Both	1 in 4	1 in 3
43	00:09:00	25 - 34	Undergrad	> Average	Female	40 per cent	30 per cent	30 per cent	40 per cent	Both	Heart disease	Heart disease	Heart disease	1 in 4	1 in 3
44	00:11:00	65 and over	Secondary	Average	Female	60 per cent	40 per cent	50 per cent	60 per cent	Both	Heart disease	Both	Both	1 in 4	1 in 4
45	00:07:00	25 - 34	Masters	> Average	Male	60 per cent	50 per cent	70 per cent	70 per cent	Both	Both	Both	Both	1 in 4	1 in 4
46	00:06:00	25 - 34	Masters	> Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Cancer	Cancer	1 in 3	1 in 3
47	00:08:00	35 - 44	Doctorate	> Average	Male	30 per cent	30 per cent	30 per cent	40 per cent	Both	Heart disease	Heart disease		1 in 3	1 in 3
48	00:06:00	25 - 34	Doctorate	> Average	Female	40 per cent	30 per cent	50 per cent	50 per cent	Both	Both	Both	Both	1 in 3	1 in 2
49	00:05:00	18 - 24	Masters	> Average	Male	50 per cent	30 per cent	30 per cent	40 per cent	Both	Cancer			1 in 4	1 in 5
50	00:13:00	25 - 34	Doctorate	> Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Both		1 in 3	1 in 3
51	00:12:00	25 - 34	Doctorate	> Average	Female	40 per cent	40 per cent	30 per cent	30 per cent	Cancer	Cancer	Both	Both	1 in 3	1 in 3
52	00:07:00	18 - 24	Undergrad	> Average	Male	40 per cent	30 per cent	60 per cent	60 per cent	Both	Cancer	Cancer	Both	1 in 5	1 in 3

Number	Time	Age	Education	Ability	Gender	Heart disease risk - male	Heart disease risk - female	Cancer risk - male	Cancer risk - female	Friends have suffered from	Friends have died from	I have donated to	I am considering donating to	Heart disease risk	Cancer risk
53	00:05:00	25 - 34	Doctorate	> Average	Male	50 per cent	40 per cent	40 per cent	50 per cent	Cancer	Cancer		Cancer	1 in 5	1 in 6
54	00:08:00	35 - 44	Doctorate	> Average	Female	50 per cent	50 per cent	50 per cent	50 per cent	Both	Both	Both	Both	1 in 2	1 in 2
55	00:07:00	18 - 24	Undergrad	> Average	Male	70 per cent	60 per cent	40 per cent	50 per cent	Both	Heart disease	Cancer	Both	1 in 4	1 in 3
56	00:08:00	25 - 34	Undergrad	Average	Male	70 per cent	60 per cent	50 per cent	50 per cent	Both	Cancer	Both		1 in 3	1 in 4
57	00:15:00	45 - 54	Undergrad	Average	Female	50 per cent	30 per cent	30 per cent	40 per cent	Both	Both	Both	Both	1 in 4	1 in 3
58	00:06:00	18 - 24	Undergrad	Average	Female	40 per cent	30 per cent	50 per cent	40 per cent	Both	Heart disease			1 in 5	1 in 5
59	00:07:00	25 - 34	Masters	Average	Female	40 per cent	30 per cent	50 per cent	50 per cent	Cancer	Cancer			1 in 4	1 in 3
60	00:04:00	25 - 34	Secondary	Average	Female	30 per cent	30 per cent	30 per cent	30 per cent	Both	Cancer			1 in 5	1 in 5
61	00:08:00	55 - 64	Doctorate	> Average	Male	40 per cent	40 per cent	30 per cent	30 per cent	Both	Cancer			1 in 4	1 in 5
62	00:09:00	35 - 44	Secondary	Average	Female	50 per cent	40 per cent	30 per cent	30 per cent	Both	Both	Both	Both	1 in 4	1 in 3
63	00:06:00	35 - 44	Doctorate	> Average	Male	30 per cent	30 per cent	30 per cent	40 per cent	Both	Both			1 in 6	1 in 3
64	00:07:00	45 - 54	Undergrad	> Average	Female		60 per cent		30 per cent	Both	Both	Both	Cancer	1 in 3	1 in 3
65	00:08:00	35 - 44	Doctorate	> Average	Female	50 per cent	50 per cent	60 per cent	30 per cent	Cancer	Cancer	Cancer	Cancer	1 in 2	1 in 3
66	00:13:00	25 - 34	Undergrad	> Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Heart disease	Cancer		Cancer	1 in 5	1 in 4
67	00:09:00	25 - 34	Doctorate	> Average	Male	50 per cent	40 per cent	30 per cent	30 per cent	Both	Both	Cancer	Both	1 in 3	1 in 6
68	00:05:00	45 - 54	Masters	> Average	Male	40 per cent	40 per cent	40 per cent	40 per cent	Cancer	Cancer	Cancer		1 in 4	1 in 3
69	00:04:00	18 - 24	Masters	> Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Both	Cancer	Cancer	Both	1 in 3	1 in 3
70	00:09:00	45 - 54	Undergrad	Average	Female		50 per cent		60 per cent	Heart disease	Heart disease	Both	Both	1 in 4	1 in 5
71	00:05:00	25 - 34	Undergrad	> Average	Male	40 per cent	30 per cent	50 per cent	60 per cent	Both	Both	Both	Both	1 in 5	1 in 3
72	00:07:00	55 - 64	Undergrad	< Average	Female	50 per cent	40 per cent	40 per cent	40 per cent	Both	Cancer	Both	Both	1 in 6	1 in 3
73	00:11:00	45 - 54	Undergrad	Average	Female	30 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Both	Both	1 in 3	1 in 3
74	00:06:00	55 - 64	Doctorate	> Average	Male	40 per cent	40 per cent	40 per cent	40 per cent	Both	Cancer	Cancer	Cancer	1 in 3	1 in 3
75	00:05:00	25 - 34	Doctorate	> Average	Male	40 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Cancer		1 in 3	1 in 3
76	00:13:00	45 - 54	Undergrad	Average	Female	50 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Both		1 in 2	1 in 3
77	00:08:00	55 - 64	Secondary	Average	Female	30 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Both	Both	1 in 6	1 in 6
78	00:08:00	55 - 64	Undergrad	Average	Female	50 per cent	40 per cent	50 per cent	60 per cent	Both	Cancer	Both	Both	1 in 5	1 in 3

Number	Time	Age	Education	Ability	Gender	Heart disease risk - male	Heart disease risk - female	Cancer risk - male	Cancer risk - female	Friends have suffered from	Friends have died from	I have donated to	I am considering donating to	Heart disease risk	Cancer risk
79	00:05:00	45 - 54	Secondary	> Average	Female	50 per cent	40 per cent	60 per cent	50 per cent	Both	Heart disease	Both	Both	1 in 5	1 in 3
80	00:20:00	35 - 44	Undergrad	Average	Male	40 per cent	30 per cent	30 per cent	30 per cent	Cancer	Cancer	Cancer	Cancer	1 in 6	1 in 5
81	00:10:00	35 - 44	Secondary	Average	Male	40 per cent	40 per cent	40 per cent	40 per cent	Both	Both	Cancer		1 in 3	1 in 3
82	00:09:00	25 - 34	Masters	Average	Female	60 per cent	60 per cent	50 per cent	60 per cent	Both	Both	Cancer		1 in 3	1 in 2
83	00:06:00	25 - 34	Undergrad	Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Cancer	Both	1 in 5	1 in 5
84	00:22:00	45 - 54	Undergrad	Average	Female	50 per cent	40 per cent	30 per cent	30 per cent	Both	Both	Both	Both	1 in 4	1 in 3
85	00:07:00	35 - 44	Masters	Average	Female		30 per cent		30 per cent	Both	Both	Cancer		1 in 6	1 in 5
86	00:12:00	45 - 54	Masters	> Average	Female	40 per cent	30 per cent	50 per cent	50 per cent	Heart disease	Both	Both		1 in 3	1 in 2
87	00:08:00	25 - 34	Undergrad	Average	Male	50 per cent	40 per cent	50 per cent	40 per cent	Both	Both	Both	Both	1 in 3	1 in 3
88	00:07:00	35 - 44	Undergrad	Average	Female	60 per cent	70 per cent	30 per cent	30 per cent	Both	Heart disease	Both	Both	1 in 2	1 in 6
89	00:06:00	55 - 64	Doctorate	> Average	Male	40 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Both	Cancer	1 in 5	1 in 6
90	00:00:00	25 - 34	Prefer not to say	Average	Female	50 per cent	50 per cent	40 per cent	40 per cent	Both	Both	Cancer	Cancer	1 in 4	1 in 5
91	00:08:00	25 - 34	Secondary	< Average	Female	40 per cent	30 per cent	70 per cent	80 per cent	Both	Cancer	Both	Cancer	1 in 6	1 in 5
92	00:07:00	45 - 54	Undergrad	> Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Both	Cancer	Cancer	Both	1 in 5	1 in 3
93	00:09:00	25 - 34	Undergrad	Average	Male	60 per cent	40 per cent	50 per cent	40 per cent	Both	Cancer			1 in 3	1 in 3
94	00:05:00	35 - 44	Undergrad	Average	Female	60 per cent	60 per cent	50 per cent	50 per cent	Both	Both	Both	Both	1 in 4	1 in 4
95	00:10:00	35 - 44	Doctorate	> Average	Male	40 per cent	30 per cent	50 per cent	60 per cent	Both	Both	Both	Both	1 in 3	1 in 3
96	00:07:00	25 - 34	Masters	Average	Female	60 per cent	50 per cent	40 per cent	40 per cent	Both	Both	Cancer	Cancer	1 in 4	1 in 6
97	00:21:00	35 - 44	Doctorate	> Average	Male	40 per cent	40 per cent	30 per cent	30 per cent	Both	Both			1 in 3	1 in 4
98	00:11:00	45 - 54	Masters	Average	Male	40 per cent	50 per cent	60 per cent	70 per cent	Heart disease	Heart disease	Both		1 in 3	1 in 3
99	00:09:00	55 - 64	Doctorate	> Average	Male	40 per cent	30 per cent	30 per cent	40 per cent	Cancer	Cancer	Cancer	Cancer	1 in 3	1 in 3
100	00:06:00	25 - 34	Undergrad	> Average	Male	60 per cent	40 per cent	40 per cent	40 per cent	Both	Both		Both	1 in 4	1 in 5
101	00:07:00	35 - 44	Secondary	Average	Female	40 per cent	50 per cent	40 per cent	40 per cent	Both	Heart disease	Both	Both	1 in 5	1 in 4
102	00:09:00	25 - 34	Undergrad	Average	Female	60 per cent	40 per cent	60 per cent	80 per cent	Both	Both	Both	Both	1 in 3	1 in 2
103	00:07:00	35 - 44	Undergrad	Average	Male	30 per cent	60 per cent	30 per cent	30 per cent	Both	Both	Cancer	Cancer	1 in 6	1 in 6
104	00:06:00	35 - 44	Undergrad	Average	Female	30 per cent	30 per cent	30 per cent	40 per cent	Both	Both	Both	Both	1 in 5	1 in 6

Number	Time	Age	Education	Ability	Gender	Heart disease risk - male	Heart disease risk - female	Cancer risk - male	Cancer risk - female	Friends have suffered from	Friends have died from	I have donated to	I am considering donating to	Heart disease risk	Cancer risk
105	00:08:00	35 - 44	Prefer not to say	Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Both	Both			1 in 3	1 in 3
106	00:09:00	25 - 34	Undergrad	> Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Both	Both	1 in 4	1 in 3
107	00:08:00	35 - 44	Undergrad	> Average	Male	40 per cent	40 per cent	30 per cent	30 per cent	Both	Both			1 in 3	1 in 5
108	00:24:00	25 - 34	Undergrad	Average	Female	40 per cent		60 per cent	50 per cent	Both	Both	Both	Both	1 in 4	1 in 5
109	07:28:00	35 - 44	Undergrad	> Average	Female	40 per cent	30 per cent	60 per cent	60 per cent	Both	Cancer			1 in 4	1 in 4
110	00:08:00	35 - 44	Undergrad	Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Both	Both			1 in 3	1 in 3
111	00:08:00	35 - 44	Undergrad	> Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Cancer	Cancer	Cancer		1 in 6	1 in 6
112	00:06:00	25 - 34	Masters	> Average	Female	30 per cent	30 per cent	30 per cent	30 per cent	Cancer	Heart disease	Both	Both	1 in 6	1 in 6
113	00:03:00	25 - 34	Undergrad	Average	Male	60 per cent	40 per cent	70 per cent	70 per cent	Cancer	Cancer	Cancer	Cancer	1 in 4	1 in 3
114	00:06:00	18 - 24	Masters	> Average	Female	50 per cent	40 per cent	40 per cent	40 per cent	Heart disease	Cancer			1 in 3	1 in 3
115	00:05:00	25 - 34	Doctorate	> Average	Male	50 per cent	40 per cent	30 per cent	30 per cent	Cancer	Cancer	Cancer	Cancer	1 in 5	1 in 6
116	00:17:00	25 - 34	Masters	> Average	Male	50 per cent	40 per cent	40 per cent	40 per cent	Both	Both	Both		1 in 4	1 in 4
117	00:05:00	35 - 44	Undergrad	Average	Male	50 per cent	40 per cent	40 per cent	50 per cent	Both	Cancer	Both		1 in 4	1 in 5
118	00:08:00	35 - 44	Masters	Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Both	Both	1 in 4	1 in 3
119	00:05:00	25 - 34	Undergrad	Average	Female	50 per cent	40 per cent	60 per cent	60 per cent	Both	Cancer	Both	Cancer	1 in 4	1 in 4
120	00:05:00	35 - 44	Undergrad	> Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Both	Cancer	Cancer	Cancer	1 in 6	1 in 6
121	00:07:00	25 - 34	Masters	> Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Cancer		1 in 4	1 in 3
122	00:10:00	25 - 34	Masters	> Average	Female	40 per cent	30 per cent	30 per cent	40 per cent	Both	Both	Both	Both	1 in 5	1 in 6
123	00:06:00	25 - 34	Undergrad	Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Cancer	Both	1 in 3	1 in 4
124	00:05:00	35 - 44	Doctorate	> Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Both	Both	1 in 4	1 in 3
125	00:08:00	25 - 34	Masters	> Average	Male	50 per cent	40 per cent	40 per cent	40 per cent	Cancer	Cancer	Cancer		1 in 3	1 in 3
126	00:05:00	35 - 44	Secondary	Average	Female	50 per cent	50 per cent	60 per cent	60 per cent	Heart disease	Cancer	Both		1 in 4	1 in 5
127	00:06:00	25 - 34	Secondary	> Average	Male	30 per cent	40 per cent	40 per cent	50 per cent	Heart disease	Cancer			1 in 4	1 in 3
128	00:02:00	25 - 34	Masters	< Average	Female	60 per cent	40 per cent	60 per cent	60 per cent	Both	Cancer	Cancer	Cancer	1 in 3	1 in 3
129	00:08:00	25 - 34	Undergrad	Average	Female	60 per cent	50 per cent	50 per cent	60 per cent	Cancer	Cancer	Both		1 in 2	1 in 3
130	00:05:00	25 - 34	Undergrad	> Average	Female	40 per cent	50 per cent	50 per cent	60 per cent	Both	Cancer			1 in 3	1 in 3

Number	Time	Age	Education	Ability	Gender	Heart disease risk - male	Heart disease risk - female	Cancer risk - male	Cancer risk - female	Friends have suffered from	Friends have died from	I have donated to	I am considering donating to	Heart disease risk	Cancer risk
131	00:07:00	45 - 54	Secondary	> Average	Male	50 per cent	30 per cent	40 per cent	40 per cent	Both	Cancer	Cancer		1 in 4	1 in 5
132		25 - 34	Secondary	> Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Cancer	Cancer	Cancer		1 in 6	1 in 6
133	00:08:00	18 - 24	Masters	Average	Male	60 per cent	40 per cent	40 per cent	40 per cent	Both	Cancer	Both		1 in 3	1 in 3
134	00:05:00	35 - 44	Undergrad	Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Both	Heart disease	Both	Both	1 in 6	1 in 6
135	00:11:00	18 - 24	Undergrad	Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Cancer	Cancer	Cancer	Cancer	1 in 6	1 in 5
136	00:05:00	18 - 24	Secondary	Average	Male	40 per cent	30 per cent	40 per cent	40 per cent	Both	Cancer		Both	1 in 4	1 in 3
137	00:04:00	25 - 34	Undergrad	> Average	Male	40 per cent	30 per cent	30 per cent	30 per cent	Both	Cancer	Both	Both	1 in 4	1 in 6
138	00:07:00	25 - 34	Undergrad	> Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Both	Both	1 in 6	1 in 5
139	00:11:00	35 - 44	Undergrad	> Average	Female	60 per cent	50 per cent	40 per cent	50 per cent	Both	Both	Both	Both	1 in 3	1 in 4
140	00:10:00	35 - 44	Undergrad	> Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Cancer	Cancer			1 in 6	1 in 6
141	00:06:00	45 - 54	Secondary	> Average	Male	50 per cent	50 per cent	30 per cent	30 per cent	Both	Both	Heart disease		1 in 3	1 in 3
142	00:08:00	35 - 44	Undergrad	Average	Female	40 per cent	40 per cent	40 per cent	40 per cent	Cancer	Cancer			1 in 5	1 in 6
143	00:12:00	25 - 34	Secondary	> Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Both	Heart disease		Both	1 in 4	1 in 3
144	00:13:00	25 - 34	Undergrad	Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Both	Both	1 in 3	1 in 3
145	00:09:00	25 - 34	Undergrad	> Average	Female	40 per cent	40 per cent	40 per cent	40 per cent	Both	Both	Both	Both	1 in 4	1 in 4
146	00:05:00	25 - 34	Undergrad	Average	Female	50 per cent	60 per cent	60 per cent	60 per cent	Both	Cancer	Cancer	Both	1 in 3	1 in 4
147	00:11:00	25 - 34	Undergrad	> Average	Male	40 per cent	30 per cent	40 per cent	50 per cent	Both	Heart disease	Heart disease	Heart disease	1 in 4	1 in 3
148	00:12:00	25 - 34	Secondary	Average	Male	40 per cent	40 per cent	40 per cent	40 per cent	Both	Both			1 in 5	1 in 4
149	00:12:00	35 - 44	Undergrad	> Average	Male	70 per cent	60 per cent	70 per cent	70 per cent	Both	Cancer	Cancer	Cancer	1 in 4	1 in 4
150	00:10:00	25 - 34	Undergrad	Average	Female	40 per cent	30 per cent	50 per cent	50 per cent	Both	Cancer	Cancer	Cancer	1 in 5	1 in 4
151	00:06:00	18 - 24	Undergrad	> Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Heart disease	Heart disease			1 in 3	1 in 6
152	00:19:00	55 - 64	Undergrad	> Average	Male	40 per cent	30 per cent	40 per cent	50 per cent	Both	Both	Both		1 in 3	1 in 3
153	00:05:00	25 - 34	Undergrad	> Average	Female	50 per cent	50 per cent	60 per cent	60 per cent	Both	Both	Both	Cancer	1 in 3	1 in 4
154	00:02:00	25 - 34	Undergrad	> Average	Female	40 per cent	50 per cent	60 per cent	60 per cent	Both	Both			1 in 4	1 in 5
155	00:08:00	25 - 34	Undergrad	Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Both	Both			1 in 5	1 in 4
156	00:19:00	25 - 34	Masters	> Average	Female	50 per cent	40 per cent	40 per cent	40 per cent	Both	Both	Both	Both	1 in 4	1 in 6

Number	Time	Age	Education	Ability	Gender	Heart disease risk - male	Heart disease risk - female	Cancer risk - male	Cancer risk - female	Friends have suffered from	Friends have died from	I have donated to	I am considering donating to	Heart disease risk	Cancer risk
157	00:06:00	25 - 34	Undergrad	Average	Female	60 per cent	50 per cent	40 per cent	40 per cent	Both	Both	Both	Both	1 in 2	1 in 3
158	00:14:00	45 - 54	Masters	> Average	Female	50 per cent	40 per cent	50 per cent	30 per cent	Both	Both	Both	Both	1 in 2	1 in 3
159	00:11:00	25 - 34	Undergrad	> Average	Female	40 per cent	30 per cent	40 per cent	50 per cent	Both	Both	Both	Both	1 in 3	1 in 3
160	00:07:00	25 - 34	Undergrad	Average	Female	50 per cent	40 per cent	50 per cent	50 per cent	Both	Cancer	Both	Both	1 in 3	1 in 3
161	00:10:00	25 - 34	Secondary	> Average	Female	30 per cent	30 per cent	40 per cent	50 per cent	Both	Both	Both		1 in 5	1 in 4
162		25 - 34	Undergrad	> Average	Female	70 per cent	60 per cent	70 per cent	70 per cent	Both	Both	Cancer	Both	1 in 5	1 in 5
163	00:13:00	55 - 64	Undergrad	Average	Female	40 per cent	40 per cent	40 per cent	40 per cent	Both	Heart disease	Both	Both	1 in 3	1 in 4
164	00:03:00	35 - 44	Undergrad	> Average	Male	60 per cent	50 per cent	40 per cent	40 per cent	Both	Cancer	Both		1 in 3	1 in 3
165	00:13:00	25 - 34	Masters	> Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Both	Both			1 in 3	1 in 3
166	00:09:00	35 - 44	Undergrad	> Average	Female	60 per cent	50 per cent	60 per cent	60 per cent	Cancer	Heart disease			1 in 4	1 in 4
167	00:06:00	18 - 24	Undergrad	> Average	Female	40 per cent	40 per cent	30 per cent	30 per cent	Both	Cancer		Both	1 in 5	1 in 5
168	00:04:00	35 - 44	Masters	> Average	Male	40 per cent	30 per cent	50 per cent	40 per cent	Both	Both	Both		1 in 3	1 in 2
169	00:05:00	25 - 34	Undergrad	Average	Female	60 per cent	60 per cent	40 per cent	50 per cent	Heart disease	Cancer	Heart disease	Cancer	1 in 3	1 in 5
170	00:06:00	35 - 44	Masters	> Average	Male	50 per cent	40 per cent	40 per cent	40 per cent	Both	Cancer	Cancer		1 in 4	1 in 3
171	00:12:00	25 - 34	Undergrad	> Average	Female	60 per cent	40 per cent	40 per cent	40 per cent	Cancer	Cancer			1 in 4	1 in 6
172	00:05:00	25 - 34	Masters	> Average	Female	40 per cent	50 per cent	40 per cent	40 per cent	Cancer	Cancer			1 in 4	1 in 4
173	00:06:00	25 - 34	Masters	> Average	Female	30 per cent	40 per cent	30 per cent	30 per cent	Both	Heart disease		Both	1 in 3	1 in 3
174	07:12:00	18 - 24	Undergrad	Average	Female	60 per cent	60 per cent	40 per cent	40 per cent	Both	Heart disease	Cancer	Cancer	1 in 4	1 in 4
175	00:03:00	25 - 34	Undergrad	> Average	Female	50 per cent	30 per cent	40 per cent	40 per cent	Both	Cancer	Cancer	Both	1 in 2	1 in 3
176	00:08:00	35 - 44	Masters	Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Heart disease	Cancer	Both	Both	1 in 4	1 in 5
177	00:10:00	18 - 24	Secondary	> Average	Female	70 per cent	60 per cent	50 per cent	40 per cent	Both	Both	Both		1 in 2	1 in 3
178	00:11:00	35 - 44	Secondary	> Average	Male	40 per cent	30 per cent	30 per cent	40 per cent	Cancer	Cancer			1 in 3	1 in 4
179	00:07:00	45 - 54	Undergrad	> Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Both	Both	1 in 3	1 in 5
180	00:11:00	35 - 44	Masters	> Average	Female	70 per cent	60 per cent	40 per cent	40 per cent	Both	Both	Both	Both	1 in 2	1 in 3
181	00:08:00	35 - 44	Undergrad	> Average	Male	60 per cent	50 per cent	30 per cent	40 per cent	Both	Both	Both		1 in 3	1 in 4
182	00:06:00	25 - 34	Masters	Average	Female	60 per cent	50 per cent	50 per cent	60 per cent	Both	Both	Both	Both	1 in 3	1 in 4

Number	Time	Age	Education	Ability	Gender	Heart disease risk - male	Heart disease risk - female	Cancer risk - male	Cancer risk - female	Friends have suffered from	Friends have died from	I have donated to	I am considering donating to	Heart disease risk	Cancer risk
183	00:06:00	25 - 34	Masters	Average	Female	40 per cent	30 per cent	50 per cent	50 per cent	Both	Both			1 in 4	1 in 2
184	00:17:00	25 - 34	Undergrad	> Average	Male	60 per cent	60 per cent	60 per cent	60 per cent	Both	Both	Both	Both	1 in 6	1 in 6
185	00:10:00	25 - 34	Undergrad	Average	Female	40 per cent	40 per cent	30 per cent	30 per cent	Both	Cancer	Cancer		1 in 3	1 in 3
186	00:12:00	25 - 34	Undergrad	Average	Female	60 per cent	50 per cent	40 per cent	40 per cent	Both	Both	Cancer	Both	1 in 3	1 in 3
187	00:08:00	35 - 44	Undergrad	> Average	Female	60 per cent	50 per cent	40 per cent	50 per cent	Both	Both	Both		1 in 5	1 in 6
188	00:05:00	18 - 24	Undergrad	> Average	Male	60 per cent	60 per cent	60 per cent	60 per cent	Both	Both			1 in 5	1 in 5
189	00:06:00	35 - 44	Secondary	> Average	Female	60 per cent	40 per cent	40 per cent	60 per cent	Both	Both	Both	Both	1 in 5	1 in 5
190	00:08:00	25 - 34	Masters	> Average	Male	50 per cent	60 per cent	40 per cent	40 per cent	Cancer	Cancer	Both		1 in 2	1 in 3
191	00:09:00	45 - 54	Masters	> Average	Female	40 per cent	40 per cent	30 per cent	30 per cent	Both	Both			1 in 4	1 in 6
192	00:08:00	45 - 54	Undergrad	> Average	Female	50 per cent	40 per cent	40 per cent	40 per cent	Both	Cancer	Both	Both	1 in 3	1 in 3
193	00:09:00	25 - 34	Secondary	> Average	Male	40 per cent	40 per cent	50 per cent	50 per cent	Both	Cancer	Cancer	Cancer	1 in 3	1 in 4
194	00:08:00	25 - 34	Undergrad	> Average	Female	40 per cent	30 per cent	40 per cent	50 per cent	Both	Cancer	Cancer	Cancer	1 in 4	1 in 5
195	00:07:00	35 - 44	Secondary	> Average	Male	60 per cent	60 per cent	60 per cent	60 per cent	Cancer	Cancer	Cancer	Cancer	1 in 5	1 in 5
196	00:07:00	25 - 34	Secondary	> Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Both	Both	1 in 3	1 in 3
197	00:09:00	25 - 34	Masters	> Average	Male	50 per cent	40 per cent	30 per cent	30 per cent	Both	Heart disease	Both		1 in 4	1 in 3
198	00:04:00	35 - 44	Undergrad	< Average	Female	60 per cent	40 per cent	50 per cent	60 per cent	Both	Both			1 in 3	1 in 6
199	00:04:00	18 - 24	Undergrad	> Average	Male	40 per cent	30 per cent	50 per cent	30 per cent	Both	Cancer		Cancer	1 in 5	1 in 3
200	00:07:00	35 - 44	Undergrad	> Average	Male	50 per cent	40 per cent	40 per cent	50 per cent	Both	Both	Cancer	Heart disease	1 in 4	1 in 5
201	00:16:00	25 - 34	Undergrad	Average	Female	60 per cent	40 per cent	70 per cent	70 per cent	Both	Cancer	Both	Both	1 in 5	1 in 4
202	00:11:00	25 - 34	Undergrad	Average	Female	60 per cent	40 per cent	30 per cent	40 per cent	Both	Both	Both	Both	1 in 3	1 in 3
203	00:07:00	18 - 24	Undergrad	Average	Female	60 per cent	40 per cent	40 per cent	40 per cent	Cancer	Cancer		Cancer	1 in 3	1 in 2
204	00:04:00	18 - 24	Undergrad	> Average	Male	70 per cent	50 per cent	60 per cent	60 per cent	Both	Cancer	Both	Both	1 in 5	1 in 4
205	00:14:00	45 - 54	Masters	> Average	Female					Both	Cancer				
206	00:06:00	25 - 34	Masters	Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Both	Cancer		Cancer	1 in 5	1 in 3
207	01:57:00	35 - 44	Secondary	> Average	Female	50 per cent	40 per cent	30 per cent	40 per cent	Both	Both	Both	Cancer	1 in 6	1 in 6
208	00:10:00	35 - 44	Prefer not to say	> Average	Male	40 per cent	30 per cent	30 per cent	30 per cent	Heart disease	Heart disease			1 in 3	1 in 3

Number	Time	Age	Education	Ability	Gender	Heart disease risk - male	Heart disease risk - female	Cancer risk - male	Cancer risk - female	Friends have suffered from	Friends have died from	I have donated to	I am considering donating to	Heart disease risk	Cancer risk
209	00:06:00	25 - 34	Undergrad	Average	Female	40 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Cancer	Cancer	1 in 5	1 in 3
210	00:22:00	25 - 34	Undergrad	> Average	Female	40 per cent	30 per cent	50 per cent	50 per cent	Both	Cancer	Cancer	Both	1 in 5	1 in 5
211	00:05:00	18 - 24	Secondary	> Average	None of the above	60 per cent	50 per cent	50 per cent	50 per cent	Cancer	Cancer	Cancer	Cancer	1 in 3	1 in 4
212	00:11:00	25 - 34	Undergrad	> Average	Male	40 per cent	30 per cent	40 per cent	40 per cent	Both	Both	Both	Both	1 in 4	1 in 3
213	00:11:00	45 - 54	Secondary	> Average	Female	50 per cent	40 per cent	40 per cent	40 per cent	Cancer	Cancer			1 in 4	1 in 4
214	00:05:00	35 - 44	Undergrad	> Average	Female	30 per cent	30 per cent	30 per cent	30 per cent	Both	Both	Both	Both	1 in 3	1 in 3
215	00:05:00	25 - 34	Undergrad	Average	Female	60 per cent	60 per cent	60 per cent	60 per cent	Both	Both	Both	Both	1 in 2	1 in 3
216	00:10:00	25 - 34	Masters	> Average	Female	50 per cent	40 per cent	30 per cent	30 per cent	Heart disease	Cancer	Both		1 in 4	1 in 3
217	00:10:00	25 - 34	Undergrad	Average	Female	60 per cent	60 per cent	70 per cent	70 per cent	Both	Both	Both	Both	1 in 4	1 in 3
218	00:08:00	25 - 34	Undergrad	> Average	Female	40 per cent	30 per cent	30 per cent	30 per cent	Both	Heart disease			1 in 3	1 in 3
219	00:07:00	35 - 44	Undergrad	> Average	Female	40 per cent	30 per cent	50 per cent	50 per cent	Both	Cancer		Heart disease	1 in 6	1 in 5
220	00:15:00	18 - 24	Prefer not to say	> Average	Male	40 per cent	40 per cent	30 per cent	30 per cent	Cancer	Cancer		Both	1 in 3	1 in 5
221	00:04:00	35 - 44	Undergrad	Average	Female		30 per cent		30 per cent	Both	Cancer	Cancer		1 in 3	1 in 3
222	00:06:00	25 - 34	Masters	> Average	Male	30 per cent	30 per cent	30 per cent	30 per cent	Both	Both			1 in 3	1 in 3
223	00:16:00	35 - 44	Doctorate	> Average	Male	40 per cent	30 per cent	40 per cent	40 per cent	Cancer	Cancer			1 in 3	1 in 3

Risk perception questions

The numbers in the table header refer to the question number in the survey.

	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
1	✓	✗	✗	✗	✗	✗	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓
4	✗	✗	✗	✗	✗	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓
7	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓
10	✓	✗	✗	✓	✗	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓
11	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓
12	✗	✗	✗	✗	✗	✗	✓	✓	✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
14	✗	✓	✓	✗	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗	✗	✓	✓	✗	✗	✗	✗	✗	✓	✓	✓	✓
15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
16	✓	✓	✗	✓	✓	✗	✓	✗	✓	✓	✗	✓	✓	✗	✓	✓	✗	✓	✗	✗	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓
17	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
18	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓
19	✗	✗	✗	✓	✗	✗	✓	✓	✗	✓	✗	✓	✓	✗	✓	✗	✗	✗	✓	✗	✓	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
20	✓	✗	✓	✓	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗	✗	✓	✗	✗	✓	✓	✓	✓
21	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✗	✓	✓	✓	✓
22	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✗	✗	✓	✗	✓	✓	✓	✓
23	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
24	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓
25	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
26	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓	✓	✗	✓	✓	✓	✓
27	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
28	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
29	✓	✗	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗
30	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗	✓	✓	✓	✗	✗	✓	✓	✓	✗	✓	✗	✓	✗	✗	✗	✗	✗	✓	✓	✓	✓
31	✗	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✗	✗	✓	✓	✓	✗	✗	✓	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗
32	✓	✓	✓	✓	✗	✗	✗	✗	✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
33	✗	✗	✗	✗	✗	✗	✓	✓	✗	✗	✓	✓	✓	✗	✓	✗	✗	✗	✗	✓	✓	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
34	✓	✗	✓	✗	✗	✓	✓	✗	✗	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✗	✗	✗	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓
35	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
36	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
37	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
38	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
39	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓
40	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
41	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
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44	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✗	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗	✗	✓	✓	✓
45	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗	✓	✗	✗	✓	✓	✓	✓	✓
46	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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48	✗	✓	✓	✓	✗	✓	✓	✗	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	✗	✗	✓	✓	✓	✓
49	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
50	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
51	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓
52	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓
53	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
54	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓

	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
55	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
56	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
57	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
58	✗	✗	✓	✓	✓	✗	✓	✓	✗	✓	✓	✗	✗	✓	✓	✓	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓
59	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✓	✓	✗	✓	✓	✗	✗	✗	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓
60	✗	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✓	✓	✓	✗	✗	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
61	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
62	✓	✓	✓	✓	✗	✗	✗	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
63	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
64	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✗	✗	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓
65	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
66	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
67	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
68	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
69	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓
70	✗	✗	✗	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓	✓
71	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
72	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
73	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓
74	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
75	✗	✗	✓	✓	✗	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓
76	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
77	✗	✗	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓
78	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
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81	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓

	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
82	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
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84	✗	✓	✓	✗	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗	✓	✓	✗	✗	✓	✓	✓	✓
85	✓	✗	✗	✗	✗	✗	✓	✓	✓	✗	✓	✗	✓	✗	✗	✗	✗	✓	✓	✓	✗	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
86	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓
87	✗	✗	✓	✓	✗	✗	✓	✓	✗	✓	✗	✓	✓	✓	✗	✗	✓	✓	✓	✗	✓	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
88	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓
89	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓
90	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✗	✓	✓	✗	✓	✓	✓	✓
91	✗	✓	✓	✗	✗	✗	✗	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✓	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
92	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
93	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
94	✗	✗	✓	✓	✗	✗	✗	✓	✗	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
95	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
96	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✗	✗	✗	✓	✗	✗	✓	✗	✗	✗	✗	✗	✓	✓	✓	✓
97	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
98	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
99	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
100	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓	✗	✗	✗	✗	✓	✗	✗	✗	✗	✓	✓	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
101	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✗	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓
102	✓	✗	✓	✗	✓	✗	✗	✗	✗	✓	✗	✗	✗	✗	✓	✓	✗	✗	✗	✓	✓	✓	✓	✗	✓	✗	✗	✓	✗	✓	✓	✓
103	✓	✗	✗	✗	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗	✗	✓	✗	✓	✗	✓	✓	✗	✓	✓	✓	✓
104	✗	✗	✗	✓	✗	✗	✓	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
105	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
106	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓
107	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
108	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
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111	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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113	✗	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗	✓	✓	✓	✓	✗	✗	✓	✓	✗	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓
114	✓	✓	✓	✗	✗	✓	✗	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
115	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
116	✗	✓	✓	✓	✗	✗	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓
117	✓	✗	✓	✓	✗	✓	✗	✓	✓	✗	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓
118	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗	✓	✗	✗	✓	✓	✓	✗	✗	✗	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓
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125	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
126	✗	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✗	✓	✗	✗	✗	✓
127	✗	✗	✓	✓	✓	✓	✓	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓
128	✓	✗	✗	✗	✗	✗	✓	✗	✓	✓	✗	✓	✗	✓	✗	✗	✓	✓	✗	✗	✓	✗	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓
129	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓
130	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
131	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
132	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
133	✓	✗	✗	✓	✗	✓	✓	✗	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓
134	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗	✓	✗	✓	✓	✓	✓	✗	✓	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓
135	✗	✗	✓	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✗	✗	✓	✗	✗	✓	✗	✗	✗	✓	✓	✓	✓

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136	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
137	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
138	✗	✗	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓
139	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓
140	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
141	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓
142	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
143	✗	✓	✗	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓	✓	✗	✗	✓	✓	✓	✓
144	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗	✗	✓	✓	✓	✓
145	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
146	✗	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
147	✓	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
148	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓
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152	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓
153	✗	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✓	✗	✗	✓	✗	✓	✓	✓	✓
154	✗	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓
155	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✗	✗	✓	✓	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
156	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
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158	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
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160	✗	✗	✓	✓	✗	✓	✗	✗	✗	✗	✗	✓	✓	✓	✗	✗	✓	✓	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗	✓	✗	✓	✓
161	✓	✗	✓	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓
162	✓	✓	✗	✗	✗	✗	✓	✓	✗	✗	✗	✓	✓	✓	✗	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓

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163	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
164	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
165	✓	✓	✗	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓
166	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓
167	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
168	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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174	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓
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206	✗	✓	✗	✗	✗	✗	✓	✗	✓	✓	✗	✓	✓	✗	✗	✓	✗	✓	✓	✗	✓	✗	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓
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209	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✓	✓	✓	✓	✓	✗	✓	✗	✗	✗	✗	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓
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218	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓
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