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How accurate are smokers' perceptions of risk?

STEPHEN R. SUTTON

Abstract  This paper highlights some of the key findings from an ESRC-funded research project on smokers' perceptions of risk, and compares them with other relevant studies. The paper is organised in terms of the two most common ways of assessing people's perceptions of the health risks of smoking, namely to ask them to give a numerical risk estimate or to compare their own risk with that of the average person or other people. The overall picture is rather confusing. Studies that have used numerical risk questions sometimes find substantial over-estimation of risks and sometimes substantial under-estimation. Research in which smokers compare their risk with that of other smokers has also yielded inconsistent findings. Studies that have asked smokers to compare themselves with other people or with non-smokers are more consistent in showing that smokers tend to under-estimate the risks. Research from both the numerical and comparative risk traditions shows fairly consistently that smokers acknowledge that they are at increased risk compared with non-smokers. It is concluded that currently there is no simple answer to the question posed in the title of the paper. Some recommendations are made for future research.

Key words: smoking; perception of risk

Introduction

In 1980, Peto (1980: p. 46) summarised the risks of smoking as follows. Among an average 1000 young men who smoke cigarettes regularly:

- about one will be murdered;
- about six will be killed on the roads;
- about 250 will be killed before their time by tobacco.

In 1994, he updated the figures for a press release that accompanied the launch of a book on mortality from smoking (Peto et al., 1994). On average, among 1000 twenty-year-olds who smoke cigarettes regularly:

- about one will die from homicide;
- about six will die from motor vehicles;
- about 250 will be killed by smoking in middle age alone;
- plus 250 more will be killed by smoking in old age.

Middle age was defined as 35–69, old age as 70 and over. All the figures refer to the United Kingdom. The risks of smoking in the United States are similar, but traumatic deaths are
more common than in the United Kingdom: risk of death from homicide stands at six per 1000 and risk of death from motor vehicles stands at 12 per 1000.

These figures convey strikingly just how dangerous smoking is compared with familiar non-medical risks. But how accurately do smokers perceive the risks they are running? In this review, I highlight some of the key findings from an ESRC-funded research project on smokers’ risk perceptions based on a series of large national surveys of adults aged 16 and over in Great Britain. I compare my findings with those from other relevant studies.

The two most common ways of assessing people’s perceptions of the health risks of smoking are to ask them either to give a numerical risk estimate (which can then be compared with epidemiological or actuarial estimates) or to compare their own risk with that of the average person or other people (which can be used to detect optimistic bias or unrealistic optimism). Since these two approaches yield different kinds of information and point to somewhat different conclusions, I consider them separately.

**Numerical risk estimates**

In one of our surveys (Sutton, 1998), respondents were asked “On average, out of 1000 twenty-year-olds in Britain who smoke cigarettes regularly and who carry on smoking, how many do you think will be murdered? How many do you think will be killed on the roads? And how many do you think will be killed by smoking before the age of 702? The questions were based closely on the statements used by Peto and colleagues (1980, 1994). Respondents’ smoking status was then ascertained.

Smoking was seen as by far the most risky of the three hazards, followed by death on the roads, and then homicide. The rank order corresponded to the epidemiological estimates. Smokers, ex-smokers and never-smokers gave remarkably similar estimates of the risk of being killed by smoking: the median estimates were 100 in each case. These findings suggest that smokers do appreciate that smoking is much more risky than other hazards and that they do so to the same extent as ex-smokers and never-smokers. There was no evidence that smokers were attempting to minimise the risks of smoking or were less knowledgeable than never-smokers. However, all three groups tended to under-estimate the risk. The ‘correct’ answer, corresponding to the epidemiological point estimate, is 250. But only 15.5% of respondents gave an answer in the range 200-300; 61.1% underestimated the risk; and 23.4% overestimated it. There was a substantial and statistically significant effect of age. The 16-24 age group had a median risk estimate of 200 compared with 100 or less in the older age groups.

Different conclusions were reached in an analysis of data from a large telephone survey conducted in the United States in which respondents were asked the question “Among 100 cigarette smokers, how many of them do you think will get lung cancer because they smoke?” (Viscusi, 1990, 1991, 1992). The findings were reported in terms of mean risk estimates. For the full sample, the mean estimate was 0.426. There were significant differences between the estimates given by current smokers (0.368), former smokers (0.408), and nonsmokers (0.464). There were also significant age differences; the youngest age group (16-21) gave higher estimates of risk than those aged over 21.

Viscusi estimated the true lung cancer death risk for smokers to be between 0.05 and 0.1. Even allowing for the fact that the risk of getting lung cancer would be somewhat higher than this, the subjective risk estimates given by respondents in this study represented substantial over-estimates of the risk, among smokers as well as nonsmokers. According to Viscusi, these biased estimates of risk are the direct result of strongly worded health warnings on cigarette packets (“SMOKING CAUSES LUNG CANCER”) and increasingly severe restrictions on smoking. He concludes that the antismoking campaign has, if anything, been too successful.
The studies described above used measures of general risk. None of them obtained estimates of respondents' own personal risk. In two surveys conducted as part of our ESRC-funded project, we found that British smokers estimated their personal risk of getting lung cancer to be 41% and their personal risk of getting heart disease to be 47% (Sutton, 1999a). There were significant associations with age and cigarette consumption, such that older smokers (particularly those aged 75+) and lighter smokers had lower estimates of personal risk. Thus, although smokers (correctly) rate heart disease as more likely than lung cancer, they tend to over-estimate their lifetime risk of lung cancer to a substantial degree. This finding has since been replicated in Norway (Rise et al., 1999). The over-estimation of the lung cancer risk may reflect the prominence given to the link between smoking and lung cancer in the past 30 years.

A number of earlier studies also suggested that smokers give rather high estimates of personal risk. For example, in a national survey of smoking habits and attitudes conducted in the United Kingdom in the early 1980s, 32% of smokers said that they were 'fairly likely' or 'very likely' to get lung cancer if they carried on smoking (Marsh and Matheson, 1983; Sutton et al., 1990). In one study conducted in the United States (Boney McCoy et al., 1992), smokers attending a cessation clinic estimated their personal risk of developing a serious smoking-related disease to be as high as 74% (this was the average rating across three diseases: coronary heart disease, emphysema, and lung cancer).

Schoenbaum (1997) analysed data from the Health and Retirement Survey in the United States in which respondents aged between 50 and 62 were asked to estimate their chance of surviving to age 75. The specific question asked was "Using any number from zero to ten, what do you think are the chances that you will live to be 75 or more?". Respondents were shown an integer scale numbered from 0 to 10, with 0 labelled 'no chance at all' and 10 labelled 'absolutely certain'. Mean estimated survival probabilities were compared with life table values calculated by Rogers and Powell-Griner (1991). The subjective survival probabilities were highest for never smokers and reduced progressively for former, current light, and current heavy smokers, for both men and women. Thus, smokers appear to acknowledge that they are at increased personal risk. For men, the average subjective probabilities were quite accurate for never, former, and current light (under 25 per day) smokers. For example, male former smokers estimated their mean survival probability to be 0.631; the actuarial value was 0.630. Current heavy smokers, however, greatly over-estimated their chances of survival (0.501 compared with 0.263). For women, comparison of subjective and actuarial estimates indicated that never, former, and current light smokers tended to under-estimate their chances of survival, whereas, as with men, current heavy smokers substantially over-estimated their chances (0.601 vs 0.308).

Can these numerical estimates be taken at face value? The substantial proportion of smokers (about 37%) in the Sutton (1999a) study who gave '50' as the answer may have been using this to indicate that they simply do not know whether they will develop the disease—in other words, that they may or may not get it. On the other hand, in the study by Schoenbaum (1997), only about 1% of the sample answered "Don't know".

In an Australian study, Borland (1997) obtained very different findings depending on whether the risk of smoking was assessed using proportions (e.g., nine out of every 10 smokers) or percentages (e.g., 90% chance). Using the proportion measure, 40% underestimated and 20% over-estimated the risk. By contrast, on the percentage measure, 15% underestimated the risk and over 60% over-estimated it. The two questions were not directly comparable in that the response categories did not map directly onto one another and the percentage question asked for a personal risk estimate, whereas the proportion question asked for a general risk estimate. Nevertheless, Borland's results suggest that smokers either do not
understand proportions and percentages or are not using these scales in the way intended. Hurd and McGarry (1995), on the other hand, provide evidence that respondents in the Health and Retirement Survey analysed by Schoenbaum (1997) did understand the probability scale and used it correctly.

Even if we assume that people do use probability, proportion and percentage scales correctly, it seems unrealistic to expect them to get the right answer (and all the more remarkable when they do). Why should people know their own chances of getting lung cancer or of surviving to age 75? Information about the health risks of smoking is seldom given in the form of absolute probabilities. Where figures are provided in information materials, they usually refer to the annual number of deaths from smoking or to mortality ratios for smoking-related diseases.

**Comparative risk estimates**

Some studies have asked smokers (and sometimes non-smokers too) to compare their own personal risk with that of a comparison target such as the typical smoker, the average person or the average non-smoker. This can be done using a single question (direct measure) or by asking respondents to give separate ratings for self and others and then computing a difference score (indirect measure).

In two of our surveys, smokers were asked to compare their own chances of getting lung cancer (and heart disease) with the average cigarette smoker of the same sex (Sutton, 1999a). The question we used was “Compared with the average ... (male/female) ... cigarette smoker in this country, do you think your own chances of getting lung cancer (heart disease) at some time in your life are ... Much higher/Higher/A bit higher/About the same/A bit lower/Lower/ Much lower?” This is an example of a direct measure of comparative risk. Under certain conditions and assumptions, the answers to such questions can be used to detect a bias in risk perception. If people, on average, view their risk of developing a given disease or experiencing a particular hazard as lower than that of the average person, then this is evidence for an optimistic bias or unrealistic optimism—unrealistic because not everyone can be below average risk (Weinstein, 1980). Note that this method does not enable us to say that a particular individual is unrealistically optimistic (or unrealistically pessimistic), only that there is a bias in the sample as a whole. Comparative risk questions have been used in a large number of studies of risk perception in relation to a wide range of different hazards. The results show a fairly consistent tendency towards optimism bias (Hoorens, 1994; Klein & Weinstein, 1997).

Although unrealistic optimism is the general rule in the literature on risk perception, our study found no evidence for optimistic bias among smokers when they compared themselves with the average smoker. On average, smokers perceived their own lifetime risk of getting lung cancer to be about the same as the average smoker. Heart disease showed a small but significant pessimism bias. Smokers tended to rate their lifetime risk of getting heart disease to be somewhat higher than the average smoker. Further analysis showed that this effect was restricted to women.

In a later survey in which we asked only about lung cancer, the identical question yielded a small but significant pessimistic bias (Sutton, 1999b). In this survey, we also included an indirect measure. Respondents were asked “If you had to put a figure on it, what would you say are your own chances of getting lung cancer at some time in your life?” They were shown a card depicting a vertical line labelled ‘0% No chance of getting it’ at the bottom and ‘100% Certain to get it’ at the top, and were asked to rate their chances by choosing a number between 0 and 100. They were then asked to rate the chances for ‘the average ... (male/female) ... cigarette smoker’ in the same way.
This indirect measure showed a small but significant optimistic bias. Thus, depending on which measure is emphasised, it would be possible to conclude from this survey either that smokers in Britain are unrealistically pessimistic about their lifetime chances of getting lung cancer or that they are unrealistically optimistic. Inspection of the inconsistencies revealed that some smokers who had said on the direct comparative risk question that their risk was higher than average were reluctant to give numerical estimates of risk that were higher for themselves than for the average smoker. Moreover, many of those who rated their risk as 'about the same' as the average smoker on the direct measure preferred to be optimistic rather than pessimistic when pressed to give an exact numerical risk estimate. These findings have recently been replicated in a national sample of Norwegian smokers (Rise et al., 1999).

A number of earlier studies asked smokers to compare themselves with the average smoker, the typical smoker, or other smokers. Hansen and Malotte (1986) asked adolescents to rate the risk of experiencing four potential consequences of cigarette smoking for someone who began smoking in junior high school and continued to smoke 10–20 cigarettes daily (generalized other) and for themselves if they were to become regular smokers (hypothetical self). Ratings of risk for self-as-a-smoker were lower than for generalized other. The smokers also rated their own risk as lower than that for hypothetical self. The latter finding does not necessarily indicate minimisation of risk since many of the adolescent smokers would not become regular smokers consuming 10–20 cigarettes per day for the rest of their lives. In a study by Lee (1989), smokers estimated their own risk of developing a smoking-related illness as 39.3%, which was significantly lower than their estimate of the risk to the average Australian smoker (49.8%). Boney McCoy et al. (1992) studied two samples of smokers. In their clinic sample, they found no difference between own risk and risk to the typical smoker. However, since we would expect smokers who seek out treatment for their smoking to be at higher risk of smoking-related disease than the typical smoker, this finding can be interpreted as suggesting an optimism bias. Boney McCoy et al. (1992) did find a significant optimism bias in their community sample but the distortion was extremely small (52.73 vs 55.57 on a 0–100 scale). McKenna et al. (1993) found clear evidence for optimism bias in a student sample of smokers but failed to replicate this finding in a more recent study using a similar sample. In a small-scale study by Benthin et al. (1993), high school students who smoked cigarettes rated their personal risk as, if anything, higher than the risk to their peers if they were to engage in this activity. Borland (1997) found a small optimistic bias in a sample of Australian smokers. When asked "Compared with other smokers who smoke the same amount as you, do you think your chance of getting a fatal illness is greater, the same or less than them?", 9.6% thought their risk was greater, 69.9% the same, 13.0% less, and 7.5% were unable to say. Borland did not report whether the bias was statistically significant. Finally, LoConte (1995: cited in Weinstein, 1998) found that college student smokers rated their risks as about the same as the average for other smokers.

Overall, then, the evidence suggests that when smokers compare themselves with other smokers, unrealistic optimism is common but not universal. There are a number of studies in which the bias is either not significant or very small. Our own studies, including the replication study in Norway, are the first to find evidence for a pessimistic bias in smokers. It is important to try to explain the differences in findings between different studies and to identify the conditions under which either optimism or pessimism is likely to be obtained. National and cultural factors, secular factors, and differences in methodology (e.g., self-completion versus face-to-face interview; direct versus indirect measures) may all be important. For example, our findings suggest that using separate numerical risk ratings for self and others may increase the chances of finding an optimism bias.

All the studies discussed above asked smokers to compare themselves with other smokers.
Other studies have used other people rather than other smokers as the comparison target (Leventhal et al., 1987; Revenson and Neufeld, 1987; Reppucci et al., 1991; Cohn et al., 1995; Hahn and Renner, 1998). All but one of these studies (Hahn and Renner, 1998) were conducted on adolescents. One should therefore be somewhat cautious about generalising the findings to adult smokers. It is also more difficult to estimate the actual lifetime risk for adolescent smokers since their smoking patterns are likely to show considerable variability. We cannot assume that they will all become regular daily smokers who will smoke for the rest of their lives. In the same way, some adolescent non-smokers may subsequently take up smoking. Nevertheless, the studies listed above have shown consistent evidence for under-estimation of risks by smokers. Take Reppucci et al. (1991) as an example. In two samples of high school students, smokers rated their risk of getting lung cancer only slightly above average compared to other students in their school of the same age and sex. Non-smokers, by contrast, rated themselves as substantially below average risk. Thus, although smokers appear to under-estimate their comparative risk, at the same time they seem to recognise that they are at increased risk compared with non-smokers. As Weinstein (1998) notes, this is a highly consistent finding in research on perceptions of smoking risk: smokers give higher estimates of personal risk than non-smokers. It is found in studies that have used numerical risk measures (e.g., Schoenbaum, 1997), as well as in those that have used comparative risk measures (e.g., Hansen & Malotte, 1986; Revenson & Neufeld, 1987; Lee, 1989; McKenna et al., 1993; Cohn et al., 1995; Hahn & Renner, 1998).

Further relevant evidence comes from two of our surveys in which smokers were asked to compare their risk with the average non-smoker (Sutton, 1999a). On average, they rated their risk of lung cancer and heart disease to be 'a bit higher'. This finding suggests that, although smokers acknowledge that they are at increased risk compared with non-smokers, they do not appear to fully appreciate just how much their risk is increased. It has been estimated that current smokers are about 10 times more likely to develop lung cancer than those who have never smoked regularly (Villeneuve & Mao, 1994).

Conclusions

The literature on smokers' perceptions of risk is rather confusing. Studies that have relied on numerical risk questions sometimes find substantial under-estimation of risks and sometimes substantial over-estimation. Even within our ESRC-funded surveys which used the same sampling procedure to draw national samples, we find different results depending on the question used. It is easy to dismiss the findings from these studies on the grounds that people do not understand the questions, but the evidence on this point is inconsistent too. Research in which smokers have compared their risk with that of other smokers has also yielded inconsistent findings, perhaps reflecting national, cultural, secular, and methodological differences between studies. Studies that have asked smokers to compare themselves with other people or with non-smokers are more consistent in showing that smokers tend to under-estimate the risks. Research from both the numerical and comparative risk traditions shows fairly consistently that smokers acknowledge that they are at increased risk compared with non-smokers.

Currently, there is no simple answer to the question posed in the title of this paper. Research is needed to try to understand how people respond to questions on risk (what do smokers actually mean when they say that their chances of getting lung cancer are 50%?), and why people often give apparently inconsistent responses to different questions. Studies in which people are coached in the use of risk scales and/or made aware of the kinds of biases to which they are susceptible would be valuable, as would studies comparing different ways
of communicating the risks. If we want to enable people to make informed decisions about their health and lifestyles, then we need to ensure that they have accurate perceptions of the risks, as well as the benefits, of engaging in health-related behaviours such as smoking.

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