

<i>References</i>
<p>Text book Ch 4</p> <p>Specification 9.2 Health Risks</p> <p>9.5 Genetic Disease</p> <p>12.2a 12.3d 12.4c 12.5</p>

Prevention of Cancer

Introduction

The main activity is discussion in small groups, to evaluate information on the best way of reducing cancer deaths and to reach decisions on priorities. The intention is to simulate the different interest groups, patients and medical experts, groups A and B, who separately choose their priorities before combining in larger committees. The A and B group information is slightly different though there is some overlap. Although in a real committee of this type both groups would have the same information the differences here are intended to represent the different background awareness that the different groups would bring.

The aims of this activity are:

- To increase awareness of the risk factors for cancer
- To develop recognition of the variability in data
- To show that risk reduction for one hazard may increase another risk
- To show how different evidence can lead to different decisions

Method - Outline scheme

Teacher	Student	Timing
Introduction - why cancer and outline of activity; see below for a suggested script		5 min
Divide students into groups of 2 or 3 Give out activity sheets A to half of these groups activity sheets B to the other half All groups to have ranking sheet (page 8) Give out evaluating evidence guidelines to each group (page 16)		3 min
	In A or B groups students discuss ranking to be given to different initiatives to reduce cancer deaths and make brief notes on their reasons Each group records ranking on chart	20 min
Get A and B groups to combine to form committee of 4 to 6 students		2 min
	Each committee of A + B discusses an agreed ranking based on both sets of evidence	15 min
	Each group records agreed ranking	5 min
Whole class discussion of conclusions Discussion of differences between patient and expert recommendations Reminder of specification topics covered		10 min

It is worth recording the rankings as a bar chart with 5 units for the most popular, etc. This allows a quick visual impression of the differences between the A and B groups and between separate groups and the overall committee. We have written the **Explanation** as a script but of course you will use it as you think best. The commentary below indicates the key points from the specification which might arise during the activity.

Explain the activity to the students

Cancers are a major cause of death in Britain. The commonest of these is lung cancer but breast cancer is as common in women.

	Total deaths 2000	Lifetime risk of death from this cancer
Breast cancer	14 400	11% for women
Lung cancer	35 000	16% smokers 0.5% non smokers

The government has decided to spend more money, £570 million extra in 2004, on reducing these death rates. They have to decide how to spend the money.

You will take the role of members of a committee which is to make recommendations on the best way to spend some of the extra money. You will have 5 suggestions presented to you and will have to rank these in order of priority because there will not be enough money for more than 2 or 3 of the proposals.

Each committee is made up of both experts and patients' representatives. Some of you will take the role of patients or their representatives, some experts. Each of these interest groups will make their decisions separately first (A or B group) and then they will work together to agree a common set of recommendations.

You will be given information on each proposal. Your decisions will be made using several different criteria.

These criteria will include

- The effectiveness in actually reducing deaths, not always as clear-cut as one might think
- A risk-benefit analysis, does the intervention cause nearly as much harm as it prevents?
- Feasibility, will it be possible to do?
- Ethical issues, considering questions such as; is the proposal a fair way of allocating resources? How much should cost be an issue when lives are at stake?

Method

Small group discussion

- Make sure that the task is clear and has a definite product which has to be communicated back
- Make sure they have enough knowledge and resources to complete the task
- Don't let it run for too long. Some groups will stray off task
- Drop in on groups for short periods with support or challenge as appropriate
- Make sure that seating allows everyone in the group to see each other, best round a table not side by side
- Do not allow one group to become too noisy - they will attract interest from other groups, who will then lose their own identity
- Normally groups work best with friends because they trust them but be prepared to break up groups which are not working - some members will be pleased
- Allow time for feedback at the end and value the contributions of all groups.

Resources

Lung cancer

www.ash.org.uk
Independent 22/10/02
www.ncri.org.uk/

Tamoxifen

Lancet 361 Jan 2003
www.jr2.ox.ac.uk/bandolier

Breast Cancer

Screening debate
www.natlbcc.org/bin
www.jr2.ox.ac.uk/bandolier

You will find that the evidence you have shows that the experts do not always agree. Most decisions about new technologies involve uncertainty. Committees have to do the best they can with the evidence available, and sometimes they get it wrong, as we know.

You may be interested to know that the other main focus of government policy is on patients getting rapid and specialist treatment as soon as they are diagnosed. This will not be discussed in this lesson although for some cancers it may be extremely significant in reducing deaths.

Commentary

	Ideas about Science. Specification numbers	A Patients	B Experts
S.1.1 Lung cancer	12.5(i)	Students will be familiar with the difficulties of giving up. The criterion used here is likely to be feasibility.	The information here has been slanted towards cost-effectiveness. Social justice is also relevant
S.1.2	12.2(a) 12.5(f) (g)	Mainly ethical Feasibility also relevant	Mainly ethical Feasibility also relevant
S.2.1	12.5 (d) (f) (h) (i)	Individual right to information and some of problems it brings.	Cost benefit Individual rights
S.2.2	12.1 (c) 12.3 (a) - (d) 12.4(c) (e) 12.5 (f)	The evidence from this one trial is not totally convincing. The lack of information on risk may be picked up. The role of the media in influencing decisions may be noted when the two groups combine.	The evidence from this one trial is not totally convincing. The balance between risk and benefit is unclear as both are serious. The decision may hinge on how “high risk group” is defined.
S.3	12.1 (c) (e) 12.2 (c) 12.3 (d) 12.5 (e) (g)	Both groups have the same information but different quotes at the end. The data presented does not give clear evidence either way. There are a wide range of Ideas involved. Replication of results, randomisation of sample, the interests of the scientists, the role of pressure groups fairness	Both groups have the same information but different quotes at the end. The data presented does not give clear evidence either way. There are a wide range of Ideas involved. Replication of results, randomisation of sample, the interests of the scientists, the role of pressure groups fairness

Lung cancer

Lung cancer is the most common cancer in the world.

In Britain 35 000 people a year die from the disease. This is 22% of cancer deaths.

In order to prevent a disease the risk factors must be known. In the case of lung cancer one risk factor, smoking, over-rides all others.

S.1.1 A Prevention of lung cancer

An article in 'The Lancet;' in 2002 stated that in public health terms, the over-riding priority for prevention of lung cancer is to reduce prevalence of smoking.

The Government estimates that a tobacco advertising ban in the UK will lead to a drop in tobacco consumption of around 3% which will save approximately 3000 lives in the long term.

32% of people in the lowest socio-economic groups smoke compared to only 21% in the most advantaged groups. Among those living in greatest hardship smoking rates are over 70%. Smoking is one of the main reasons for the difference in life expectancy in different social groups.

? Do you, as patients' representatives, think that spending money on helping people to stop smoking is a priority?

S.1.2 A Research into treatment of lung cancer

Survival times are increasing for most cancers. Breast cancer patients now have more than a 75% chance of surviving for more than 5 years. Earlier diagnosis contributes to increased survival but the main reason is better treatment.

There are no new treatments available for lung cancer and lung cancer sufferers still have only a 5% chance of surviving the first year after diagnosis. However research into lung cancer is underfunded compared to other cancers.

Patients' representatives

A1 contd

A recent newspaper article said that the lack of public sympathy for Britain's shrinking but still considerable band of smokers was revealed in figures showing that lung cancer attracts only 3 per cent of all research spending on cancer but accounts for 22 per cent of cancer deaths, or 35 000 people a year.

It went on to say that breast cancer takes almost 18% of research funding and accounts for 8% of

cancer deaths. Leukaemia attracts 17% of research funds and accounts for just 3% of cancer deaths.

Lung cancer's poor showing in the research stakes is at least partly due to the stigma attached to it. Sufferers are widely seen as having brought it on themselves.

The total amount spent on finding a cure for cancer in the UK is estimated at between £450 and £500 million per year.

Over 90% of lung cancer patients are smokers or former smokers.

? Do you, as patients' representatives, think that research into better treatment for lung cancer is a priority?

Patients' representatives

Breast cancer Prevention

To prevent a disease we have to identify the cause of the disease or significant risk factors.

To prevent the disease we also have to be able to do something about these causes or risk factors.

Risk factors	Lifetime Risk	
Overall lifetime	11%	
BRAC genes	85%	between 2% and 5% of cases are caused by genes
Obesity	16%	
Alcohol 1 unit a day	12%	
Smoking	11%	
Age over 70	16%	

Figure 1 Risk Factors for Breast Cancer

? Identify the two most significant factors influencing individual risk of breast cancer.

S.2 .1 A Genetic screening

Women can be tested to see whether they have one of the BRAC genes.

It is normally recommended that women who have family members with breast cancer should be tested. About 10% of those who have a family member with breast cancer will be found to have one of the high-risk genes.

About 720 women with a BRAC gene die of breast cancer each year in the UK.

Patients’ representatives

A2 contd

The advantages of knowing that you have the gene are:

- You can take more care to check regularly for symptoms and to have regular X-ray screening
- You can take medication which reduces your risk - see S.3.3
- You could have an operation to remove your breasts to reduce your risk even further. Some women have done this

The disadvantages might be:

- You will be constantly worried
- You will worry about any daughters you have
- The preventive measures available at present are nowhere near 100% effective.

The total costs of screening and associated counselling for all high risk women would be about £7 million. per year.

- ?
- **Would your patient group recommend genetic screening for all women who have a family history of breast cancer?**

S.2.2 A Tamoxifen

Tamoxifen is used to treat women who have breast cancer. In the late 1990s trials were carried out to see whether it also prevented breast cancer in high risk women. The results of these trials have now been published.

In 1998 in the US the Safety Monitoring Committee found that Tamoxifen was so effective that it recommended that the trial be stopped early and all women be given the choice of taking Tamoxifen. The results of the trial are given in Figure 2. The researchers said

“It is now established that human cancer can be prevented with a pharmacological intervention.”

Some of the US researchers consider that about 20% of women over the age of 40 are at high risk of breast cancer and should take Tamoxifen.

	Tamoxifen	Placebo
Total women	15 500	5 500
Cases of breast cancer	85	154
Deaths from breast cancer	3	5
	55% reduction in breast cancer	

Figure 2 Results of US trial of Tamoxifen to prevent Breast Cancer

A2 contd 2

In January 2003 the result of similar trials in the UK were published. They were reported in the *Evening Standard* newspaper. The report stated that a drug used to treat breast cancer can also prevent women from developing it in the first place. It is thought this breakthrough could save millions of lives.

The drug was described as “cheap”, at only 8p per day.

It is claimed the drug may have saved the lives of 20 000 women in Britain over the last 20 years.

The Independent newspaper quoted Professor Cusick from The Imperial Cancer Research Fund in London. Professor Cusick reported that results from a clinical trial involving over 7 000 women at high risk for breast cancer confirm that tamoxifen reduces the chances such women will develop the disease. It cuts that risk by about one-third.

Some women however are concerned about the implications of giving medication to women who are apparently healthy. There are reports that Tamoxifen has serious side effects in some women.

- **Would you, as patients representatives, recommend that all women at high risk of breast cancer risk be given Tamoxifen?**

Patients' representatives

A3

Breast cancer screening

S.3 A Evaluating the benefits of screening

A breast screening programme typically invites all women in the age range to have an X-ray at intervals between 1 and 3 years. This type of X-ray is called a mammogram. The rationale is that the X-ray will detect very early breast cancer and allow early treatment which improves chances of survival. However the claims of benefit are still controversial.

Using the information presented here you have to decide whether to recommend an extension of the current screening programme to include older and younger women. The current programme costs about £52 million a year. Extending it could put the cost up to £87 million.

Breast screening costs £40 per X-ray.

Evidence

In 2002, 'The Lancet' reported that a screened group had a death rate from breast cancer 21% less than that of the control group. The total number of breast cancer deaths from women in the trial was 1095. This study, carried out in Sweden involved 247 000 women, of whom about half were screened every two years. The results were from a follow up study over 16 years.

Some researchers suggest that this trial may not have been adequately randomised between the screened and control groups. Others dispute this.

In 2002, The Lancet also reported results of a Canadian trial involving 132 163 women. This trial found no difference in deaths from breast cancer between one group who were screened regularly and the control group who were not.

This trial was adequately randomised

An Institute of Cancer Research report published in the BMJ 2000 outlined results from a study of death rates from breast cancer in England and Wales. The results showed that this has fallen by 21.3% between 1990 and 1998. The researchers estimate that screening was responsible for 6.4% of this fall. The rest was due to better treatment.

The analysis compared the death rate to that which would have been expected if screening and better treatment had not been introduced.

Screening is much less reliable in women aged 40 - 50. Rate of death from breast cancer in this group is 3 per 1000 women.

Patients' representatives

Risk of screening

A3 contd

“About the same radiation dose as flying to Australia and back for each screening”

Department of Health

? Does the scientific evidence convince you that extension of screening to both younger and older women should be given a high priority? Perhaps you have to include other issues in your decision-making.

Ethics

Value of a life or cost-effectiveness?

Even if the benefit of screening is very small a person’s life can never have a price put on it. However if resources are limited they should be allocated as fairly as possible. The millions of pounds spent on screening could save more lives if used in other ways and it therefore may be more ethical to do so.

Who should influence decision making?

Patient power

Many women’s groups who are concerned about the death rate from breast cancer campaign actively for screening. They are supported by many doctors. A restriction in the availability of screening to only high risk groups or older women, where the benefits are clearer, would make the government very unpopular and lead to negative press coverage.

In the US, the National Institutes of Health recommended that women under 50 should not be screened. The decision was widely criticised in the media and by some women’s groups and finally reversed by another body, the National Cancer Institute.

Two recent comments on the issue

“ Routine mammograms urged at 40”

US web site

“The effect of the screening programme, combined with improvements in treatment, could result in up to a halving of the breast cancer death rate in women aged 55 - 69”

Department of Health

? Do you think we should give extension of the screening programme to all women aged 40 - 70 a priority? Consider ethical and political issues as well as scientific evidence.

Ranking 1

You have been given information on options for reducing deaths from the two commonest cancers in Britain.

Rank them according to the priority you would give them on the basis of the information available. Show your ranking by shading in the squares below. 5 squares for the most popular, 1 for the least. Make brief notes on your reasons because you will then need to justify your ranking to the other group of patients representatives or experts who may have other priorities.

Group Patient/Expert

	ranking	reason
action to reduce smoking	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
research on lung cancer	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
genetic screening for BRAC genes in all at risk women	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Tamoxifen for all at risk women	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
increase X-ray breast screening to include women 40 - 70	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

Ranking 2

Expert plus patient group combined decision

	ranking	reason
action to reduce smoking		
research on lung cancer		
genetic screening for BRAC genes in all at risk women		
Tamoxifen for all at risk women		
increase X-ray breast screening to include women 40 - 70		

B1

Lung cancer

Lung cancer is the most common cancer in the world.

In Britain 35 000 people a year die from the disease. This is 22% of cancer deaths.

In order to prevent a disease the risk factors must be known. In the case of lung cancer one risk factor, smoking, over-rides all others.

S.1.1 B Prevention of lung cancer

Over 80% of all lung cancer deaths are caused by smoking. In 1999, 34 240 people in the UK died of lung cancer. Mortality from lung cancer in men fell from around 880 deaths per million population in 1990 to 628 in 1999, continuing the downward trend since the 1970s, which reflects the fall in tobacco consumption in the male population.

Research by the Centre for Health Economics at the University of York has shown that the cost to the NHS of treating diseases caused by smoking is approximately £1.5 billion a year.

The Treasury earned £9 510 million in revenue from tobacco tax for the financial year 2000-2001.

Smoking and social class

Despite a reduction in the overall prevalence of smoking in the UK over the past 30 years, there has been little change in smoking rates among those living on low incomes and those who are least advantaged.

Smoking prevalence remains far higher among people from manual as opposed to non-manual socio-economic groups – 32% compared to 21% in 1998.

Among those living in greatest hardship smoking rates are over 70%. Smoking, more than any other identifiable factor, contributes to the gap in healthy life expectancy between those most in need and those most advantaged.

Reducing smoking would also reduce the incidence of heart disease, the single biggest cause of death in the UK.

Information from ASH (Action on Smoking and Health)

- **Do you, as experts, think that spending money on helping people to stop smoking is a priority?**

Experts

S.1.2 B Research into treatment of lung cancer

The total amount spent on finding a cure for cancer in the UK is estimated at between £450 and £500 million per year.

Figure 1 below shows the proportion of research funds spent on different cancers with the death rates for each cancer for comparison.

Percentage of research spending on different cancers as a percentage of the total compared with Mortality (2000)

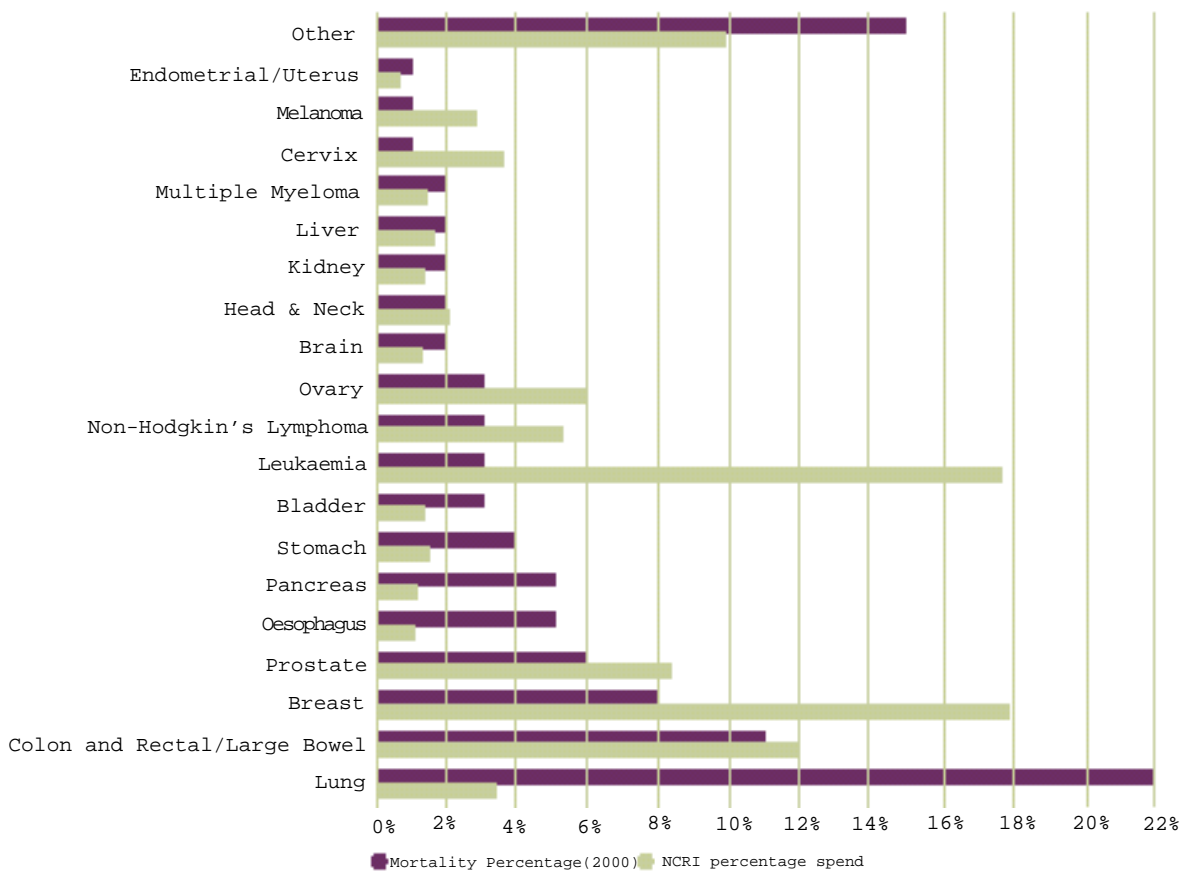


Figure 1 from National Cancer Research Institute (NCRI) report

Lung cancer is a difficult condition to research. There are very few promising leads.

? Do you, as experts, think that research into better treatment for lung cancer is a priority?

Experts

B2**Breast cancer Prevention**

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Risk factors	Lifetime Risk	
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Obesity	16%	
Alcohol 1 unit a day	12%	
Smoking	11%	
Age over 70	16%	

Figure 4 Risk Factors for Breast Cancer

? Identify the two major risk factors for breast cancer.

S.2.1 B Genetic Screening

Cost of screening one woman for BRAC gene is £100. Counselling should be available to all women who have the test. This would increase the cost to about £200.

It is normally recommended that women who have family members with breast cancer should be screened. About 10% of those who have a family member with breast cancer will be found to have one of the high-risk genes.

About 720 women with a BRAC gene die of breast cancer each year in the UK.

It has been estimated that there are about 500 000 women in the UK who would be eligible for the test.

Experts

B2 contd

The knowledge that a woman has the gene does not make it much easier to reduce the risk. The most important options are:

- frequent screening, which has its own risks (see page 15)
- taking Tamoxifen which is controversial (see Figure 5 page 13)
- surgical removal of both breasts, a drastic option that a few women have chosen

? Would your expert group recommend genetic screening for all women who have a family history of breast cancer?

S.2.2 B Tamoxifen - a preventive drug?

It has been suggested that Tamoxifen, a drug used to treat those with breast cancer, can also be used to prevent it. There have been several trials in the UK and elsewhere. Healthy women who are apparently at high risk of breast cancer are divided into two groups. One group received Tamoxifen for several years, the other received a placebo.

7 152 women age 35 to 70 with a family history of the disease followed over 5 years		
	Tamoxifen	Placebo
total women	3578	3566
cases of breast cancer	69	101
deaths from breast cancer	2	2
risk reduction	32%	
serious blood clots	43	17
death from all causes	25	11

Figure 5 Results of UK trial of Tamoxifen, The Lancet

In 2002, The Lancet reported that the overall evidence supports a reduction in the risk of breast cancer, but it is unclear whether this benefit outweighs the risks and side-effects associated with tamoxifen.

Other similar trials have reported an even higher risk reduction, whilst some have shown little or no benefit.

? Would you, as experts, recommend that all women at high risk of breast cancer risk be given Tamoxifen?

B3

Breast cancer screening

S.3 B Evaluating the benefits of screening

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Breast screening costs £40 per X-ray.

Evidence

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Screening is much less reliable in women aged 40 -50. Rate of death from breast cancer in this group is 3 per 1000.

Experts

B3 contd**Reliability of data*****False positives and false negatives***

A report by Gotzsche, Cochrane Centre, Denmark, published in Lancet 2000 described a false negative as a result from screening which tells a woman that she does not have breast cancer even though she does. False negatives in screening will reduce the number of lives saved. It is estimated that in younger women aged 40 -50 between a quarter and a third of cancers are not picked up. Screening is less effective in this age group.

A false positive result was described as one which tells a woman she does have cancer even though further tests show that she does not. False positives will create anxiety and possibly unnecessary surgery and medication. Some researchers suggest that false positives occur in 4 -6% of X-rays for breast cancer so that women would have around 50% chance of having a false positive requiring further investigation during their lifetime.

Risk of screening

X-rays involve high-energy radiation and themselves increase the risk of cancer. The increased risk depends on the equipment used but may be as high as 1% increased risk of breast cancer for each X-ray. Most women will have between 5 and 15 during their lives.

Cancer Prevention Coalition web site

A comment on the issue

“The effect of screening programmes, if any, is small and the balance between beneficial and harmful effects is very delicate. We conclude that screening for breast cancer with mammography is unjustified.”

Lancet Jan 2000



Do you think we should give screening a priority?

Experts

Evaluating Evidence

To make decisions you need to consider the reliability of the evidence you have. The main ideas you need are given below. There is more detail in the text book on page 226.

Data

Likely to be reliable	Problematic
Is the difference between the intervention and the control group large enough to be significant?	A very small difference
Sample size is large enough	Small sample
Unbiased sample patients involved put into the intervention and control group in a truly random way	Biased sample. Some significant difference between the two groups

Conclusions

Likely to be reliable	Problematic
The data justifies the conclusions	The conclusions are based on a correlation
There is an accepted mechanism to explain the conclusion	Data might be explained in another way

The scientists who published the work

Likely to be reliable	Problematic
Recognised experts Work in a respected institution	Have a direct interest in the issues

The publication

Likely to be reliable	Problematic
Is a reputable journal where articles are peer reviewed	A source which may have a strong commitment to one point of view

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