# Bad science: learning from science in the media

When you read the newspaper, how do you know what to believe? **Ed Walsh** guides you and your students through the minefield of science in the media.

Science is all around us – but so is pseudoscience. Few of us read the original research papers behind every 'science' story, so how do we know what to believe? And why aren't all media stories about science reliable? This classroom activity aims to teach students:

- The difference between observational and intervention studies
- Why we need to carefully scrutinise media reports about the health outcomes associated with different aspects of diet
- That the decision to change lifestyle is often dependent upon a range of factors.

REVIEW

- Biology
- Digestion
- General science
- Ages 11-16

This article enables students to learn to think scientifically about what they read or hear in the media. Beginning with a role-play, the activity triggers their thinking and group discussion. The activity relates to digestion and health, and would therefore be suitable for biology lessons, but the structure of the activity could be used in any science lesson to encourage critical thinking.

For students aged 14-16, the activity could be used as described. For younger students (aged 11-13), this article could encourage the teacher to use the media cautiously to raise awareness of science topics or as the basis of class discussions on topics related to the curriculum.

At the end of the activity, a class discussion could move beyond the science curriculum, examining the implications of dieting, sun exposure and cosmetic surgery.

*Stephanie Maggi-Pulis, Malta*

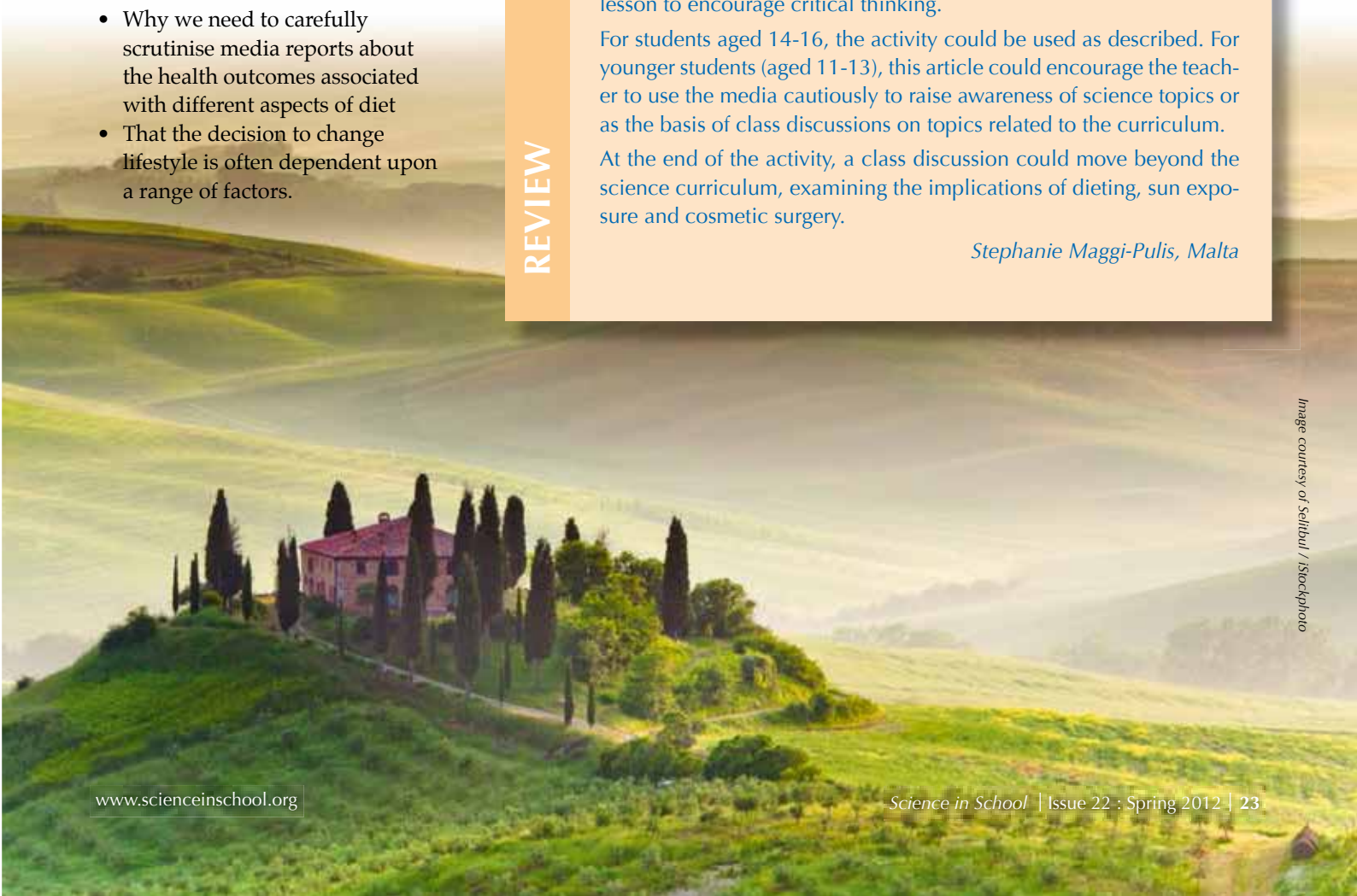
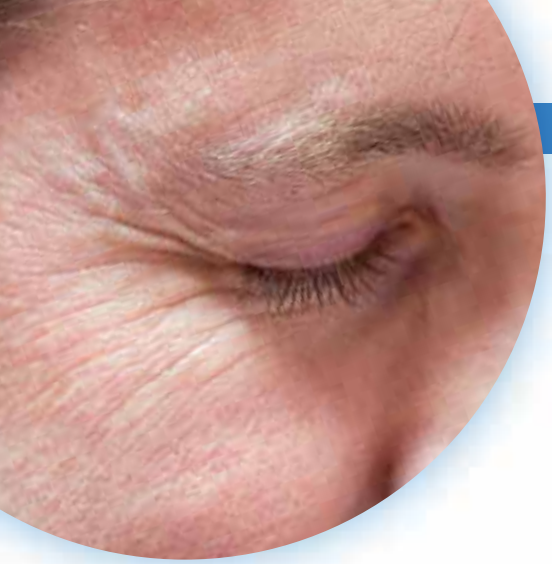


Image courtesy of Selitbul / iStockphoto





## Introduction

1. Ask students to imagine that they have decided to emigrate. They are going to live and work in one of the following regions: Sweden / rural Greece / Melbourne, Australia. Show students images of these regions[w1].
2. In small groups, they should discuss all the things that might be different about living in these situations, such as pollution, diet, healthcare, pace of life, prosperity, types of employment, and climate.
3. Explain that after a number of years, the wrinkling of their skin will be measured, quite scientifically. Which of the factors they have identified might make a difference to the amount of wrinkling? Establish that there could be a number of causes.

It is often hard to find out which of many possible causes has produced a particular outcome, such as skin wrinkling, especially if some of the possible causes are interlinked. In a scientific study we try to change only one thing at a time. This may sometimes be difficult, and we need to think of a way to account for that shortcoming, or consider conducting a different kind of study.

## Main activity

1. Ask the students to imagine that they are working as scientists and have been asked to conduct research into the use of olive oil in people's diets as a way of reducing skin wrinkling. The hypothesis is that 'more olive oil consumed leads to fewer wrinkles'.
2. Ask students to decide how they could set up such an investigation. Get them to think about such factors as:
   - The size of the groups
   - How to make it a fair test
   - How to control the variables.
3. What problems are there with conducting such research?

Explain that there are two main types of study that scientists could use to answer this question, an *observational study* and an *intervention study*. Observational studies are when scientists find people who have already brought the change they are studying into their lives (e.g. who has been using olive oil in their diet and who hasn't?).

4. Ask the students to consider the advantages and disadvantages of this kind of study.
   Draw out that observational studies use existing behaviours, so are cheap and easy to do, but may struggle to isolate single variables. People in the study group may well use different amounts of olive oil in their diets, but there are almost certainly going to be lots of other differences as well. As a result, it may be extremely difficult to clearly identify the extent to which the presence of olive oil is the significant factor in preventing the wrinkling of skin.

Explain that intervention studies ('trials') are when the scientists control the variables (e.g. you are going to have olive oil in your diet, but he is not).

5. Again, ask the students what they think the advantages and disadvantages of this type of study are. Ideas should include that intervention studies involve a much better control of variables and the groups can be balanced to eliminate other variables. However, they are more expensive to run and may be unethical: imagine researching smoking in this way. They may also take longer: if you want to examine the effect of a lifetime of eating olive oil on life expectancy, you would have to start your experiment with children, but wait perhaps up to 70 years until you had your answer.
6. Return to the investigations proposed by the students, and ask them to determine which type of study they used.

Explain that in 2001 a detailed scientific study was conducted into the wrinkling of skin on people who lived in Sweden, Greece and Australia, and that you are going to share the findings. Depending on the age and ability of the students, you could do this in one (or more) of three ways:

- Explain verbally, making key points on the board
- Give students copies of the edited findings (student worksheet 1, page 26, which can also be downloaded from the *Science in School* website[w2])
- Give students copies of the original research paper (br Purba et. al., 2001).

7. Ask the students to work in groups and explore what the research showed.



Gothenburg, Sweden

*Image courtesy of jaime.silva; image source: Flickr*

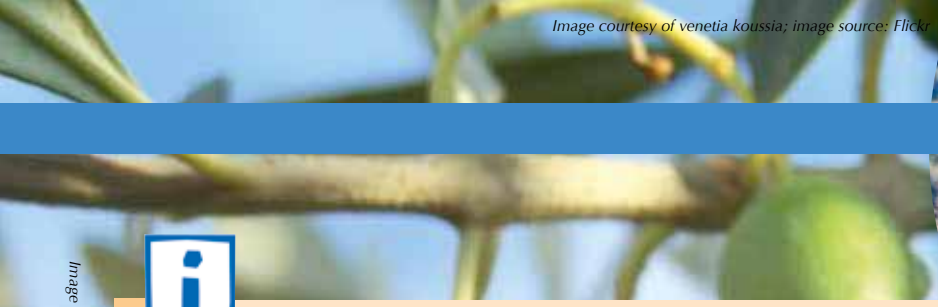


Image courtesy of venetia koussia; image source: Flickr

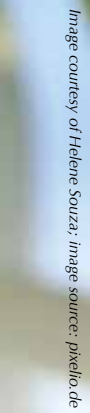


Image courtesy of Helene Souza; image source: pixelio.de

BACKGROUND

# Bad Science is good for school science

*Bad Science* is a book (Goldacre, 2008), a newspaper column in *The Guardian* and a website[w3] by Ben Goldacre, an award-winning writer and broadcaster who specialises in unpicking questionable scientific claims made by scaremongering journalists, dodgy governments reports, evil pharmaceutical corporations, public relations companies and quacks. It promotes a healthy scepticism as a way of detecting powerful and effective uses of science and its misuses and abuses.

Ed Walsh, science advisor for Cornwall Learning, has taken eight of the case studies from the book and turned them into lessons to excite students (aged 14-16) and to encourage them to think for themselves and to use the *Bad Science* approach. To download the rest of the teaching materials, visit the Bad Science for Schools website[w4]


Rural Greece

- Was this an observational or an intervention study?
- The study found an association between features of people's diets and the amount of wrinkling they had. That might be because different diets cause wrinkles to different extents. But what alternative explanations are there? Are there factors which might be independently associated with both diet and wrinkles, such as social class, working outdoors, sunlight exposure, smoking, and so on? (In this situation, scientists would call these alternative explanations 'confounding variables'.)
- Did this study prove that changing your diet will help you get fewer wrinkles?

8. Ask the students to work in small groups. Each group has to write a short piece of text (no more than 50 words) for a local newspaper using this report as the basis.

   The editor has made it clear that they want something engaging about how readers can enjoy the summer sun without being affected by it. Keeping the editor happy might be difficult because the research has shortcomings and does not give a clear answer. The pieces should be written in large writing on sugar paper and displayed around the room.
9. Ask students to assess each other's work and give each piece two marks (out of five): one mark for 'how engaging it is' and the other for 'how accurate it is'.
10. Show the students the extract from the *Daily Mirror* ('Sun protection on a plate', student worksheet 2, page 27, which can also be downloaded from the *Science in School* website[w2]), part of a longer article with a series of tips about improving diet. Ask the students to discuss the extent to which the article's conclusion is reasonable. Emphasise that we are not saying that olive oil is not good for you, but asking whether this conclusion is entirely justified.

Some students may think that the news stories make the good advice in a rather dry research paper accessible to a wide range of people. Others may feel that it is not quite as simple as that, and that if you want smoother skin in old age you might have to do a bit more than consume more olive oil. Some may feel that simplifying the story to make it accessible, and leaving out the caveats, has also made it misleading.

11. Draw attention to the abstract from the research paper, which said that "This study illustrates that skin wrinkling in a sun-exposed site in older people of various ethnic backgrounds may be influenced by the types of foods consumed." Remind students of the confounding variables they identified earlier in the lesson and ask them the extent to which either their report or the one from the *Daily Mirror* recognised these.
12. Ask students to work in pairs to list the pros and cons of observational and intervention studies.

Take a show of hands – if students saw the newspaper headline tomorrow, 'Scientific study shows butter causes s kin cancer', would they stop eating butter immediately?

Melbourne, Australia


Image courtesy of Oliver Brunner; image source: pixelio.de

# **Student worksheet 1:** Summary of conclusions from the research paper

This study (br Purba et al., 2001) was set up to see if there was a correlation between the intake of various foods and nutrients and the wrinkling of skin in places with significant amounts of sunlight.

The study included four groups:

**Group 1:** 177 people born in Greece but now living in Melbourne, Australia

**Group 2**: 69 people born in Greece and living in rural Greece

**Group 3**: 48 Anglo-Celtic Australians living in Melbourne

**Group 4**: 159 people born in and still living in Sweden.

They were participating in the International Union of Nutritional Sciences 'Food habits in later life' study and had their dietary intakes measured and their skin assessed.

The results showed that Group 4 had the least skin wrinkling in a sun-exposed site, followed by groups 1, 2 and 3. Analysis of the data and identifying correlation with food groups suggested that there may be less skin damage amongst people with a higher intake of vegetables, olive oil, fish and legumes, and lower intakes of butter and margarine, milk products and sugar products.

High intakes of vegetables, legumes and olive oil seemed to offer protection against wrinkling whereas a high intake of meat, dairy and butter appeared to have the opposite effect.

This study illustrates that skin wrinkling in a sun-exposed site in older people of various ethnic backgrounds may be influenced by the types of foods consumed.

Gothenburg, Sweden

*Image courtesy of Alex Garcia; image source: Flickr*

Image courtesy of James Peacock; image source: Flickr



# Student worksheet 2: *Daily Mirror* article

## Sun protection on a plate!

*By Angela Dowden 13/06/2006*

*With temperatures soaring to record levels, it's vital to protect yourself from the Sun's rays. Here are the foods that can help...*

*By making a few simple changes to your diet, you can help protect your skin from sunburn, ageing and even cancer. Of course, you also need to keep wearing your sun lotion and a hat and stay in shade during the heat of the day, but here's how to get some of your SPFs [sun-protection factors] on a plate...*

### *Olive oil*

*An Australian study in 2001 found that olive oil (in combination with fruit, vegetables and pulses [legumes]) offered measurable protection against skin wrinkling. Eat more olive oil by using it in salad dressings or dip bread in it rather than using butter.*

Image courtesy of wrw; image source: pixelio.de

Image courtesy of andrea.pacelli; image source: Flickr

## References


br Purba, M et al. (2001) Skin wrinkling: can food make a difference? *Journal of the American College of Nutrition* **20(1)**: 71–80

The article is freely available here: www.jacn.org/cgi/reprint/20/1/71.pdf

Goldacre B (2008) *Bad Science*. London, UK: Harper Collins. ISBN: 9780007240197


## Web reference

w1 – A worksheet with the images of rural Greece, Melbourne and Sweden used in this article can be downloaded from the *Science in School* website: www.scienceinschool.org/2012/issue22/badscience#resources

To find more freely available photographs to use, try Flickr (www.flickr.com) and the German website Pixelio (www.pixelio.de).

For a more extensive review of free image databases for science lessons, see:

*Science in School* (2006) Free image databases. *Science in School* **1**: 87. www.scienceinschool.org/2006/issue1/web

w2 – To download student worksheets 2 and 3, visit the *Science in School* website: www.scienceinschool.org/2012/issue22/badscience#resources

w3 – To read Ben Goldacre's newspaper column, visit the Bad Science website: www.badscience.net

w4 – To download the eight 'Bad science for schools' lesson plans, visit: www.collinsnewgcsescience.co.uk/badscience

## Resources

For a review of Ben Goldacre's book *Bad Science*, see:

Hayes E (2011) Review of *Bad Science*. *Science in School* **18**. www.scienceinschool.org/2011/issue18/badscience

If you enjoyed this article, you might find the other teaching activities in *Science in School* useful. See www.scienceinschool.org/teaching

You might also like to browse the medicine-related articles in *Science in School*. See: www.scienceinschool.org/medicine

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Ed Walsh is a curriculum developer with experience of working with teachers, schools, local authorities and national agencies. As Science Advisor for Cornwall Learning he provides support and guidance to schools in Cornwall, UK, about curriculum development in general and science in particular, including writing and editing material for classroom use and teacher support.