

ARCTIC SEA ICE DATA – PRESENTING THE EVIDENCE

The Arctic Survey's measurements will allow us to better characterise the current state of the Arctic sea ice cover and predict its declining trend.

The Arctic sea ice extent is the area of the Arctic that is covered by at least 15% of sea ice, including areas of the Arctic ocean completely covered by ice, and those that are only partially covered.



Sea ice extent in September 2007. The pink line indicates the average extent over the years 1979 to 2000.

Question 1: While you are having breakfast one morning you notice that both your newspapers are running leading articles on the decrease in Arctic sea ice extent. *The Daily Panic* headline screams: “Arctic sea ice extent decreases by over 20%”.
The Laid-back Weekly says:

“Arctic sea ice extent decreases by only 5% a year”.

Which of the two headlines do you think indicates a faster decrease of sea ice extent? Do they give you enough information to assess the rate at which the ice cap is disappearing?

* **Answer:** We cannot say which headline indicates a faster decrease, as they do not give enough information. *The Daily Panic* headline does not indicate the time period in which the sea ice extent decreased by over 20%. *The Laid-back Weekly* figure seems to be an average over several years, but does not indicate which years these are.

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Intrigued, you look up figures on the Arctic sea ice extent on the Internet. You find the following data for the years 2004 to 2008:

Year	Sea ice extent in million km ²
2004	6.05
2005	5.57
2006	5.92
2007	4.30
2008	4.67

Question 2: Work out the percentage decrease from 2004 to 2008.

 **Answer:** *The percentage decrease is 22.8% (all figures are rounded to one decimal place).*

Question 3: Work out the year-on-year percentage changes from 2004 to 2008, and work out the average percentage change over this period.

 **Answer:**
*From 2004 to 2005 there was a 7.9% decrease.
 From 2005 to 2006 there was a 6.3% increase.
 From 2006 to 2007 there was a 27.4% decrease.
 From 2007 to 2008 there was a 8.6% increase.
 This gives an average yearly decrease of 5.1%.*

Question 4: Were the two newspaper headlines wrong?

 **Answer:** *Both papers were correct, but the information given was incomplete.*

Question 5: Can you come up with a headline that describes the decrease of sea ice extent from 2004 to 2008 more accurately?

 **Answer:** *There are several possibilities, including “Arctic sea ice extent has decreased by over 20% between 2004 and 2008”, “Arctic sea ice extent has decreased by over a fifth between 2004 and 2008”, or “Arctic sea ice extent has decreased by an average annual rate of 5% in the period from 2004 to 2008”.*

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Question 6: What is the most dramatic change in the years from 2004 to 2008? How does this compare to the average annual decrease?



Answer: *The sea ice extent has decreased by 27.4% from 2006 to 2007. This is more than 5 times the average annual decrease of 5.1%.*

Question 7: Now suppose that you are a newspaper editor. Based on the data from 2004 to 2008, what headline would you run if you wanted to make the decrease of sea ice extent appear as dramatic as possible? What headline would you run if you wanted to play down the decrease?



Answer: *There are several possibilities. A headline to draw attention to the decrease might quote the sharp drop in 2007: “Sea ice extent has shrunk by 27% in a single year”, or “In 2007 sea ice extent disappeared at over 5 times the average annual rate”. It might also quote the overall drop of over 20% since 2004, or express this in fractions as “over a fifth”. To play down the decrease, you might quote the increase from 2007 to 2008: “Sea ice extent increases by 8% in the last year”, or quote the average annual rate of decrease of 5.1%, as this is less dramatic than the total rate. Lead students into a discussion on how all these headlines are correct, but frame the evidence in a positive or negative light.*

Question 8: Based on your data, write a paragraph which gives an accurate representation of the decrease in sea ice extent since 2004.



Answer: *The paragraph should include the percentage or fractional changes from 2004 to 2008 and point out the sharp drop in 2007, comparing this to the average annual rate. It should also note that there has been a small increase from 2007 to 2008.*

Presenting statistical evidence in a way that puts a negative or positive spin on it is called *framing the evidence*. This doesn't mean that the numbers presented are actually wrong, but it does mean that the picture created can be misleading. Evidence framing is not just something that is practiced by tabloid newspapers – politicians are sometimes guilty of it, and it can be found in serious newspapers and sometimes even scientific publications and press releases. So whenever you read about a statistical result, make sure that the article gives you all the information you need to understand it, and look at the figures carefully.

The data used in this worksheet was collated by the Snow and Ice Data Centre <http://nsidc.org/index.html>