



CFC Induced Ozone Depletion: Hole in the Sky or Hole in the Science?

CASE STUDY

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*This case study highlights two tactics of science misinformation and disinformation efforts: deviant criteria of assent for accepting scientific ideas and cherry picking science evidence and ideas. See **Characteristics of Science Misinformation/Disinformation Efforts** for more information regarding these tactics and **Ozone Depletion: Fabricating a hole in the scientific evidence** for the companion story to this case study.*



Numbered red flags refer to descriptions of misinformation and disinformation provided at the end of the case study.

The year is 1985. Images of a “hole” in the ozone over the south pole (right) have surfaced and caused public outcry for the regulation of Chlorofluorocarbons (CFCs) into the atmosphere. Sonny Burns, the CEO of a successful refrigerant manufacturing company, AirCo, is holding a business meeting to discuss the future direction of the company with his business partners, Isabella and Aaron.

Sonny: We need to address this ozone hole situation. The public is concerned about Perma-Cold (our best-selling refrigerant), and they are asking us to stop production. Isabella and Aaron, I need your help with deciding the future of AirCo.

Isabella: People are upset because Perma-Cold is contributing to CFC emissions, which is what causes the ozone to deplete.

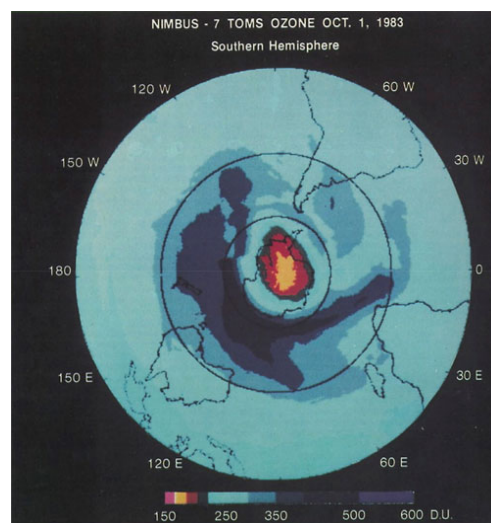
Aaron: But what is ozone depletion?

Isabella: Good question. The Earth's atmosphere contains different gases, including O_3 . We call O_3 “ozone”, just like how we use “water” to talk about H_2O . There is a layer of ozone that changes in size naturally with the seasons, however, certain chemicals react with O_3 and deplete the amount of pure ozone.

Sonny: So how can our Perma-Cold refrigerant be one of those certain chemicals causing this? It's put into cars and refrigerators, not the air.

Isabella: CFC compounds are used in refrigerants like Perma-Cold because of their low boiling temperature and non-toxicity, making them safer and more efficient than previous refrigerants that could only be used in industrial settings. Refrigerants release CFCs into the air when they are disposed of and/or handled improperly.

Sonny: I heard that the scientists don't have *real* evidence that links ozone depletion to CFCs. Why should we stop production of Perma-Cold without proof?



Isabella: What do you mean by no *real* evidence?

Sonny: The scientists used mathematical modeling. Real evidence requires direct observation and randomized control-treatment experiments.



Aaron: Scientists' work can be accurate and powerful for informing decisions, even without direct observational evidence or control-treatment experiments. Many studies instead rely on other methods, such as historical natural records and modeling, appropriately selected for the research context. We must be cautious not to make unreasonable demands on the scientific community before accepting credible science.

Why might it be problematic to dismiss scientists' warnings about ozone depletion until there is evidence based on direct observations?

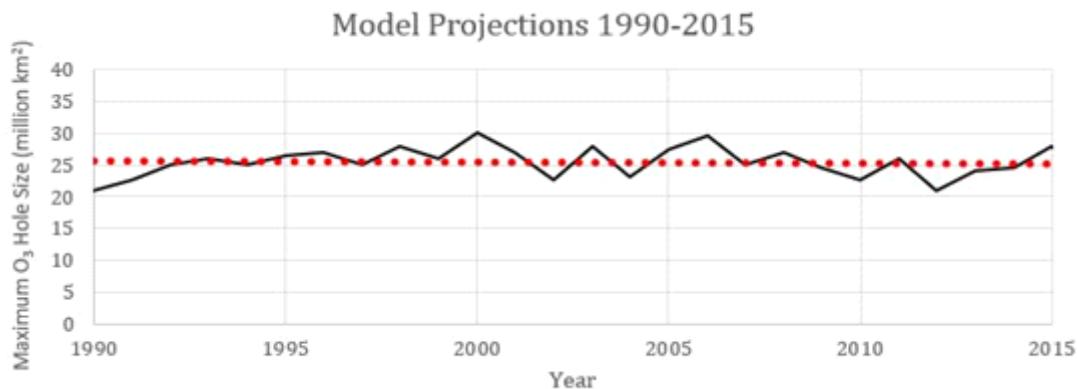
Isabella: Sherwood Rowland and Mario Molina used previously collected data and their understanding of chemical reactions to estimate how current levels of CFC pollution would impact the ozone (Molina & Rowland, 1974). They did not need observational evidence of ozone depletion to confidently inform policymakers and the public about the issue.

Sonny: Okay, so trusting the methods and the science that ozone depletion is being caused by CFC emissions is reasonable, but why do we care?

Isabella: Well, the ozone absorbs some radiation from the sun. This absorption offers some protection from harmful UV rays – UV rays that can cause a host of serious skin conditions including skin cancer.

Aaron: Keep in mind that skin cancer and other health impacts of CFCs often manifest later in life, meaning decades can pass before empirical evidence is gathered. Also, human health is not the only area that could be harmed by CFC pollution.

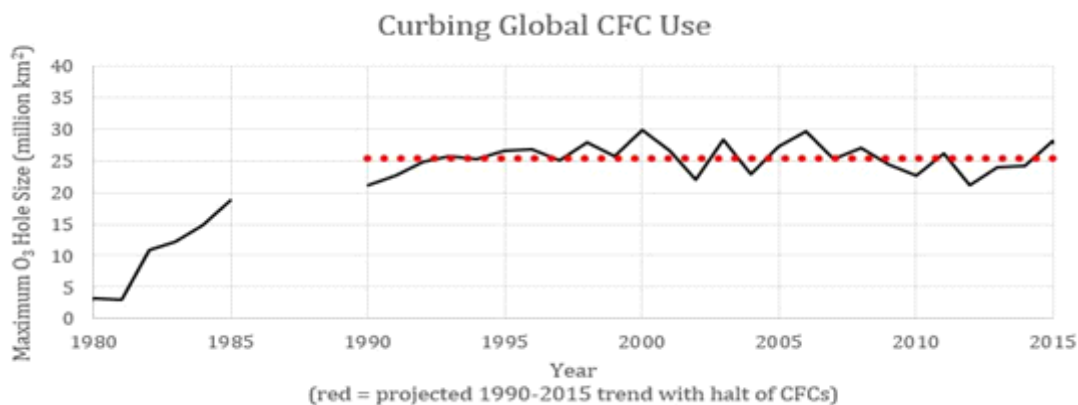
Sonny: This is tough. Perma-Cold is our best-selling product and huge part of our financial success. Let me check the models one more time...



Sonny: I don't see the claimed growing problem that might be caused by the release of our refrigerant. The trend looks pretty flat to me for the next 25 years.



Aaron: Oh, that's the model for if the use of CFCs is halted. We also have figures from when scientists and engineers first started measuring the hole.



Isabella: In this case, looking further back offers more clarity on the potential impact of our actions. We truly have a chance to halt the rapid growth and reach stability in ten years. Left unchecked, the growing hole could be triple the size.

How can citing selectively trimmed data and isolated studies misrepresent the science regarding an issue and negatively impact decision-making? How can someone guard against this misinformation/disinformation approach and improve their confidence in their judgement of science-sounding claims?

Sonny: What options do we have?

Isabella: There are lots of factors to consider as a business leader. Economically, we have to consider what any stop to production would do to the company's bottom line and our ability to offer strong jobs. Environmentally and from a human-health standpoint, the long-term effects are undeniable.

Aaron: It sounds like we can do anything - from completely halting production to continuing production and sales as-is. If we waited, there might be time for research into a safer alternative, but there's no way of knowing when that might be. If we stop production, we will be forced to find an alternative sooner. Also, we could implement programs to buy-back and replace aging refrigerators before CFCs are unintentionally released, but that will cost money and won't have guaranteed success.

Using the information from the case study and other credible sources (e.g., your course content) answer the following questions.

How might the features of misinformation and disinformation associated with CFCs and ozone depletion impact peoples' thinking and decision-making?

How might personal and group-reinforced emotions and biases influence thinking and decision-making regarding this issue?

Regulating your own emotions and personal biases and citing multiple lines of credible evidence (scientific, economic) as well as ethical and social considerations, propose a resolution regarding the use of CFCs in AirCo.'s best-selling refrigerator.

RED FLAG GLOSSARY



Deviant criteria of assent

The standards for acceptance of scientific knowledge are multifaceted and nuanced, but reasonable and evenhanded. In contrast, those spreading science misinformation/disinformation establish criteria that are customized in a way that the accepted science is almost impossible to satisfy. At the same time, purveyors of science misinformation/disinformation do not hold the information they spread to such standards.



Cherry picking

Selectively focusing on particular studies and evidence that are at odds with the entire body of relevant studies and evidence is a common feature of misinformation/disinformation efforts. This feature is referred to as cherry picking because of its highly selective choice of studies and evidence while ignoring the overwhelming number of studies and body of evidence that supports the consensus position of the scientific community.

References

Molina, M. J., & Rowland, F. S. (1974). Stratospheric sink for chlorofluoromethanes: chlorine atom-catalysed destruction of ozone. *Nature*, 249(5460), 810-812.