

Deciphering Health Science News in the Mainstream Media

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Improving Kids' Environment



Improving Kids' Environment

Chemical Exposure Linked to Billions in Health Care Costs

(National Geographic 3/5/15)



Processed meats may affect male fertility, study shows (CBS News 8/5/15)



Report: Pesticide exposure linked to childhood cancer and lower IQ (CNN 9/14/15)



Roundup's cancer links cited in new study

(Pittsburg Post Gazette 9/22/15)



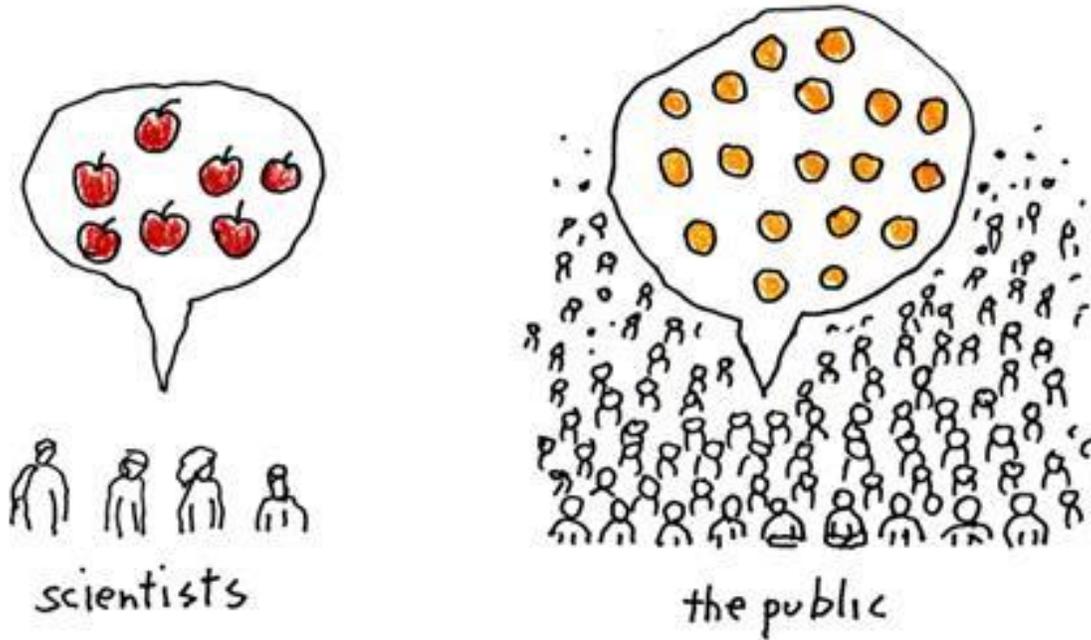
Science in the News

- ▶ Volume - there's a lot
- ▶ Intensity - sensationalism
- ▶ Contradictory - eggs bad for you, eggs are good for you!
- ▶ Challenge a belief - in an increasingly complex world people cling tight to the things they believe to be true.
- ▶ Internet - search for validation
- ▶ Basis for understanding - science literacy

Science Literacy in the US

(from “8 Myths About Public Understanding of Science”
American Scientist 2/9/15)

Science communication



Science literacy in the United States is declining. (True or False?)

False

- ▶ Science literacy among adults in the United States is increasing.
- ▶ Nevertheless, science literacy is still much lower than is appropriate for an informed citizenry (it's just always been low). In fact, the recent Pew Research poll shows that most Americans feel that current K-12 STEM education leaves much to be desired.
- ▶ Indeed, according to Jon D. Miller in the 2011 book *The Culture of Science: How the Public Relates to Science Across the Globe*, the increase in science literacy among adults is largely due to college-level education and informal learning resources, but science literacy among secondary school graduates has not increased.

People need more information to understand science of concern to the public. (True or False?)

False

- ▶ In truth, it's not more information that people need—it's better communication of that information.
- ▶ In the Information Age, people are flooded with—you guessed it—information. Giving people more information to consume is not going to cut through the noise, unless you can get people to pay attention and then listen.
- ▶ There are many ways to change communication: Language, length, presentation, framing, venue, medium, and sources used are all important. For starters, communication can be improved by understanding the language and sources of information valued by an audience, as well as their misperceptions and fears about a particular issue.

Disagreements are about the facts, which people just do not understand (True or False?)

False

- ▶ At their core, these policy relevant disagreements are not really about facts; they are about people's values.
- ▶ People disbelieve scientifically supported information when they feel they must do so to protect a deeply held value.
- ▶ In fact, people become frustrated with experts when they seem insensitive to these values.

Arguments supported by facts and evidence will change people's beliefs.

(True or False?)

False

- ▶ Factual and evidence-based arguments do not change most people's beliefs.
- ▶ Scientists are also much more comfortable questioning each other's evidence behind their arguments, but most people do not find this convincing and some may actually see this as an indication that the scientist is part of the problem.

Typical article

Indoor Pesticides Linked to Childhood Leukemia, Lymphoma

Sept. 14, 2015

Stephen Feller, UPI.com (over 100 years of journalistic excellence)

Children who are exposed to insecticides are nearly 50% more likely to develop leukemia or lymphoma, according to a new study that linked exposure to the disease.

Both diseases are rare in children, however the incidence of childhood cancer has increased in the last several decades, even as more children survive them because of better treatment, according to the [National Cancer Institute](#).

In the US, about 5 out of every 100,000 children are diagnosed with leukemia and overall 32.1 of every 100,000 children are diagnosed the some type of cancer.

“Although pesticides are necessary for the elimination of insects and other pests, the toxic chemicals used in agriculture and for public health can be harmful or even deadly in children,” researchers said in a [press release](#). “Exposure to residential indoor insecticides but not outdoor insecticides during childhood was significantly associated with an increased risk of childhood cancers, including leukemia and lymphoma, but not childhood brain tumors.”

The researchers reviewed data from 16 previous studies on the possible association of childhood cancer and pesticides finding that childhood exposure to the chemicals increased chances for leukemia by 47% and the chance of developing lymphoma by 43%.

Researchers caution that while the link was seen in data, pesticides may be helping to influence the development of other cancers and not necessarily only leukemia and lymphoma.

We are starting to get to the place where there is enough science, it just starts to add up to say that we can’t really ignore anymore,” Dr. Catherine J. Karr, a professor of pediatrics and director of the Pediatric Environmental Health Specialty Unit at the University of Washington, [told CNN](#). “This study is a nice contribution because it focuses in on the effect of home use of pesticides versus (other) exposures.

The study is published in the [Journal of the American Academy of Pediatrics](#).

What are we looking for here

- ▶ What is the point of the article?
 - ▶ To report on a recently published study linking the use of common household products to a serious childhood illness.
- ▶ Who wrote and published the article
 - ▶ **Stephen Feller**, Owner and Chief Loudmouth at 1037 Media. Via LinkedIn “My professional goal is to work with publications and organizations that can use my skills to help people either by spreading knowledge and information or alerting people to products and services they can benefit from.” However, no specific background in health or science in his profile.
 - ▶ **UPI.com** United Press International is a leading provider of news, photos and information to millions of readers around the globe via UPI.com and its licensing services. With a history of reliable reporting dating back to 1907, today's UPI is a credible source for the most important stories of the day, continually updated - a one-stop site for U.S. and world news, as well as entertainment, trends, science, health and stunning photography. UPI also provides insightful reports on key topics of geopolitical importance, including energy and security. A Spanish version of the site reaches millions of readers in Latin America and beyond. UPI was founded in 1907 by E.W. Scripps as the United Press (UP). It became known as UPI after a merger with the International News Service in 1958, which was founded in 1909 by William Randolph Hearst. Today, UPI is owned by News World Communications. It is based in Washington, D.C., and Boca Raton, Fla.

What are we looking for? (cont.)

- ▶ Is there a source for the information?
 - ▶ A study published in the [Journal of the American Academy of Pediatrics](#).
- ▶ What questions does the article raise?
 - ▶ Which specific pesticides or classes of pesticides were implicated?
 - ▶ Is a review of other studies a valid way to aggregate the data and draw conclusions?
- ▶ Is there any conflicting information?
 - ▶ Why lymphoma and leukemia and not brain tumors?
 - ▶ “Although pesticides are necessary for the elimination of insects and other pests...”
- ▶ Is this enough information to act on?

Source Study

“Residential Exposure to Pesticide During Childhood and Childhood Cancers: A Meta-Analysis” by Mei Chen (Dept. of Environmental Health, Harvard), Chi-Hsuan Chang, Lin Tai and Chenseng Lu

PEDIATRICS, Official Journal of the American Academy of Pediatrics

What is Meta Analysis?

a quantitative statistical analysis of several separate but similar experiments or studies in order to test the pooled data for statistical significance (Merriam Webster). Great for replication.

Harvard

PEDIATRICS - “is an official peer-reviewed journal of the American Academy of Pediatrics (AAP).” Although peer-review is not infallible.

Questions

- ▶ What is the Big Question researchers are trying to answer and does this match with what is reported in the general media article?

Is there a connection between chronic low level residential pesticide exposure during childhood and the incidence of childhood cancer?

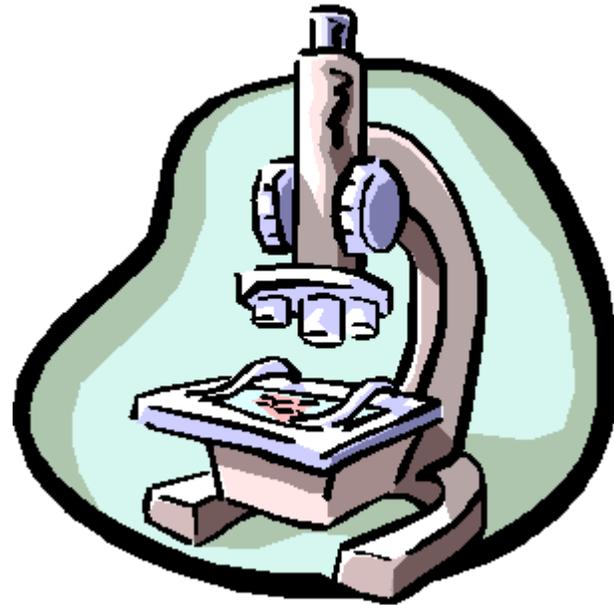
- ▶ **Methods**

- ▶ Number of subjects and how they were chosen (bigger is better and random is best)
 - ▶ Searched all observational studies (on humans and in English that compare subjects against a control group) published in PubMed before Feb. 2014 and reviewed reference sections of articles derived from searches - 277 studies found
 - ▶ Only 16 studies included in meta-analysis - original epidemiologic studies (look at incidence to discern information about causes and patterns) reporting on non-occupational pesticide exposure
 - ▶ Excluded in order to reduce bias: studies not reporting original results, toxicological studies (study of adverse effects of chemicals on living organisms); studies conducted in a occupational setting, on hazardous waste sites, on farm or near agricultural pesticides;

► Methods (cont.)

- What was measured and does that relate back to the Big Question?
 - Two authors independently extracted and tabulated the data
 - Looked at data by pesticide category, exposure location and type of cancer. Then each of these by who did the application - professional or homeowner.
- Dose
- Confounding Variables - are there variables that the researcher failed to control, or eliminate, damaging the internal validity of an experiment.
 - Removed the study with the highest weight
 - Removed the studies reporting extreme (highest and lowest) odds ratio
 - Removed hospital based studies
 - Removed studies with extended exposure windows or ill-defined pesticide categories
 - Exclusion list
- Controls

- ▶ Results and conclusion - Do they match what was reported?
- ▶ Author identified weakness or further study
 - ▶ “The small number of studies included in the analysis represents a major limitation of the current analysis.”
- ▶ Sources of Bias
 - ▶ Author affiliation
 - ▶ Funding source for study



Certainty Paradox

The real world varies unpredictably. Science is mostly about trying to discover the patterns and what causes them, in the best case scenario.

The average annual temperature has been increasing. What is causing that?

Lots of honeybees are dying off. What is causing that?

Separating out the variables is difficult.

Some research we can't do - expose people to a chemical suspected of causing harm.

Certainty is what we seek but rarely find. That leaves the door open for beliefs, faith and values.