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ARTICLE

Use and Abuse of Scientific Knowledge: The Portrayal in the Media

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Abstract

The utility of science and media to the human race is not a point of debate. The new paradigm is the interplay between science and media. Both are cost and time intensive endeavors, having a huge impact on public life and conduct. The use and benefits of sciences are innumerable and stand uncontested. The abuse of science comes from three sources. And this abuse happens because science sells. The three sources of abuse are: • Politics • Media • Advertising

These three sources are intrinsically linked. Our focus will be “media”

“Advertising may be described as the science of arresting human intelligence, long enough to make money from it.”

Stephen Leacock

Science is like religion. It has the potential of being used as an ideological weapon by people with ill intention. People/public usually because of their limited knowledge of science will hesitate from asking piercing questions of pseudo- scientific demagogues. The scientific jargons are impressive giving casual statements a veneer of rationality. The politicians and the industry love to use this rationality to their advantage. Media is the tool. However, scientists also use the media as a tool to spread information, gain popularity and make money. They also use it as scare tactic. The media personnel or journalists will also use science to inform the public and for personal gains. The end result is sensationalization of science by all the stakeholders. The power of media and science combined is overwhelming and can be dangerous. The aim should be to create more linkages between the two and aim for a more harmonious relationship than the one that exist now.

Introduction

Media today has power, clout and reach which is formidable. The interplay between media and science becomes even more potent, because the masses believe both without challenging either. Moreover, for most the entire knowledge post high school biology class about science comes from the media.

The utility of science and media to human race is not a point of debate. The issue is bad science and bad media, or media sensationalizing science. For example, a report by the social market foundation (SMF) an independent research group, has accused the UK media of sensationalizing science. There is a need to understand that media portrayal of issues have a huge impact on masses perception. Scientific knowledge transfers are very sensitive in nature. Science and media both sell, but both need to be cautious and responsible, about the power they can exercise over the minds and behavior of people. The public inherently mistrust the governments; the media is something they trust. They also trust scientists, one of the most trusted communities in a society. When ever, media say something with the backing of/on behalf of this community believe factor is very high. However,

a review of science in the media tells you that science in the media so often, if I may quote Ben Goldacre, is “pointless, simplistic, boring, or just plain wrong”.

The challenge is to boost the correct representation of science and scientific knowledge in media not only in news reporting but also in advertising and politics. This will ultimately help to better understand important debates involving scientific research. This paper will examine:

- Media-Science Nexus
- Use/Advantages of Media And Science Interplay
- Misuse of Science
- Misuse of statistics in Media

Media-science nexus

Science and media cannot survive without each other in the twenty-first century. National Association of Science Writers (NASW) is one of the oldest organizations, incorporated in its objectives, in 1934 to promote positive and good reporting on scientific findings and developments. NASW, today, is working to provide free flow of scientific information to non-scientists. Since the very beginning; scientists, because of media, were able to transfer the significant information to the public. From splitting of uranium atom to the invention of most valuable drugs to cure deadly disease media has helped science to reach individuals at the doorstep, throughout its journey. From TV channels such as Science, Discovery etc. to the science magazines such as Current Science, New Scientists, Popular Science, Science News, Global Science etc. all grounded on the principle to provide scientific information to general masses of the world, in a way as scientist has a lot to say and the general public is hungry for that knowledge, media is the source.

Uses/Advantages of Media and Science Interplay

Post 1945 world has witnessed an era of accelerated advanced research in the science world. The governments started to heavily invest in every field of science. From nuclear science to polio research and from space research to environmental sciences the paces of new developments have multiplied. These developments eventually must reach the doorstep of the general public. Journalists at that time bridged the wide gap by news coverage. The media has, thus, revolutionized the society with scientific information. Scientific debates have become the political agenda in the democratic countries in election campaigns such as debates on global warming, genetically modified food etc.

The media has also had a positive impact on health practices throughout the world. Today, media is the cheapest and most accessible mode of information; therefore it is tremendously revolutionizing health practices especially in the developing world. For example the reproductive behavior in Africa. Married, uneducated women in Zambia who are regularly exposed to broadcast media are twice as likely to use birth control as those exposed to no media. In a study in Burkina Faso that measured women's desire to have children, women who were regularly exposed to media and information about the responsibilities associated with raising children said they hoped to have an average of 3.7 children, while those exposed to no media said they wanted an average of 6.3 children. In 1990, the World Health Organization assessed the Philippine government's media campaign in support of regular vaccination for children. Its researchers found that the increase in the proportion of fully vaccinated children aged 12–23 months from 54 percent to 65 percent was “significantly attributable to that campaign.” The vaccinations were also more likely to be started and finished on time.

In Pakistan, Internews' Humanitarian Information Portal (HIP) covered two of the worst-hit provinces, Sindh and Punjab during floods of year 2010 and 2011, working with local journalists to produce radio reports for the affected communities to ensure important information about aid and assistance. The informative programs cover health matters such as nutrition, malaria, hygiene and mother/child health, child safety and vulnerable communities. HIP and ensuing health information is provided online, over the radio, shared through listening groups, and accessed via mobile phones through call-in programs and SMS, providing critical health information to populations in need.

More recently media played an important role in educating the public about Dengue fever. The polio campaign, before it was politically hijacked, produced excellent results because of the awareness campaign in the media. Since 1988, when a worldwide campaign against Polio was launched, the number of new Polio cases in Pakistan has also decreased significantly and government has been trying its best to make Pakistan a Polio-free country. Since the launch of the polio eradication initiative, about 5 million children had been saved from being crippled through vaccination.

Misuse of Science

Scientific knowledge has a very high stature for the average person and they largely remain unchallenged by most, almost like religious dogmas. It carries even more significance in the contemporary world because science provides unbiased and objective information. Therefore, science has also been brutally misused to gain benefits. It allows its abuse and misrepresentation by the unscrupulous. The exploitations of science are largely done by the media, advertising industry and last but not least by politicians.

Media

Science stories that are covered in the media are of five types:

- Wacky Stories
- Health Stories
- Scare Stories
- Breakthrough Stories
- Plain Science Stories

In 2004, a reputable British newspaper, the Independent ran a wacky science story that generated an actual editorial. Wacky stories don't end here. Infact, they never end, says Ben Goldacre, infidelity is genetic say scientists. Electricity allergy real, says researcher. Scientists have found the formula for, the perfect way to eat ice cream, the perfect TV sitcom, the perfect boiled egg, love, the perfect joke, the most depressing day of the year, and so on and so forth. Every paper –covers them. This results in compromising the position of the scientists and science itself and serves no purpose, except may be an interesting two minute read to be quoted latter somewhere as the most irrelevant part of casual conversation.

Health stories also make headlines. Every Christmas and Easter, regular as clockwork, you can read that chocolate is good for you, just like red wine is, and with the same monotonous regularity, in breathless, greedy tones you hear how it's scientifically possible to eat as much fat and carbohydrate as you like, for some complicated reason, but only if you do it at "the right time of day". These stories serve one purpose: they promote the reassuring idea that sensible health advice is outmoded and moralizing, and that research on it is paradoxical and unreliable.

Scare stories related to science also get a lot of media space. Based on minimal evidence and expanded with poor understanding of its significance, they help perform the

most crucial function for the media, which is selling you. The MMR disaster was a fantasy entirely of the media's making, which failed to go away. In fact the Daily Mail is still publishing hysterical anti-immunization stories, including one calling the pneumococcal vaccine a "triple jab", presumably because they misunderstood that the meningitis, pneumonia, and septicaemia it protects against are all caused by the same pneumococcus bacteria.

Once journalists get hold of a scare story or what they think is a scare story, insignificant increase in risk are presented, often out of context, that makes the danger appear disproportionately large. Seroxat story, or the ibuprofen and heart attack story are examples in point.

The third and the most destructive category of science stories in media are "breakthrough stories". As the media is now turned to an enterprise, it always needs breakthrough stories to fulfill its appetite. Newspapers, TV channels, radio –all forms of media, always run in search of new leading stories. But in this struggle, they provide such updates which are not well grounded. Especially in sciences where findings are not the last verdict; this is due to the fact that scientific ideas come up with several experiences which may prove them wrong. However, if media has launched those studies earlier would not provide updates and developments regarding that same phenomenon. Thus, misconceptions prevailed are carried forward.

In 2004, a seminar identified six different categories relevant to understanding misuses of science. They are:

Cherry picking: When making an argument, people often selectively choose or present information that makes their case look as strong as possible. Not only is this an effective tactic in argumentation; cherry picking is inescapable as all uses of facts are selective by their nature.

Dueling Experts: On complex scientific subjects there are typically many valid ways to interpret data and present findings. This is part of the richness of science, particularly regarding highly complex topics. In cases where experts disagree a decision maker frequently can and must select from among expert opinions. This is exactly how the adversarial legal process works. Simply because experts disagree is not a sufficient basis for identifying a misuse of science.

Mistake: A mistake is an unambiguous factual error.

Mischaracterization: A mischaracterization of science refers to the intentional or unintentional characterization of a body of research or a particular finding in a way that is simply incorrect or clearly misleading. There is clearly room for interpretation as to what constitutes mischaracterization versus cherry picking.

Delegitimization: Conflicts of interest, real or perceived, can delegitimize information-producing bodies to such a degree that whatever information they produce is discounted in the decision making process, eliminating any chance for knowledge to contribute to effective decision making.

Advertising: Science sells, or at least science can induce us to buy. Those clever advertising types know this and exploit the feelings of helplessness many people have when confronted by scientific claims. One particularly insidious example of this is the use in advertising of the phrase Clinically Proven. "Clinically proven" in an advertisement adds a veneer of respectability and reassures us about the safety of its product: it is using science to sell or

to be more specific it is pseudo science to add gloss to the product.

Of course, “clinically proven” should only be used for products that have undergone a full clinical trial. There are strict guidelines for conducting clinical trials to ensure that the results are meaningful. If the guidelines are not followed, the results are likely to be untrustworthy.

In a recent case, the “clinically proven” tag was used in advertising for RoC Complete Lift Cream, and this got its manufacturers, Johnson and Johnson, into deep water. Complete Lift Cream is a snip at £18 for a 50ml pot and is sold to make the skin look lifted and firmer, to “rediscover a younger looking you”. Complete Lift Cream with the claim: “measurable lift in just 8 weeks”.

A second scientific ploy used in advertising is to say that the product contains a special chemical. No one will know what this is but it increases the mystique attached to the product. The accompanying text for the RoC Complete Lift advertisement stated that the product “contains patented THPE which re-tightens and firms the facial contours by contracting skin cells...Clinically proven to work in just 8 weeks of use”.

Following two complaints from members of the public, the Advertising Standards Authority requested the advertisement be withdrawn as they said it was misleading and the claims could not be substantiated. Johnson and Johnson said that the product had been tested in a clinical trial. The Advertising Standards Authority examined the trial and concluded that it had not been carried out properly as no objective data had been recorded and only one person was rating the effects and this was a Johnson and Johnson employee. The advertisement was withdrawn.

In societies like Pakistan, the advertising agencies, do not even have to use the clichéd clinically proven, all they have to do is put a real doctor or someone wearing a white Doctor’s gown to give their product the authenticity of science, the objective being of course to stump the consumer with that of backing science and sell. Similarly titling like the “Doctor’s tooth paste”, the name in its self is misleading, than we have a Doctor Mom subscribing to a certain floor cleaner and another Doc Mom enforcing the concept of self medication and suggesting popping pills after a long day of work is just fine to function on, instead of suggesting that may be its all right to be tired after a day’s work and take a nap to recover. Then probably a flip side is that wrong messages sent in by the advertisers are not challenged by the scientist as part of their responsibility to the masses, and these may also include, a permanent cure for ailments like diabetes or medication to increase height and lose weight and last but not least become fairer etc. the unscrupulous advertising of fairness creams in Pakistan is a known phenomenon. Fairness creams are harmful. They cause thinning of the skin and prevent the secretion of Melanin. Melanin has its own useful effects like it blocks cancer causing rays of the sun so you would find that colored people get less skin cancer than white people and also colored people get less sun burns. Now fairness creams block the Secretion of the melanin in the skin thus making it less colored.

It also stops sun rays to tan your so the skin looks fairer. Advertisements say that a person could become 20% more fairly; showing it on the shade scale but the natural color of the skin will not change. An extreme example can be where doctors in the UK were confused by symptoms presented by a woman where there was no reason for her weight gain, stretch or stripe marks and inability to conceive. It was only after further questioning that she admitted to using a skin lightening product called Clobetasol. A cream banned in the EU which contains high levels of the steroid corticosteroid. The woman far exceeded the recommended usage, using two tubes of Clobetasol a week for over seven years and developed the unexplainable symptoms.

Perhaps another interesting example is the use of semi-scientific messages on the cartons of fruit juices saying it “contains antioxidants – to help in the struggle against cellular ageing”. This sounds good, but does it really mean anything?

There is a widespread belief that antioxidants can counteract various deleterious processes in the body including ageing, heart disease and cancer. You see this in the popular press and one of the outcomes of this belief is the huge consumption of antioxidant supplements. But is there any evidence that antioxidants really have these beneficial effects? This has been addressed by the Cochrane Collaboration (an independent foundation) who analyzed the results of a number of trials of antioxidant supplements and concluded that far from being beneficial, most of them had no effect and some of them might actually be harmful. So, based on the evidence, antioxidant supplements do not have beneficial effects.

Politics

Yet another abuse of science is its political manipulation which is both morally and ethically wrong. Political manipulation of science is largely done for the procurement of votes or to keep certain issues of science out of public domain, media is the vehicle, for it is there where a story either flies or dies. Examples of political manipulation of scientific and its portrayal in the media are abundantly found.

In 2003, a climate change report written by the Environmental Protection Agency was changed. The removal of any reference to a review confirming that human activity contributed to global warming was ordered by the White House. By doing so, politicians unethically altered scientific findings. The Union of Concerned Scientists expressed their concern over the Bush administrations lack of representation from the scientific domain on advisory panels. Advisory panels are responsible for the formulation of legislative decisions based on scientific findings which can be distorted for political gain. The Union of Concerned Scientists is asking that Congress provide oversight hearings so that science can be saved from becoming federal government propaganda. Ethical violations are occurring in the highest offices of U.S. politics and people must stand up to save the integrity of science. A most striking and impressive example of such a stance involves the oath of the U.S. Surgeon General, Richard H. Carmona, against the Bush administrations political interference in public health. Political manipulation of science is morally and ethically wrong. The public views the Surgeon General as “the nation’s doctor”. His is the voice that the public listens to when deciding what should be modified in our daily lives for the purpose of living more comfortable and healthier lives.

Carmona charged the Bush administration with unparalleled levels of political interference in his work to help the U.S. public improve their health. It is astonishing to hear that his speeches were censored. The Bush administration muted his attempts to inform the public because it may have incited an unfavorable response. This is similar to abstaining from disclosing to the public the oncoming of a tornado or hurricane because of the commotion that it might stir up. Carmona stated that the Bush administration was more focused on strengthening the presidents image than on public health by censoring his speeches and removing him from attending important health events in order to attend “political rall[ies]”.

The political misuse of science now seems to have hit alarming levels, at least in the United States. Among many examples, perhaps the one most indicative of the seriousness of this trend is the misrepresentation and blatant misuse of the 2001 report from the US National Academy of Sciences (NAS) in its unequivocal endorsement of the 2001 United Nations’ Intergovernmental Panel on Climate Change (IPCC) findings. Historically, this IPCC report may stand as the long-term scientific landmark work on the influence of humans on average global temperature rise and ultimately, human-driven global climate change. Yet

the Bush administration has continuously softened the language of the IPCC and NAS reports. In one celebrated case that came to light in the summer of 2005, the New York Times reported that Mr. Philip Cooney, the Chief of Staff for the White House Council on Environmental Quality, diluted scientific wording in a key 2003 US Environmental Protection Agency report that clearly made the connection between greenhouse gas emissions and global climate. Mr. Cooney is a lawyer with no scientific training. The late pre-eminent anthropologist Joseph Campbell celebrated the spiritual awakening of the earliest peoples, and tried to find unity in the religions of today, while at the same time recognizing the ancient to modern influence of science and technology on belief systems. The late Pope John Paul II, a human and religious icon revered around the world, accepted the modern theory of evolution. Within their own personal callings, these men spent brilliant lifetimes spinning new understanding into their web of the world and beyond. Neither would ever have dreamed of distorting, suppressing, or misusing legitimate, consensus-based scientific research. Those who would do otherwise, to promote personal, political, or ideological agendas, must be exposed and put aside.

Another dimension of it which is an example from Pakistan is that the ‘Anti-polio’ campaigns are facing stiff resistance from local religious leaders in a number of areas in NWFP and . During anti-polio campaign in February, the parents of 24,000 children in northern Pakistan refused to allow health workers to administer polio vaccinations, mostly due to rumors that the harmless vaccine was an American plot to sterilize innocent Muslim children. Some of the local religious leaders in the Swat, Bajaur and Malakand agencies are telling the people not to get their children vaccinated since the practice is un-Islamic, and that those that die of polio would be considered martyrs. The disinformation – spread by extremist clerics using mosque loudspeakers and illegal radio stations and by word of mouth – has caused a sharp jump in polio cases in Pakistan and hit global efforts to eradicate the debilitating disease. As a result of this political hijack of the polio campaign, Pakistan became the world top polio-endemic country in 2010, with 142 cases and is now the cause of polio transmission for the entire world.

Figure 1: Number of confirmed cases of poliomyelitis in Pakistan, 1997–2006

Figure 2: Number of districts with confirmed poliomyelitis cases in Pakistan, 1997–2006

Politics and Funding of Science

Without politicians and government, science would not be funded. Politicians and scientists must learn to work together in order to better serve the public. Politicians cannot and should not tell scientists what to do. Scientists are standing up for their rights and for the ability to bring to the constituents the truth about their findings. Scientists are not trying to scare the public, but warn them of the true dangers that are present. If politicians want the world to continue growing and if they want to prepare for the future, they must let scientists do their jobs without making them follow any hidden agenda. In order to alleviate this problem, both groups must let go of their indifference and remember the united purpose of helping the populous of this nation.

Misuse of Statistics

Misuse of statistics is probably another dimension of abuse of science in media. And statistics just make the text so much more authentic and news worthy as Tom Seigfried, Editor in Chief of science news rightly points out “The census that Maths gives are often misinterpreted for it usually emanates from flawed reasoning. An example quoted by him is that of FDA coming out with a new drug, say Drug “A”. According to research, there is a 5% chance that Drug A will not work, this however does not mean that there’s a 95% chance that the drug ‘A’ will work.

There is ‘Dubious Data Award’ annual list, produced by Statistical Assessment Service (STATS), a Washington based NGO, which analyzes and critiques the presentation of scientific findings and statistical evidence in the , highlighted factual inaccuracies in news reporting. For example, during election times, STATS is often referred to in newspaper articles about the use of statistics in political rhetoric. For example, during the presidential election of 2004, the organization challenged claims by both and at the request of the . Again in 2006, it challenged a study by the , used by and , which claimed that almost half of the alcohol industry's revenue came from underage drinkers. According to STATS, American teenagers who drink alcohol would each have to consume more than 1,000 drinks

per year for this to be true. STATS has also disagreed with recommendations from that parents should discontinue use of soft vinyl toys, teethingers, and similar products containing, pointing out that phthalates in children's toys have been cleared for use by both the and the Consumer Product Safety Commission and the European Union's Institute for Health and Consumer Protection. The annual list has received coverage from The Washington Post and the Los Angeles Times, among other news organizations.

In their search for drama and an underwhelming desire to be "first", journalists frequently make the following blunders:

Failure to specify a base, for example: "This (insert any food additive) increases the chances of getting cancer of the (insert any organ) by 40%" according to (insert any source dubious or otherwise)". Without knowing the chance of contracting the original disease, the increase tells us nothing. The original probability might have been 5% in which case the increase in the overall probability is less than 2%. Boringly, it helps to know what base you are coming off.

Failure to specify any counterfactual: Current prime example, numerous statistics on flu and swine flu and deaths and coughs and colds. What we want to know is how many people died from swine flu who, but for catching swine flu, would not have died. Being "pretty terminal already then caught the flu" does not count. Nor do the significant number dying of non porcine flu strains every year (over 500,000 in the US alone). The panic of Dengue fever in Pakistan in the years 2010 and 2011 as well, get lots of media coverage. Media has in its reporting created panic in the general public and spread fear and panic. For weeks, Dengue deaths made headlines without ever referring to the huge number who also got cured. Those infected are mainly from . Patients are primarily admitted to government hospitals. The over-sensationalization of dengue came up with the news regarding death of Punjab MPA Mumtaz Jajja on September 30, 2011. Dengue 2074 cases were reported out of which 7992 were of Lahore nothing on how many were cured and have rescued.

Failure to adjust for age: Western populations are getting older and older faster and faster but also living longer and longer. This has numerous impacts.... more years exposed to the

chances of being run over, becoming alcoholic, becoming deaf but not necessarily getting a hole in one. Rates of old peoples' problems increase without any change whatsoever in the per capita incidence of whatever is making headlines.

Failure to invert - i.e. apply a sanity test, for example "3 out of every 10 children in N.Z. schools today have reading difficulties according to (whoever currently stands to gain out of attracting more resource into education)". This means 70% of children do not have reading difficulties - at least on this measure, just as having a 5% chance of dying in the next 5 years means you have a 95% chance of getting by if you don't give it another thought.

Recommendations

Science and media are both doing tremendous service to the society and the masses. Their interplay should be beneficial and positive. The following recommendations may be of value.

- Science needs the media and it is media's responsibility to correspond to that need. Neither should try to abuse nor exploit each other.
- A lot of problems arise because of lack of knowledge and weak linkages between the two. An effort should be made from both sides to bridge this gap.
- Science reporting should be done by people with some background of science.
- The era of Ivory Tower, for scientists is over. It is also their responsibility to cultivate the media and watch for and identify abuse of science where it happens.

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Seroxat is set to overtake Prozac as the world's favourite antidepressant. With 100m prescriptions in more than 100 countries, it is aggressively marketed as the addiction-free answer to our anxieties. But thousands of patients are now saying their dependence on the dream drug has all but destroyed their lives. For Details See:
<http://www.guardian.co.uk/theobserver/2002/apr/28/features.magazine37>

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Remembering that I'll be dead soon is the most important tool I've ever encountered to help me make the big choices in life. Because almost everything - all external expectations, all pride, all fear of embarrassment or failure - these things just fall away in the face of death, leaving only what is truly important.

- **Steve Jobs** in his *Stanford University's commencement speech*, 2005.