

Collective delusions about immunization: Where, to whom, and why.

On my computer screen is a beautiful young girl. A former cheerleader, we are told, who can now, due to the seasonal influenza vaccine, locomote solely by walking backwards.¹ Satire? The word flits through my mind, tinged with hope, only to be dashed as the deathly serious newscast informs us that this is the face of a “one-in-a-million” vaccine injury. The source of this number is evidently left as an exercise for the viewer, as are many seemingly crucial background details. We learn that the poor creature got a flu shot, and immediately came down with a flu-like illness. Now, faster than you can say *post-hoc ergo propter hoc*, she suffers from dystonia, a rare neurological syndrome with no known cure.

We’re not privy to several seemingly relevant details. Was the illness confirmed as the flu? If it was, did the strain match the vaccine? Was it even a live-virus vaccine? Is the diagnosis of dystonia plausible, and has it been verified by experts? Are there not other possible explanations?

Unsurprisingly, perhaps, this bizarre case is not as it first appears. Flooded with calls after the video first aired, several dystonia experts have publically stated that the woman does not appear to suffer dystonia, nor seizures, and that her symptoms are likely psychogenic. However, in the face of so much apparent willingness to believe a patently absurd claim, larger questions loom. Why does vaccination seem to attract a disproportionate share of mistrust? Is there

¹ The video can be viewed at <http://www.youtube.com/watch?v=k3xgV11ZSAg>. As of writing, the most popular version had over 3.6 million views.

something about vaccination that makes it particularly prone to paranoia?

Vaccines are counted among the crowning achievements of public health. According to the World Health Organization (WHO) and the United Nations Children's Fund's (UNICEF) 2007 Immunization Summary, more than 2.5 million deaths a year are prevented by vaccination against just four diseases: diphtheria, tetanus, pertussis and measles (UNICEF, 2007). However, vaccines are also among the most maligned of medical interventions, inspiring grass-roots protest, celebrity activists, and international charities devoted to their downfall. A recent editorial laid the blame for clusters of disease outbreaks in the United States on decreasing vaccination rates (Omer, Salmon, Orenstein, deHart, & Halsey, 2009), while another revealed that the number of reported pertussis cases soared from about 1000 in 1976 to over 26000 in 2004 (Glanz et al., 2009). A disease that vaccines had nearly consigned to the dustbin of history has risen once more. All of this, as far as anyone can tell, is unrelated to the actual rate of harm caused by vaccination.²

Is there some fundamental characteristic of vaccination that lends it to such hyperbole? This paper will explore the nature of vaccine panic by examining several facets of the phenomenon. First, regional variation in vaccine panics will be described (the "where"). Next, the demographic distribution of several anti-vaccine movements will be examined ("to whom"). Finally, several potential explanations are proposed (the "why").

² Live vaccines can cause infection, though they do so very rarely, and there have been cases of serious adverse events caused by particular vaccine components. However, less-maligned medical interventions can also cause harm, so this does not explain why vaccines are the focus of such ire.

Where

A telling feature of collective delusions about vaccination is that they adopt different forms across geographic and cultural lines. In the Islamic world, the typical plot involves a Western-Israeli plot to render men infertile. This flu season, the adjuvant in Jeddah was the concoction that Free-Masons and Baxter pharmaceuticals were out to sterilize men and kill children. The campaign was extensive, including chain emails, text messaging, and supported by television interviews of experts. One text message warned, about the then-planned H1N1 influenza vaccine "before you take it or give it to your children, watch Al-Jazeera tonight at 10 p.m. There will be a show about the vaccination and its side effects. Please inform your friends and relatives." That evening, Al-Jazeera English's Bela Hodoud (Without Borders) program interviewed "consumer health expert" Dr. Leonard G. Horowitz on H1N1 and vaccinations. He described the vaccine as "pangenocide", an inspired portmanteau, if a tad implausible.

In Africa, one popular theory holds that the oral polio vaccine was the origin of the subsequent HIV/AIDS pandemic. As the argument goes, sick chimpanzees used in medical research in the Congo might have carried a primate immunodeficiency virus (PIV), which then contaminated facilities used to produce the polio vaccine. This contaminated vaccine transmitted the virus that eventually evolved into HIV-1, and the first victims progressed to full-blown AIDS over the following 15-20 years. This theory has been discredited by two findings. First, analysis of remaining samples of the polio vaccine failed to find any trace of the virus. Second, genetic analysis of HIV strains in humans have revealed the lineage of PIV carried by chimpanzees is

phylogenically distinct from any HIV strain circulating in humans (both lines of evidence are summarized in Weiss, 2001). Still, the rumor persists in the popular discourse, and may be part of the reason that the effort to eradicate polio was stalled.

In Britain and North America, the major panic centers on the Measles-Mumps-Rubella (MMR) vaccine, and an apocryphal link with autism. This rumor has its beginnings in a since-discredited paper published by Dr. Andrew Wakefield in the *Lancet* (1998), who now faces serious charges of professional misconduct in the UK. Fears grew when the US government reported that vaccines might expose children to more ethylmercury (in the form of the preservative thimerisol) in 1999³. This is based on a bit of chemical confusion⁴. Regardless, the preservative was removed from all childhood vaccines⁵ as a precautionary measure, a move which was accompanied by an extremely poor bit of public health messaging. A press release issued by the American Association of Pediatrics explaining the move stated "Parents should not worry about the safety of vaccines. The current levels of thimerosal will not hurt children, but reducing those levels will make safe vaccines even safer. While our current immunization strategies are safe, we have an opportunity to increase the margin of safety." This no doubt served to fan the flames of uncertainty⁶, more than enough to provide the slight tug of worry that may be enough to paralyze a concerned parent. Notably, autism rates have not fallen

³ The sequence of events is well summarized by Dr. Paul Offit, one of the central figures in the MMR-autism story, in a recent *New England Journal of Medicine* article (Offit, 2007).

⁴ Methylmercury is a harmful contaminant at low doses, but the additional carbon atom of ethylmercury facilitates its clearing from the body. It is very likely harmless.

⁵ Save the seasonal influenza vaccine, which still contains a trace amount of thimerisol.

⁶ Not unreasonably, as it is difficult to fathom how removing something that is safe from a mixture could make the remainder safer.

since the removal of thimerisol from vaccines, but the story has permuted to posit a fuzzier threshold effect – “too many, too soon” is the new mantra. All the signs of an unfalsifiable hypothesis are there, inextricably latched to the conviction that vaccines *must* do harm.

It appears that vaccine panics map onto underlying local anxieties, which can persist despite being divorced from a plausible or consistent effect of the vaccine in question. In the Islamic world, where paranoia around crusading Western forces runs high, a story playing on these fears is the dominant meme. In Africa, a continent whose history could be approximately summarized as a series of botched aid attempts, the theory that one of the few successful interventions sowed the seeds of future destruction is the one to gain traction. In the worried-but-well West, the story is that an ill-understood neurological syndrome is caused by exposure to an environmental toxin. While none of these stories are uniquely confined to one or another geographic region, each has a different level of local popularity. Vaccination fears seem to mould onto the local zeitgeist, however varied they may be.

To Whom

Like family, apple pie and the American dream, vaccine delusions draw support from otherwise unlikely bedfellows. The far left and the far right seem united in their opposition to vaccination, for radically different reasons. For the right wing, vaccine represents an intolerable imposition on personal freedoms. Much of the concern expressed by conservative commentators has focused on the allegedly high level of government coercion involved in the process. Fears of compulsory vaccination also run high. For the left, vaccines may be seen as

contrary to the natural order, or bundled with fears over environmental contamination.

Although vaccine fears transcend national boundaries and political stripes, it does appear that one particular demographic is especially prone; parents of young children. In a sense, this is predictable, as anecdotally parents seem to become more cautious following the birth of their children.

Why

Vaccines are perceived as a risk far in excess of what could be justified by any empirical cost-benefit analysis. The reasons for this will likely be varied, but in this section I will propose several candidate explanations. First, vaccines have the property of being preventive agents. Non-events are impossible to perceive, by definition. Even when recognize at an intellectual level that bad outcomes are likely prevented now and again, this knowledge carries exactly zero emotional weight. Not becoming ill with influenza after getting the shot doesn't register as an important event. Preventing a disease such as diphtheria, which virtually no young person today has ever encountered, may register even lower. Contrast this with the vivid, emotional imagery employed by vaccine skeptics, and this begins to look like a very one-sided affair.

Another possible explanation is simple ignorance. The unknown is scary, and poll results indicate that only 50% of Americans⁷, know that an electron is smaller than an atom (Pew Research Center, 2009). This leaves a great deal of room for the unknown. It is common to

⁷ I don't mean to pick on Americans. Canadians, I'm sure, fare no better; our advantage here lies merely in not being the subject of this particular poll.

hear from vaccine skeptics the objection to taking drugs, which ignores the fact that vaccines are not drugs. Another objection is that the current vaccine schedule overloads the immune system of children, despite the fact that children encounter thousands of wild pathogens every day. Combining basic scientific illiteracy with the preponderance of information available on the internet is not likely to lead to optimal decision making. Humans are hard-wired pattern-recognition experts. The saying "correlation does not imply causation" is widely heard, but equally widely ignored. Much is made of the proximity in time of vaccination and the emergence of, say, autism. However, millions of children are vaccinated around the age at which neurological symptoms are most likely to be diagnosed. Chance alone demands that these events will converge with very high precision, not once but hundreds of times. In scientific parlance there is insufficient evidence to reject the null hypothesis that vaccines do not increase the rate of harmful outcomes; in less cautious language these folk theories have been demolished as thoroughly as is realistically possible in science. The events are correlated, but unlikely to be causally related.

Conclusions

As we find ourselves in the midst of a public health emergency, it is worth reflecting on the role of communication. Each person has more influence than they might believe on their friends, family, neighbors, and coworkers. Paul Sandman, a noted risk communicator, has stated that the correlation between what he terms "outrage" (how worried people are) and "hazard" (how dangerous something is), across many domains, is approximately 0.2. Statistically, this implies that only 4% of the variance in how outraged people are about a risk is explained by how hazardous it is, and vice versa. Sandman's point is that although we often assume that the goal of communications during a crisis is to

decrease public concern, the actual goal ought to be to move it to an appropriate level. In practice this often means messaging intended to calm, but it can well mean the opposite if the level of outrage is too low. It may be that in the current climate of widespread mistrust of vaccination, it is more effective to increase concern over the danger of the influenza pandemic than to decrease concern over the dangers of vaccination.

Inoculation against infectious disease is among the greatest successes of public health. Diseases which were once feared killers of scores of children and adults are now confined to the history books. We spend countless hours pouring over spreadsheets, simulations, and laboratory benches, trying to determine the optimal means of delivering vaccines, who to target for inoculation, and how to protect ourselves against new diseases. However, beyond the ivory tower of academe and past the edge of the cubicle farms of government lie tangled groves of competing folk theories about vaccination with an enormous impact on behaviour. Given the tremendous power of new media to connect people and facilitate the unfettered transfer of information, this is no longer an issue that public health has the luxury of ignoring. Understanding the nature of these delusions may help to improve communication about this important topic. This may be especially vital when they affect the propensity of believers to be vaccinated or to vaccinate their children.

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