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Vaccinations in the Developing World

Matthew MacDonald

Vaccines exist for some of the most devastating diseases in the world from typhoid to tuberculosis, with an estimated 3 million children saved by vaccinations in 1991 (Grzybowski, 1991). Logic would suggest that those who encounter these pathogenic organisms on a daily basis would welcome immunity to them; however the question is much more convoluted amongst those in the developing world. In short, it is accurate to say that achieving satisfactory vaccination rates for any disease in the third world is determined by supply, social, and cultural factors.

Consider tuberculosis (TB) as an exemplar to the vaccination paradox. It is estimated that TB causes three million deaths a year - more fatalities than any other bacterial pathogen - with an estimated 1.7 billion people worldwide currently infected. Tuberculosis in the developing world is so prevalent that the UN's World Health Organization declared it a global health emergency and classified it as one of the three diseases of poverty, which also includes AIDS and malaria (WHO, 2005). Despite having a highly effective vaccine, ninety-five percent of all new TB cases are found in developing nations (Grzybowski, 1991). Most incredulous of all is that the vaccine for TB, Bacillus Calmette-Guérin (BCG) is a relic of the 1920s. The BCG vaccine has proven to be effective in 80% of patients, though its specific biochemical mechanism is not well understood (Soysal et al., 2005).

Vaccines are created when scientists create a harmless version of a pathogenic bacteria or virus to be injected into a healthy person. This procedure allows the patient's immune system to identify the true and dangerous disease by virtue of having an antigenic memory stored in B-cells (CDC, 2009). Through trial and error, Calmette and Guérin discovered that subculturing virulent strains of *Mycobacterium bovis* in a media of glycerine, bile and potato created a less virulent strain of TB. After painstakingly reculturing the bacteria for nearly a decade, they created a non-pathogenic version of TB (Fine, 1989). By 1921 the first inoculation was performed on a child; 90 years later, it is predicted that 3x109 BCG vaccines have been administered worldwide. After almost a century of possessing an effective vaccine against TB, the developing world continues to suffer tuberculosis at pandemic levels (Barretol et al., 2006). Much of the aforementioned statistics seem contradictory; despite having a viable and proven vaccine, TB continues to be a scourge to one out of every six human beings – "why?" is the question this essay will attempt to answer.

> "[...] vaccine planners must collaborate with the community in question"

Supply Service Factors

Before discussing underlying cultural and social resistances to vaccinations, the rate-limiting step of supply and service must be examined. One major consideration is the physical location of vaccination clinics as well as the hours they operate during the day; mothers will not take their children to be vaccinated if they must be working from 9 to 5. Therefore, vaccination planners must collaborate with the community in question in order to align their resources for maximum effect (Boniar et al, 1989). We also see a drop in vaccination rates when clinic workers are pressured to focus exclusively on the quantity of individuals they vaccinate to the detriment of the quality of service. In the same vein we observe a decrease in the population's willingness to be vaccinated when organizational policy avoids any risk-taking even when it is in the best interest of the patient or the community. For example, clinic doctors refer critically ill patients to distant hospitals simply in order to avoid responsibility (Grzybowski, 1991). It is important to have both a readily available supply of vaccines and staff who are trusted to administer it, but this factor eclipses an even more intractable issue: does the public want the vaccine?

Social Factors

Recent trends in establishing effective vaccination programs have moved towards a 'social marketing' approach to encourage compliance and self-motivated behaviour. Instead of focusing on factors that predict the

Figure 1 Implementing vaccine programs in developing countries involves overcoming several challenges.

non-compliance with vaccination programs, the model of social marketing works similarly to its consumer-marketing cousin in finding predictors of demand (adherence) and self regulation. Examples of such studies in North India and Nepal have shown that there is gender disparity: males are more often vaccinated than females and a positive correlation exists between the mother's education level and her compliance in a vaccination program (Grzybowski, 1991).

It is important to remember that vaccination programs do not operate in a vacuum; compliance is a function of a complex interplay of regional history as well as how individuals perceive western influences and even their own government. A powerful example is in India; conspiracy theories have emerged among conservative Hindu and Muslim groups linking vaccination programs to hidden political agendas. Mahadevan's 1986 study suggested that Indian Muslims feared that vaccines are not medicinal but are in fact a sterilizing agent designed to enforce family planning, thus curbing their population growth and limiting the number of Muslim voters. These fears stem from past events such as when, in the 1970s, the Indian government exercised 'emergency' state power in the name of population control. Then, in 1990 during heightened Muslim-Hindu tensions, vaccination programs that specifically targeted women and children were coincidentally intensified (Bastien, 1989). Such tensions also include Western influences, as many in India believe that vaccination programs are simply a modern day adaption of the techniques used by Christian missionaries who built hospitals and schools in order to convert Hindus. One leader of a prominent Hindu group in a South Indian city, as interviewed by Grzybowski, pointed out the visual similarities between a hypodermic needle and the Christian cross. He also believed that youths vaccinated against diseases would feel immune to the wrath of the gods they have forsaken when they abandon their heritage in favour of "Christian values, tastes, and desires." In the most extreme cases, there are fears that vaccination programs are nothing more than a western attempt to gather biological data about immunodeficiencies in the developing world's population in order to produce biological weapons against them, as was a heated controversy in India's national press in 1987 (Scheper-Hughes & Lock, 1987). A comprehensive list of social anxieties and variables that inhibit vaccination programs is essentially impossible due to the complex and ever changing geopolitical and social landscape. An effort, however, must be made to compensate for concerns and fears that cultures produce when an external agent attempts to influence them even if it is with benevolent intentions.

Cultural Factors

While less appreciated for its importance than social factors (Grzybowski, 1991), cultural influences regarding the perception of vaccinations and illnesses in general as well as the idiosyncratically held role of medicine in producing and protecting health is just as pivotal in the success of any vaccination campaign.

> "[...] cultural factors such as a lack of education can lead to reduced compliance rates as patients develop unreasonable expectations of vaccines"

One of the major stumbling blocks in creating a sustainable, wide-scale vaccination program is a poor understanding of what vaccinations do and what diseases they protect against which leads to unrealistic expectations. Grzybowski found that mothers either believe that vaccines are good for a child's health in a general sense akin to a balanced diet or that vaccines are designed to protect against serious diseases but nothing specifically. While 40-50% of mothers thought vaccinations protect against specific illnesses, only 25% could name a local disease that is vaccinable. Another major folly is that mothers often see vaccines as a treatment instead of a preventive measure, and thus do not vaccinate their children on the reasoning that the child is healthy (Raharyo & Corner, 1990). These misconceptions are often caused by rapid explanations given by health care workers for why mothers should comply with vaccination directives

or why a more sophisticated explanation is outside of an uneducated mothers' understanding.

Another cultural aspect to consider is the general view a population holds about medicine and the ethical dilemma of either attempting to explain vaccination in rational terms, or instead introduce the concept using existing cultural frameworks – essentially explaining vaccinations as "magic". Should the significance of the raised skin of a TB test be described in terms of an immune response or that its purpose is akin to a mystic's divination procedure? In this precarious line of reasoning, one must remember the distinction between attributing the effects of a vaccine to magic, which is indefensible, and simply elucidating expectable results using terms familiar to the target population. While one's first instinct may be to favour the option that does not appear to involve the intentional spread of superstition, consider which is less truthful: using existing cultural frameworks to explain that BCG will protect against TB for some time like an amulet would protect against a malevolent spirit, or giving a vague explanation that ultimately leads to a mother who draws false conclusions about the purpose and ability of a vaccine (Grzybowski, 1991)?

Conclusion

Failure to vaccinate is sometimes thought as a kind of parental neglect, that the parent does not care enough for the child's health to have him or her vaccinated; indeed this is the opposite of the truth. Mothers who refuse to vaccinate often do so for fear of the child's health, even if that fear is misplaced. When you subtract the supply issues involved and imagine a best-case scenario in which vaccines are available to all those who seek it, we are still hindered by the social environment that the vaccination program finds itself in as it must contend with non-health related issues such as racial tension. In addition to social factors, cultural factors such as a lack of education can lead to reduced compliance rates as patients develop unreasonable expectations of vaccines. Any successful vaccination regiment must contend with these three factors while never losing sight of that our efforts are humanitarian; forced vaccination compliance gained through a government's directive is unsustainable and morally grey at best, so we must endeavour to educate and win the hearts and minds of those we are trying to help so that they seek vaccination of their own volition.

Postgraduate Editor in Focus

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