Immunization:

International Communication,

Surveillance

and

Prevention

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PUBP 710 005
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Fall 2003

Abstract:

Increasingly effective strategies to reduce the outbreak and spread of infectious diseases have been designed and implemented particularly within the second half of the 20th century. In fact, efforts have accelerated with the very dawning of the 21st Century, indicating that a much greater threat of the spread of contagious disease may be seen from the perspective of not simply individuals, but more importantly from countries in relation to each other. On the one hand, this notion of enhanced vulnerability stems from the view that increased human mobility is directly a result of technological changes. Conversely, one advantage of these changes is that control of disease on a broad scale is now actually an option. Still others believe that immunization is a basic human right which has not be granted to people or countries equally.

It is true that much of the success of international initiatives to eradicate infectious disease may be attributed to the success of immunization programs. The effectiveness of such programs, however, is a result of the combination of the administration of vaccines in prevention of or as a response to an outbreak of infectious disease, as well as the careful reporting and recording of disease cases and deaths. A final and crucial aspect of immunization is the continuance of public health surveillance.

Purpose:

This paper attempts to examine the efficacy of globally collaborative vaccination programs intended to reduce the threat of natural or inflicted outbreaks of communicable disease and to ensure the safety and ultimately the well-being of large populations. Specifically, it addresses the issue of international public health in the context of inherently preventive medicine techniques that involve immunizing populations against contagious diseases. It asks whether immunization alone can lead to the effective containment and eradication of disease.

Introduction and Background:

Control of the spread of disease has been considered important for hundreds of years. The first evidence of disease control dates back to the 14th Century when quarantine efforts were begun in Venice in 1377.[1] In 1851, the first International Sanitary Conference was held in Paris, and was followed by eight conferences over the next fifty years, to discuss communicable diseases affecting many nations.[2] Now known as the International Health Regulations (IHR), the International Sanitary Regulations of 1951 set the stage for formal international public health standards following the establishment of the World Health Organization (WHO) in 1948, and what has become the Pan American Health Organization (PAHO).[3] Of the six original target communicable diseases (cholera, plague, yellow fever, smallpox, relapsing fever and typhus), only the first three – cholera, plague and yellow fever – remain as serious threats for causes of epidemics.[4]

Today, the IHR requires that WHO Member States report all and any cases of these three remaining diseases (presumably added to the list recently is a fourth disease, SARS). The IHR also calls for confirmation that reported diseases are cleared from the areas or regions in which they are found; and, that nations abide by cross-border travel

[1] David Heymann, "Emerging Infectious Diseases," *World Health*, p. 4(3), vol. 50, no. 1, Jan-Feb 1997, 1997 World Health Organization. Available from Health Reference Center, George Mason University Libraries. <http://mutex.gmu.edu:2089> (16 November 2003).

[2] "International Health Regulations (IHR)," Communicable Disease Surveillance and Response (CSR), World Health Organization, 2003 World Health Organization. <http://www.who.int/csr/ihr/en> (5 December 2003).

[3] "IHR," CSR.

[4] "IHR," CSR.

and trade regulations, including sanitization measures and practices, as well as the disclosure of affected international travelers' medical history.[5] The WHO states that its

> guiding principle for the IHR is to prevent international disease spread by early detection of events that threaten public health. This requires early detection of unusual disease events through an effective national surveillance system. International coordination is a necessary part of the effective response to public health emergencies of international concern.[6]

Additionally, immunization plays a crucial role in preventing rampant spread of disease, and can be used in response to certain outbreaks. Although the existence of the WHO has certainly contributed to the increased control of diseases, there is no way to enforce its rules. Thus, not all outbreaks are brought to the attention of the international public health community.[7]

As a response to this growing concern that has developed more fully since the 1970's, in the year 2000, the WHO was joined by a larger international community of groups who have the same goals, in the promotion of vaccine programs.[8] The Global Alliance for Vaccines and Immunization (GAVI) is comprised of WHO and the World Bank, "national governments, international organizations such as the United Nations Children's Fund (UNICEF),"[9] private funds (Bill and Melinda Gates Children's Vaccine Program), and many other international foundations.[10] GAVI, as an international organization, has been able to transcend private industry financial obstacles to the use of

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[5] "Current IHR," Communicable Disease Surveillance and Response (CSR), World Health Organization, 2003 World Health Organization. <http://www.who.int/csr/ihr/current/en> (5 December 2003).

[6] "Revision Process of the IHR," Communicable Disease Surveillance and Response (CSR), World Health Organization, 2003 World Health Organization. <http://www.who.int/csr/ihr/revision/en> (5 December 2003).

[7] Heymann, "Emerging…"

[8] "Global Alliance for Vaccines and Immunization (GAVI)," Fact Sheet No. 169, Revised March 2001, ©GAVI, <http://www.who.int/vaccines/gavi/FactSheet-en.doc> (5 December 2003).

[9] "GAVI," Fact Sheet No. 169…

[10] "GAVI," Fact Sheet No. 169…

vaccines, making them available on a global scale. In spite of their successes, they see their mission as being far from complete.

Methodology:

The primary methodological approach of this paper is first to define the most widely known international vaccination and immunization programs and how they relate to public health policy. Specifically, this paper will take a closer look at the goals of the implementation of these programs to improve international public health, and finally, it will identify data that indicate whether some of the immunization programs already in place have achieved the objectives set for them.

The information provided by the WHO and associated organizations serves as a quite useful tool in determining the success of immunization programs, which have played such a major role in the reduction of incidents, and even the eradication of, some diseases. All of this information is great news, but it is seen only in light of the fact that the very eradication of this disease has rendered humanity practically defenseless to the possibility that a deadly disease may be purposefully reintroduced. This would unravel the very objectives to which organizations like GAVI took so long to become devoted.

Findings of separate, individual studies also provide insight into the factors associated with improved public health, such as comparatively stable economies, low fertility rates, coupled with low infant and child mortality rates.

Results:

As stated above, technology has made many things possible, while at the same time it has left much conflict unresolved. Many of the deaths experienced in countries around the world may be prevented through the implementation of immunization programs. Lack of financial resources is the greatest obstacle to the wide scale prevention of these diseases.[11]

[Table 1][12] Annual deaths from vaccine-preventable diseases, 2001 WHO Estimates

Disease	Under 5	Over 5	Total
Diphtheria	4 000	1 000	5 000
Measles	554 000	191 000	745 000
Polio	< 100	< 1 000	1 000
Tetanus	201 000	80 000	281 000
Pertussis	285 000	1 000	286 000
Hepatitis B	3 000	518 000	521 000
Haemophilus influenzae b (Hib)	450 000	-0-	450 000
Yellow fever	15 000	15 000	30 000
Meningitis AC*	12 000	14 000	26 000
Rotavirus*	338 000	162 000	500 000
Pneumococcal disease*	841 000	768 000	1 609 000
TOTAL	**2 703 000**	**1 751 000**	**4 454 000**

* Vaccines against meningitis AC, rotavirus and pneumococcal disease that are appropriate for use in developing countries are not currently available but under development.[13]

[11] John H. Barton, "Financing of Vaccines," *The Lancet*, Section: Viewpoint, pp. 1269-1270, vol. 355, no. 9211, 8 April 2000, 2000 The Lancet Ltd.: Stanford Law School, Stanford, CA. Available from LexisNexis™, George Mason University Libraries. <http://mutex.gmu.edu:2123> (30 November 2003).

[12] "Table 1" not part of original label provided by GAVI.

[13] Table, Title and Note: ©Global Alliance for Vaccines and Immunization, (GAVI) Partnering with the Vaccine Fund, <http://www.vaccinealliance.org/home/General_Information/Immunization_informa/Diseases_Vaccines/vaccine_preventable_deaths.php> (5 December 2003).

As the above table shows, child mortality rates are a significant indicator of the fatal effects of many diseases, such as pneumococcal disease, measles and influenza ("the flu"). Of these three diseases, the flu vaccine is one of the most underutilized in the world.[14] The number of outbreaks confirmed by the WHO having reached 578 from July 1998 to August 2001, including cholera, meningitis, haemorrhagic fever, anthrax, and viral encephalitis,[15] again reinforces the need for improved and expanded, multi-faceted immunization programs.

The GAVI reports that in 1974, when the World Health Assembly began its Expanded Programme on Immunization (EPI), the immunization rate was 5%, and that mortality rates have been reduced since the 1980's.[16] After finally raising the vaccination coverage of children to 80% in 1990, it dropped to 74% nine years later, and one fourth of today's children is still not covered by immunization against the six diseases – measles, polio, pertussis, diphtheria, tetanus and tuberculosis – initially covered by EPI.[17] Although these statistics show both room for improvement, as well as major achievements in the realm of public health, GAVI, and many other, smaller groups promote the use of vaccination by stating that their intentions are to decrease the number of deaths in children, saving a vast number of lives.

However, this focus on the vaccination of children is not unfounded. From a similar but not identical standpoint, other studies view the situation from an economic

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[14] "Under-Utilized Vaccines," Disease Information, ©GAVI, <http://www.vaccinealliance.org/home/General_Information/Immunization_informa/Diseases_Vaccines/disease_info.php?PHPSESSID=e8728ac9783a7a416fa127d334289d95> (6 December 2003).

[15] "Global outbreak alert and response," Part IV, Emerging and Epidemic-Prone Diseases, *Communicable Diseases Global Defence against the Infectious Disease Threat*, Edited by Mary Kay Kindhauser, side note, p. 59, 2003 World Health Organization: Geneva, < http://www.who.int/infectious-disease-news/cds2002/index.html> (5 December 2003).

[16] "GAVI," Fact Sheet No. 169…

[17] "GAVI," Fact Sheet No. 169…

improvement perspective. Research in this area focuses less on merely the well-being of children (although they most likely view this as positive), and more on data which suggest that there is a correlation between low infant and child mortality, and increased economic development, measured as "income per head" (GNP).[18] Dasgupta observes that regions in which countries possess relatively stable economies also have lower overall fertility rates, combined with low infant mortality, suggesting that fewer, yet healthier humans are being born.[19] The findings in the 1970's of P. N. Shrestha, Chief, Smallpox Eradication Project and Expanded Programme on Immunization, Department of Health Services, Kathmandu, Nepal, also support this focus on immunizing children. Shrestha observed that almost 75 percent of the smallpox cases (prior to its eradication in Nepal in the 1970's) were found in children under the age of 15. He also stated, "this age incidence is similar to that in many other countries,"[20] and is the primary reason for the program's focus on the vaccination of babies and children.

[18] Partha Dasgupta, "The Population Problem: Theory and Evidence," *Journal of Economic Literature*, p. 1898, vol. 33, no. 4, December 1995, 1995 American Economic Association, 2003 JSTOR. Available from JSTOR, George Mason University Libraries, <http://www.jstor.org/> (12 September 2003).

[19] Dasgupta, "The Population Problem…," p. 1882.

[20] P. N. Shrestha, "Smallpox Eradication in Nepal," p. 10, document WHO/SE/78.107, World Health Organization. Available from World Health Organization Website, <www.who.int> (30 November 2003).

Discussion:

The need for the continuation and improvement of vaccine programs is now a global – not simply domestic – concern. As people worldwide are now able to move about freely from country to country, so too are the diseases which they carry. The health and safety of each person is now affected by, if not dependent on, the health and safety of all others. As a result, international groups have been developing plans which are now greatly improved. Many deaths, however, still occur as a result of insufficient vaccination of the population. In addition, the mutation of many diseases, as a result of the now broadly based world of medicine, reinforces the need for immunization and protection against the uncontrolled spread of communicable disease.

While immunization is the most effective form of response and prevention of contagious diseases, several other measures that are included in these programs ensure that vaccines are administered in an environment with as much reduced threat as possible. For example, Shrestha points out that the success of the Smallpox Eradication Programme in which he was involved in Nepal would not have been reached without a system of reporting all cases – mild, severe and fatal.[21] Essentially, those involved in this project only began to make significant progress when participants actively sought to find, report, and isolate incidents of smallpox in Nepal in the 1970's.

GAVI and its members have launched extensive surveillance and monitoring programs, which keep track of incidents of infection, and death. They also have outlined the clear processes for communication and international response to reported outbreaks. The United States alone is in the early stages of its development of an extensive world-wide surveillance system, in coordination with other countries. These examples are

evidence that the need for monitoring is recognized. This is especially important if an act of bioterrorism is carried out, because this could affect many nations.

Of current focus are the malaria and influenza vaccines, and a possible HIV vaccine. The malaria and HIV vaccines require further research, while the widely successful, yet under-utilized flu vaccine calls for on-going research, in order to adapt to the mutation of various strains on a constant basis. International conferences are convened annually to determine what the upcoming year's needs will be for the flu vaccine.[22]

[21] Shrestha, "Smallpox Eradication…," pp. 2-3.

[22] ©Global Alliance for Vaccines and Immunization, (GAVI) Partnering with the Vaccine Fund, <http://www.vaccinealliance.org/home/General_Information/Immunization_informa/Diseases_Vaccines/disease_info.php?PHPSESSID=00c794f85ef441891da5d76b5f070563> (5 December 2003).

Conclusions:

Despite that the increased mobility of humans poses a major challenge in the realm of global health policy, the changes in technology that have also led to humans' ability to travel internationally, as well as intercontinentally, have also yielded potential avenues for the spread of knowledge. This increased access to information is perhaps the most useful tool of preventive medicine. On the other hand, these avenues for the dissemination of information are not well-suited for every region or country. In the consideration of public health policies, therefore, a great amount of research must be dedicated to determining the best way by which the interests, and particularly the health, of various groups of people may be included in global public health initiatives.

Also, the connection between low infant mortality and higher economic prosperity is important to the world of public policy in general. This link, more importantly, suggests that world development policy should be considered in conjunction with public health policy, not just for the sake of saving children's lives, but also for the purpose of promoting the welfare of humans more equitably over all nations. As, Dasgupta states,

> Correlation is not causation, but there are now reasons for thinking that such liberties [as political and civil] are not only desirable in themselves, but also have instrumental virtues in empowering people to flourish in the economic sphere.[23]

Thus, without stating that one factor causes another, policy should focus on the notion that improving public health holds strong implications for economic prosperity, taking into account individual, differing cultural factors. Overall, these factors provide an important basis for policy to improve human welfare.

[23] Dasgupta, "The Population Problem…," p. 1898.