WEEKLY EPIDEMIOLOGICAL REPORT

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Immunization against diseases of public health importance (part 2)

The cost-effectiveness of immunization

Immunization is considered among the most cost-effective of health investments. There is a well-defined target group, contact with the health system is only needed at the time of delivery and vaccination does not require any major change of lifestyle.

A recent study estimated that a one-week "supplemental immunization activity" against measles carried out in Kenya in 2002 in which 12.8 million children were vaccinated would result in a net saving in health costs of US$ 12 million over the following ten years; during that time it would prevent 3 850 000 cases of measles and 125 000 deaths. In the United States, cost-benefit analysis indicate that every dollar invested in a vaccine dose saves US$ 2 to US$ 27 in health expenses.

The cost of immunizing a child

In mid-1990s, vaccines to provide "basic" coverage for tuberculosis, polio, diphtheria, tetanus, pertussis, and measles cost about US$ 1 per child. Inclusion of vaccines for hepatitis B and Hib, raises the vaccine cost alone to US$ 7-13 per child (not including administration and injection equipment) in the developing world. When vaccine administration is included, the costs amount to between US$ 20-40 per child. It has become a significant challenge for low-income countries and international health agencies to find ways to introduce more highly-priced vaccines such as those for hepatitis B and Hib, which can greatly increase the costs of national immunization programmes. With many new vaccines expected to be available in the near future, issues of financing and financial sustainability will become ever more important.

Financing immunization

Many developing countries have difficulties affording vaccines. International initiatives such as the Expanded Programme on Immunization and the Global Alliance for Vaccines and Immunization (GAVI) have provided impetus, funding, and technical support that have helped increase immunization coverage and the number of vaccines provided. The proposed WHO-UNICEF Global Immunization Vision and Strategies, intended to run from 2006-2015, would further this existing coordination, aim to expand vaccination coverage, and enable the logistical systems set up for that purpose to provide other health care services as well.

The economics of vaccine development have tended to run against the interests of the world's poorer countries. Vaccines are much less profitable than medicines, and pharmaceutical firms understandably have been reluctant to make the high investments necessary to research and develop vaccines against infectious diseases, realizing that the largest pool of potential customers are governments that likely could not afford to pay enough for these products to ensure a profit. For the same reason, when new vaccines have been developed, limited quantities often have been manufactured, increasing the cost per dose. Part of the difficulty for manufacturers is in forecasting demand and in accounting for various market uncertainties.

Steps have been taken to deal with these challenges. For example, since 1977, the Region of the Americas Revolving Fund for Vaccine Procurement has acted as a bulk purchaser for countries that join the programme. The Fund

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assures manufacturers of a large and predictable market for vaccines, and over 30 participating countries of prices up to 80% below those offered to individual countries. The UNICEF Vaccine Independence Initiative, established in 1991, sets up a revolving fund for each participating country, allows these countries to buy vaccines through UNICEF's procurement system using local currencies, and enables them to pay for the vaccines only after delivery. A more recent approach is to guarantee a large market and a reasonable price in advance to pharmaceutical firms which develop vaccines that will have great health benefits for poor nations. This "push-pull" approach is being financed and progressively fine-tuned by a coalition of international donors, bilateral aid programmes, private philanthropists, and some governments.

Herd Immunity

Most diseases are treated or prevented for the most part on an individual basis. People with high blood pressure or diabetes must take medicine or change their lifestyle. What others do around them, and whether or not they suffer from the same conditions, does not have a direct effect on the health of those individuals.

Infectious diseases such as polio are different. Children's risk of catching polio is intimately connected to whether people around them are infected with the virus. It is also connected to whether those others are immune to infection as well as, of course, whether the children themselves are immune.
Children who are not immune to polio are far less likely to catch it if most of the people around them are immune, whether from having been vaccinated with OPV or from having been infected with the poliovirus in the past. In such a situation, if somebody infected with the poliovirus comes into the village and the virus is spread to his or her close contacts, they are likely to have antibodies against it. Their antibodies will inactivate the virus and stop it from being passed on to the next set of people. As long as the non-immune children do not have close contact with the infected person during the time that he or she is excreting the virus, they are not likely to become infected. If no non-immune host is found before the infected person stops excreting the virus, the virus cannot continue to replicate and will die out.

If each infected person transmits the infection to just one other person during the time that he or she is excreting the virus, the virus can continue to circulate. If each infected person transmits the virus to at least one other susceptible person, the virus will spread among the community, reaching ever-larger numbers of people. But, statistically speaking, if each infected person transmits the virus to on average less than one other susceptible person, the virus will eventually die out.

When enough people in a community are immune, people infected with poliovirus will transmit the infection to (on average) less than one other person each. Therefore, even if a virus is introduced, it will not spread far. Most people in the community will never encounter the virus, much less become infected with it. Thus, even those who are not individually immune will be protected. It can then be considered that the community as a whole is safe from sustained circulation of virus, and is a secure environment for the few non-immune people within it. That is known as **"herd immunity"** or some times it is refered as **"community immunity"**. The overall high level of immunity in the group protects the few who are not individually immune.

The proportion of people who must be immune to a disease in order for herd immunity to benefit the community depends on how contagious the disease is and on the conditions which allow it to spread. A highly contagious disease in conditions favourable for spread (for example, in an area with high population density) will require a very high proportion of people to be immune before herd immunity can protect the non immune.
The level of immunity in the population can be raised either through epidemics of disease, or through vaccination. The latter, of course, is much safer and less painful. In order to gain the full benefit of herd immunity, however, a very high proportion of people must be vaccinated. For reach disease and population, it is possible to calculate the proportion of people who must be vaccinated in order to ensure that the disease cannot spread. If a higher proportion is vaccinated, the disease will gradually shrink in scope and die out; no epidemic will occur.

For polio, it has been calculated that 80-86% of children need to be vaccinated to stop the spread of the virus 4. The exact proportion necessary will vary slightly from place to place, depending on local conditions. It is important to note that the critical proportion of population immunity must be maintained in every community and area in a country, not merely at an overall national level; otherwise outbreaks will still be possible in some places.

WHO immunization work

In the field of immunization WHO works with partners including governments, United Nations agencies and other international organizations, bilateral government health and development agencies, non-governmental organizations, professional groups and the private sector. WHO's specific responsibilities include:

- Supporting and facilitating research and development;
- Ensuring the quality and safety of vaccines;
- Developing policies and strategies for maximizing the use of vaccines;
- Reducing financial and technical barriers to the introduction of vaccines and technologies; and Supporting countries in acquiring the skills and infrastructure needed to achieve disease control and eradication.

Resource:

http://www.who.int/mediacentre/factsheets/fs288/en/print.html
www.wpro.who.int/internet/files/pub/Polio3/chapter2.pdf

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Table 1: Vaccine-preventable Diseases & AFP

24th - 30th April 2010(17th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2010	Number of cases during same week in 2009	Total number of cases to date in 2010	Total number of cases to date in 2009	Difference between the number of cases to date in 2010 & 2009
	W	C	S	N	E	NW	NC	U	Sab					
Acute Flaccid Paralysis	00	00	00	00	00	00	00	00	00	00	01	29	24	+ 20.08 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	-
Measles	01	00	00	00	00	00	00	00	00	01	11	33	44	- 25.0 %
Tetanus	00	00	00	00	00	00	00	00	00	00	01	08	10	- 20.0 %
Whooping Cough	00	00	00	00	00	00	00	00	00	00	00	07	22	- 68.2 %
Tuberculosis	207	00	12	05	06	22	01	09	16	278	349	2997	2756	+ 08.7 %

Table 2: Newly Introduced Notifiable Disease

24th - 30th April 2010(17th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2010	Number of cases during same week in 2009	Total number of cases to date in 2010	Total number of cases to date in 2009	Difference between the number of cases to date in 2010 & 2009
	W	C	S	N	E	NW	NC	U	Sab					
Chickenpox	05	07	07	06	04	13	02	02	07	53	508	1349	5946	- 77.3 %
Meningitis	10 CB=6 KL=4	01 NE=1	04 GL=3 HB=1	00	01 TR=1	05 KN=5	02 AP=1 PO=1	01 BD=1	10 RP=6 KG=4	35	23	520	352	+ 47.7 %
Mumps	01	00	03	03	02	04	02	01	04	20	21	290	587	- 50.6 %
Leishmaniasis	00	00	00	00	00	00	10	00	00	10	09	116	362	- 67.9 %

Key to Table 1 & 2

Provinces: W: Western, C: Central, S: Southern, N: North, E: East, NC: North Central, NW: North Western, U: Uva, Sab: Sabaragamuwa.

DPDHS Divisions: CB: Colombo, GM: Gampaha, KL: Kalutara, KD: Kandy, ML: Matale, NE: Nuwara Eliya, GL: Galle, HB: Hambantota, MT: Matara, JF: Jaffna, KN: Killinochchi, MN: Mannar, VA: Vavuniya, MU: Mullaitivu, BT: Batticaloa, AM: Ampara, TR: Trincomalee, KM: Kalmunai, KR: Kurunegala, PU: Puttalam, AP: Anuradhapura, PO: Polonnaruwa, BD: Badulla, MO: Moneragala, RP: Ratnapura, KG: Kegalle.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps.

Special Surveillance: Acute Flaccid Paralysis.

Leishmaniasis is notifiable only after the General Circular No: 02/102/2008 issued on 23 September 2008.

Table 4: Selected notifiable diseases reported by Medical Officers of Health

24th - 30th April 2010(17th Week)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptospirosis		Typhus Fever		Viral Hepatitis		Human Rabies		Returns Received
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%
Colombo	47	1617	4	61	0	5	4	24	0	7	5	231	0	3	0	24	0	1	**77**
Gampaha	40	1607	0	13	0	9	0	14	0	8	4	155	0	2	1	35	0	2	**67**
Kalutara	18	475	6	51	2	8	0	7	1	24	3	129	0	0	1	15	0	1	**83**
Kandy	18	546	5	95	0	1	3	11	0	2	1	24	5	62	2	25	0	1	**78**
Matale	7	328	1	183	0	1	0	8	2	62	4	42	0	3	2	21	0	0	**83**
Nuwara	0	59	12	85	0	0	2	47	57	61	0	9	0	27	1	17	0	0	**85**
Galle	27	303	5	72	0	4	0	0	0	9	3	28	0	3	0	6	0	2	**63**
Hambant	14	298	1	14	0	2	0	1	0	3	0	21	0	42	0	4	0	0	**100**
Matara	2	142	1	38	0	1	0	1	0	39	1	118	1	65	0	9	0	0	**65**
Jaffna	10	1987	4	63	0	1	4	300	0	5	0	0	0	98	1	33	0	1	**42**
Kili-	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**25**
Mannar	0	79	1	15	0	0	0	24	0	2	0	0	0	0	1	12	0	0	**100**
Vavuniya	2	481	1	15	0	1	0	25	0	7	0	0	0	0	0	10	1	1	**50**
Mullaitivu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Batticaloa	25	967	4	44	0	2	1	15	13	25	1	5	0	1	1	1	0	1	**86**
Ampara	1	62	0	23	0	1	0	4	0	6	0	16	0	0	0	7	0	0	**57**
Trincomal	14	718	0	50	0	5	0	3	0	7	0	8	1	6	0	11	0	0	**60**
Kurunega	19	487	12	80	2	5	0	12	0	5	4	143	0	22	2	45	0	1	**75**
Puttalam	6	513	2	27	0	3	0	31	0	120	0	53	0	0	1	9	0	0	**44**
Anuradha	8	724	0	28	0	2	0	3	0	21	1	28	0	17	0	23	0	3	**53**
Polonnar	10	151	0	23	0	1	0	1	0	2	0	34	0	0	0	15	0	0	**71**
Badulla	3	228	2	59	0	1	0	34	0	13	2	28	1	32	0	35	0	0	**53**
Monaraga	9	192	3	70	0	0	0	18	0	4	1	16	0	20	0	48	0	1	**55**
Ratnapur	23	687	8	127	0	4	0	9	0	8	2	154	0	29	0	43	0	1	**50**
Kegalle	5	343	8	27	0	4	1	24	0	15	1	83	0	5	0	38	0	0	**64**
Kalmunai	12	448	9	70	0	0	0	5	0	0	0	0	0	0	0	7	0	1	**62**
SRI LANKA	**320**	**13443**	**89**	**1334**	**04**	**61**	**15**	**631**	**73**	**455**	**33**	**1307**	**08**	**437**	**13**	**493**	**01**	**17**	**66**

Source: Weekly Returns of Communicable Diseases WRCD).
*Dengue Fever / DHF refers to Dengue Fever / Dengue Haemorrhagic Fever.
**Timely refers to returns received on or before 30thApril , 2010 Total number of reporting units =311. Number of reporting units data provided for the current week: 236
A = Cases reported during the current week. B = Cumulative cases for the year.

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Comments and contributions for publication in the WER Sri Lanka are welcome. However, the editor reserves the right to accept or reject items for publication. All correspondence should be mailed to The Editor, WER Sri Lanka, Epidemiological Unit, P.O. Box 1567, Colombo or sent by E-mail to chepid@sltnet.lk.

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