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Social, Economic and Psychological Impacts of Childhood Diseases Subject to Immunization

Introduction

Childhood diseases *sensu stricto*, preventable by immunization, and other diseases which can occur at any age, all have as main effects mortality, morbidity, suffering, financial costs for the family or community, loss in quality of life or long-term consequences such as disability, malformation and dependency. Even if the immediate impact of a given disease may appear to be relatively small (for example rubella), there may occur substantial secondary effects which must be taken into account. The total burden of some of the childhood infectious diseases is often overlooked as they may bring chronic sensory or mental, heart, locomotion or nervous system disturbances. In evaluating the impact of those diseases and of preventive actions, the division into social, economic and psychological aspects is largely artificial; they mostly are interdependent and always socioeconomically and sociopsychologically connected.

Social Impact

The importance and the social impact of childhood diseases vary according to the disease in question, its incidence, mortality and the expected relative frequency of adverse reactions to immunization. The reduction of mortality has a most important demographic impact in developing countries. For the situation in Europe see Table 1. In the US in the pre-immunization period (before 1963) an average of 4 million cases of measles occurred each year. In 1968 there were 250,000 estimated cases, and the target for 1990 of less than 500 [1] has not been achieved: there were over 22,000 cases until the end of September 1990. (The original target for the elimination of all indigenous measles transmission was 1982!) The incidence of new cases and the number of fatalities due to immunizable children's diseases now decline everywhere year by year, and the adverse reactions are becoming relatively more prominent.

As an illustration two examples are given below (Tables 2 and 3):

Estimated European regional immunization coverage based on routine reports (latest available information as per January 1990) [2] was:

BCG	76%	(Italy 30%, Luxemburg 50%, Sweden 12%)
DPT	84%	(Ireland 45%)
Polio	86%	
Measles	74%	(France 41%, FRG 50%, Italy 21%, Malta 58%)

Table 1: Diseases subject to EPI programme – reported annual incidence in Europe a) (last available information as per January 1990).

	Cases	No. of countries represented	% of Countries	
Diphtheria	886b)	26	81	1989
Measles	290,748	25	78	1987
Pertussis	103,982	27	84	1987
Poliomyelitis	133c)	31	97	1989
Tetanus	892	10	31	1987
Neonatal tetanus	65d)	3	9	1989
Tuberculosis	118,506	25	78	1987
				Reference [2]

a) Including Israel;
b) 98% of cases were reported from the USSR, Albania and Turkey;
c) 87% of 89 cases reported from the USSR;
d) 63 cases in Turkey.

Table 2: Estimated frequency of complication in pertussis and after immunization.

	Whooping cough per 100,000 cases	DPT vaccine per 100,000 doses
Permanent brain damage	600 – 2,000	0.2 – 0.6
Death	100 – 4,000	0.2
Encephalopathy/encephalitis	90 – 4,000	0.1 – 3.0
Convulsions	600 – 8,000	0.3 – 90
Shock	–	0.5 – 30
Sudden infant death syndrome		0.04 – 1.5
		Reference [3]

Table 3: Serious reactions in nonimmunized and immunized against measles.

	Per 100,000 cases of measles	Per 100,000 vaccinations
Pneumonia	5,000	1
Convulsions	720	60
Brain damage	280	0.1
Early death	10	0.02
		Reference [4]

Out of 32 member states 14 (44%) stopped using BCG. Indicators of the social impact are not all perceived nor clearly defined. They involve ethical and legal questions, for example laws regulating insurance for treatment and immunization, prevention, compensation (even if there is

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no compulsion for immunization), for rare but nevertheless possible cases of side effects. They should not be denied but discussed openly, both as failures and/or real controversies.

Beyond physical suffering and death the prominent social impact indicator of infectious diseases is the capability to function normally, i.e. the social integration of persons who have been affected. This involves assured training and working opportunities as well as social legislation for the employment of handicapped persons. The whole social dynamic is expressed by the following parameters:

- risk of disease for community and individual, and risk acceptance (ignorance, fatalism, lack of communication);
- social responsibility for vaccination (lack of opportunities, services, operational difficulties);
- acceptance of immunization by the public and/or the right to refuse (sects refusing immunization exist in all major religions);
- right of the authorities to impose certain administrative measures (camps, nurseries, kindergartens, schools, military services, etc.)

Target setting in children's diseases is clear: prevention, elimination of morbidity and mortality or of the consequences of a disease. However, on close analysis some differentiation is necessary as to social acceptance, organization and support. Is the goal short-term or long-term, is it control or eradication? Although the results of immunization are best measured against the absence of disease, the problem of evaluation is not self-evident as it includes many facets and areas. Data can be misused in various ways [5]:

- "eye-wash", overstating effects of a programme;
- "submarine", attempt to torpedo a programme by overstating negative side effects;
- "white-wash", attempt to hide the lack of results or failures;
- "postponement", attempt to delay a programme under the pretext of need for further research;
- "posture", the evaluation is carried out but not taken into account in decision making.

A social impact can be caused by serious controversies in society and among physicians about the efficacy and best strategy of vaccination (examples: BCG, polio [6,7], pertussis, rubella, DPT [8]). As far as the public is concerned, this may be influenced by the knowledge about infections and the attitudes towards them: by a perceived threat, the susceptibility to infectious diseases and their severity, the perceptions and knowledge about the efficacy, availability of vaccines and the fear of reactions to vaccines, furthermore by the concepts of health and preventive medicine, and the knowledge and attitudes towards health services and their personnel. All this is conditioned by the socioeconomic levels of the families and by their cultural environment. The last are difficult, but not impossible to influence.

Everywhere there are also anti-vaccinationists among physicians, who argue that the risk of exposure to infections is smaller than the risk of immunization. The classical examples are the controversies over pertussis vaccine-associated encephalopathy/encephalitis or over vaccine-associated poliomyelitis cases and the "spread" (type 3 virus) in OPV contacts (12 vaccine-associated cases occurred in Europe in 1989 [9]). In the 15-year study (1970–1984) by the WHO in six countries the risk of vaccine-associated poliomyelitis has been found to be less than one case per one million children vaccinated [10,11], in other studies 0.23–0.5 cases [12–15] per one million immunized (approximately one case per 2.8 to 5 million doses distributed [10]). Long-time non-acceptance of measles vaccination by some European physicians was due to the fear that the proportion of cases in the older high-risk age groups might increase when and if the immunity wanes. Conflicting advice often confused the public.

The potentially most dangerous new trends influencing the immunization issue are the attitudes of so-called alternative medicine. Although formerly not explicitly mobilizing against immunization but rather against science and modern medicine, these groups, particularly homeopaths, have now become more aggressive, amply supported by the media and anti-vaccination literature. Through manifested skepsis and political or public pressure they might undermine confidence in immunization procedures, diminish the acceptance in the community and make the maintenance of a high level of coverage difficult. In France there is a liga for the freedom of vaccination and the book against vaccination has had six editions [16]. *Rey* saw some ecological echo [17] in the opposition to immunization. The WHO can be rightly criticized that it has not yet taken steps to invalidate the arguments of the anti-vaccinationists.

Economic Impact

The assessment of the economic impact with all the financial consequences of an infectious disease and the evaluation of control activities has been one of the objectives of the WHO Regional Office for Europe. (Project established in 1975, meeting in 1981). Unfortunately, values corresponding to various children's diseases in absolute terms are rarely available, nor are they systematically analyzed where data collection is possible. A distinction should be made between the direct and indirect costs of a disease. Direct costs essentially relate to the value of health service resources expended as a result of a given disease, while indirect costs measure the broader effects on the economy as a whole, in terms of the loss of output resulting from morbidity, disability and premature mortality.

Concerning direct costs, the following categories can be distinguished [18]:

a) preventive activity, immunization and prophylaxis, promotion of environmental health, health education, diagnosis;

b) curative and follow-up activity (outpatient care, hospi-

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Table 4: Costs involved in 11 national immunization programmes.

Programme component	Average percentage of total cost range
Recurring costs	77% (70 – 86%)
Salaries	45% (27 – 60%)
Transportation	12% (8 – 15%)
Vaccine	12% (3 – 21%)
Miscellaneous	8% (5 – 43%)
Capital costs (facilities and equipment)	23% (14 – 30%)

tal care and convalescence) and rehabilitation (braces and appliances);
c) supportive activity (research, identification of high-risk groups, development of health information systems, and training of health personnel), training of affected persons in special skills.

Indirect costs include a number of non-monetary indicators for comparative purposes. Four main headings are distinguished:
a) rates of incidence;
b) rates of mortality;
c) rates of disability (temporary and long-term) and diminished competition capacity;
d) loss of earnings and production (for parents of a sick child).

Only the last of these indicators relates to measurable financial costs, but the other items are clearly relevant for an assessment of the overall impact of a disease. The measurement of indirect costs raises a number of difficulties both practical and conceptual, for example relating to the measurement of output losses due to premature mortality. The costs involved in 11 national programmes (Table 4) can be summarized as follows [19].

It is a characteristic of infectious diseases that they impose a substantial economic burden on society even if their incidence has fallen to zero or near zero, due to the need to maintain preventive activities (immunization*), particularly important where a high incidence could return unless control measures are constantly repeated for each new susceptible generation. This makes the idea of eradication so attractive, since it would be less expensive than to perpetually continue to immunize, as the example of smallpox has demonstrated. (In the US alone annual savings are at least one thousand million US dollars. This is more than three times the cost of the entire smallpox eradication). However, also immunization per se is economically profitable. The total loss incurred by one case of paralytic polio is sufficient to immunize 10,000 children and prevent 100 cases of the disease [20].

The cost/benefit analysis given below (Table 5) shows the variance depending on the country, author and measuring instruments:

*coverage, intensive surveillance, active (and probable) case investigation, eventually aggressive outbreak control

Table 5: Ranges of cost/benefit analysis in different immunization programmes.

BCG	1:10 – 1:40
Influenza	1: 2 – 1:12 (adults)
Rubella	1: 6 – 1:20
Measles	1: 4 – 1:10
Mumps	1: 2 – 1: 7
Pertussis	1: 3
Polio	1: 2.6 – 1:90

References [21–24]

Table 6: Advantages and costs saved due to measles vaccination in the USA (1963–1981).

Cases prevented	48,200,000
Deaths prevented	4,840
Late damages prevented	16,100
Normal life expectancy assured	1,439,000
Schooldays made possible	159,309,000
Physician's treatment avoided	24,880,000
Hospital days avoided	2,762,000
Saving	$ 4,448,000,000

Reference [26]

Even a cost/benefit ratio of 1 : 1 signifies the self-financing of the immunization programme. The total costs of the control programme and of the expenditure for disease should be compared with the costs that would have been incurred if no control measures had been carried out. (For calculations undertaken in Europe see [25]).

In the analysis of a preventive measure, the total costs of the control programme and disease are compared with the number of cases of an illness prevented, the result being often expressed as the cost per prevented case (as an example see Table 6).

The benefit can also be measured by the saving in suffering and human lives, but in that case certain monetary values need to be established. Although some health economists have attempted to do so [27], it is questionable whether human lives and suffering can ever be expressed in terms of money. Both methods, cost-benefit and cost-effectiveness are open to critics, not only due to methodological problems but also for being thought superfluous today [28,29]**). They might be useful for new vaccines and their comparison with the presently used ones.

Psychological Impact

The psychological impact of the diseases subject to immunization, once they have occurred, is not only felt by

**Although immunization programmes have met with general support, and although there is no definite prospect that outside donor support will be reduced, and indeed in the medium term it may even have increased, the other side of "sustainability" is the question of who will pay the 2.000 million US $ annually ($ 600 million thereof in hard currency for vaccines, for example) that a fully sustained global immunization is projected to cost in the future. Although the developing nations already globally pay some 80% of the estimated costs of the "Universal Childhood Immunization" (also called UCI) campaign, these are mostly for salaries in local "soft" currencies [30].

affected children, but also by their parents. For the individual it includes psychic suffering due to unnecessary illness, unhappiness due to the inability to fully participate in normal activities, and due to impairment of some functions, (for example blindness or paralyses) or handicaps preventing social integration at later stages (partnership, marriage, etc.). There can be the hidden grudge of the handicapped towards parents who did not facilitate immunization. The parents might have feelings of guilt for the rest of their lives. The care of severely mentally handicapped children not infrequently leads to a breakdown of the family or of marriage.

The first and most important psychological factor influencing all further stages is the parents' perception of the risk of infectious diseases, the awareness of danger or the disregard of it, and the willingness to accept it. Formerly the risk was obvious to every parent. The subsequent fall in incidence and/or the complete absence of some infectious diseases has led to a loss of fear, a slackening of immunization efforts or to diminished acceptance, resulting in a low degree of a subjectively felt need for protection. This phenomenon is observed in some European countries (vaccination tiredness, immunization gap). In Vienna in 1988, for example, 40% of children and adolescents were not protected against measles and mumps, although 1987 was an epidemic year. Protection levels over 55–60% are infrequent in other cities. The lack of an immunization protection is thought to have been responsible for the measles epidemic in Hungary, December 1988 to May 1989, affecting about 20,000 immunized but not protected persons of whom 70% were between 16 and 22 years old. Presumably the vaccine was not of sufficient stability and the immunization at eight months was too early for permanent protection. The same happened in Albania with well over 40,000, perhaps over 100,000 cases in 1989 and in Canada (10,000 cases until mid 1989), in Czechoslovakia in 1990 and in California with thousands of cases. According to the director of the CDC's Immunization Division in Atlanta, 97% of the children entering school are adequately immunized against diphtheria, tetanus, poliomyelitis, mumps, rubella and measles, but a substantial number of preschool children was not vaccinated at the recommended age. A study in Ohio found that only a little over 60% of children whose parents had 12 years or less of education were adequately immunized, compared with 83% of children whose parents had had 16 or more years of education. In 1988 CDC estimated that as many as 11 million women in the United States had not been immunized against rubella. Similarly, 11 million young adults are not protected against measles [31], causing an upsurge of measles outbreaks in urban areas in 1990. It is disturbing that nearly 15 million American women of childbearing age have no private or governmental health insurance that covers maternity care. In 1988 more than 11 million children were not insured for medical care [32]. Complaints about the psychological lack of motivation came from the Federal Republic of Germany. In a survey [33] children's diseases were considered as dangerous only by 5% of the participants and the need for immunization was acknowledged by 20% only. According to the Institute of Psychology at the University of Bonn the barriers to motivation for immunization were:

- immunization is only part of health awareness and promotion programmes;
- it is not seen as prophylaxis of the main risk factors in life (ecology, stress, street traffic accidents, unhealthy food habits and use of stimulants);
- permanent impairments are not expected;
- past personal experience of disease without consequences demotivates the parents;
- low probability – general or personal – of presently getting children's infectious diseases;
- widely spread skepsis and insecurity about the real protection impact of immunization coupled with lack of adequate knowledge about it;
- generally widely spread information about complications and damages due to immunization;
- information deficit among physicians and thus their negative advice;
- emotional apprehension or fear of the procedure itself;
- mother's fear of negative reactions in children (crying);
- fear of aesthetic impairment;
- forgetfulness about the dates (in the absence of an invitation from health authorities or of a reminder through media);
- financial constraint if immunization is not reimbursed;
- refusals for religious reasons.

Children's diseases cannot be separated from the consideration of the main (seventh) basic epidemiological question: "What action did you take?" For a long time the logic of this, i.e. complete vaccination coverage, has been self-evident as it still is in countries where such diseases are highly prevalent and their burden great. It served as a measure of minimal competence of governments, of political bodies and of the preventive health services, and today it shows the relation of the public to those services.

In the hands of able leaders social mobilization of the medical profession and the general public, well-designed and well-operating projects can substantially reduce infant and child mortality and morbidity rates and effectively eliminate sequels of children's diseases subject to immunization.

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