Estimating the costs of achieving the WHO–UNICEF Global Immunization Vision and Strategy, 2006–2015

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Objective To estimate the cost of scaling up childhood immunization services required to reach the WHO–UNICEF Global Immunization Vision and Strategy (GIVS) goal of reducing mortality due to vaccine-preventable diseases by two-thirds by 2015.

Methods A model was developed to estimate the total cost of reaching GIVS goals by 2015 in 117 low- and lower-middle-income countries. Current spending was estimated by analysing data from country planning documents, and scale-up costs were estimated using a bottom-up, ingredients-based approach. Financial costs were estimated by country and year for reaching 90% coverage with all existing vaccines; introducing a discrete set of new vaccines (rotavirus, conjugate pneumococcal, conjugate meningococcal A and Japanese encephalitis); and conducting immunization campaigns to protect at-risk populations against polio, tetanus, measles, yellow fever and meningococcal meningitis.

Findings The 72 poorest countries of the world spent US$ 2.5 (range: US$ 1.8–4.2) billion on immunization in 2005, an increase from US$ 1.1 (range: US$ 0.9–1.6) billion in 2000. By 2015 annual immunization costs will on average increase to about US$ 4.0 (range US$ 2.9–6.7) billion. Total immunization costs for 2006–2015 are estimated at US$ 35 (range US$ 13–40) billion; of this, US$ 16.2 billion are incremental costs, comprised of US$ 5.6 billion for system scale-up and US$ 8.7 billion for vaccines; US$ 19.3 billion is required to maintain immunization programmes at 2005 levels.

In all 117 low- and lower-middle-income countries, total costs for 2006–2015 are estimated at US$ 76 (range: US$ 23–110) billion, with US$ 49 billion for maintaining current systems and $27 billion for scaling-up.

Conclusion In the 72 poorest countries, US$ 11–15 billion (30%–40%) of the overall resource needs are unmet if the GIVS goals are to be reached. The methods developed in this paper are approximate estimates with limitations, but provide a roadmap of financing gaps that need to be filled to scale up immunization by 2015.

Bulletin of the World Health Organization 2008;86:27–39.

Une traduction en français de ce résumé figure à la fin de l'article. Al final del artículo se facilita una traducción al español. الترجمة العربية لهذه الخلاصة في نهاية النص الكامل لهذه المقالة.

Introduction

In 2005, the World Health Assembly approved, and the United Nations Children's Fund (UNICEF) Executive Board endorsed, the Global Immunization Vision and Strategy (GIVS).[1,2] The primary objective of GIVS is to reduce vaccine-preventable disease mortality and morbidity by two-thirds by 2015 compared to 2000, a contribution towards achieving the Millennium Development Goals, especially Goal 4, which calls for a two-thirds reduction of under-5 mortality by 2015.[3]

GIVS identifies four strategic areas: immunizing more people against more diseases; introducing newly available vaccines and technologies; linking immunization to other critical health interventions; and managing vaccination programmes and activities within the context of global interdependence. GIVS articulates more than 25 new ideas and innovative approaches, and it is anticipated that countries will adopt the strategies most suited to their needs.

GIVS was developed in the context of increasing resources for immunization; in 1999 a public–private partnership, The Global Alliance for Vaccines and Immunization (GAVI Alliance) was initiated to provide financial support for immunization in the world's poorest countries.[4–6] By the end of 2005, government and private sources had pledged a total of US$ 3.3 billion to the GAVI Alliance, enabling it to provide support to 73 of 75 eligible countries. Between 2000 and 2005, total GAVI Alliance disbursements were US$ 760.5 million.[7] GAVI Alliance's resource outlook over the next decade has improved with the launch of two innovative funding mechanisms: the International Finance Facility for Immunisation (IFFIm),[8] which could provide up to US$ 4 billion over the next 10 years, and the Pneumo Advance Market Commitment (AMC),[9] which will provide US$ 1.5 billion to support low-income countries for the purchase of new vaccines against *Streptococcus pneumoniae*, a leading cause of childhood meningitis and pneumonia mortality.

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doi:10.2471/BLT.07.045096
(*Submitted: 18 June 2007 – Revised version received: 9 October 2007 – Accepted: 12 October 2007 – Published online: 6 December 2007*)

In 2005, WHO and UNICEF undertook, as a companion to the GIVS document, to estimate the costs to reach immunization goals;[10] this paper reports on the methods and results of that initial exercise.

Methods

Countries included

Estimates were done for all low- and lower-middle-income countries (as of 2003)[11] focusing on the subset of GAVI Alliance-eligible countries[12] (for 2005–2010, countries with 2003 gross national income (GNI) per capita < US$ 1000), whose characteristics[11,13,34] are highlighted in Table 1.

Cost components included

The costing has two main components: the first estimates current spending for immunization as of 2005 and how much will be needed to maintain the current immunization system. The second component estimates the incremental costs needed to scale up immunization coverage, including routine delivery and campaigns, and to introduce all available and safe vaccines according to WHO recommendations, including a finite set of new vaccines expected to become widely available (see Fig. 1).

For vaccine-specific costs, we define "traditional" vaccines as those in widespread use in the Expanded Programme on Immunization (EPI): Baccillus Calmette–Guérin (BCG), three doses each of diphtheria-tetanus-pertussis (DTP) and oral polio vaccine (OPV); (we assume use of this ceases in 2010 following polio eradication), a single dose of measles vaccine (MCV1) for children under one year of age, and two doses of tetanus toxoid (TT2+) vaccine for pregnant women. "Underused" vaccines include a second dose of measles (MCV2); three doses of hepatitis B (HepB) and *Haemophilus influenzae* type b (Hib) vaccines; yellow fever (YF); and rubella. "New" vaccines include three doses of rotavirus and conjugate pneumococcal vaccines; and single doses of Japanese encephalitis (JE) and conjugate meningococcal A (MenA) vaccine, for populations at risk.

Deriving country-specific projections

Costs are projected using the following assumptions: (a) routine coverage of existing vaccines based on actual 2005 country-specific immunization schedules in use reaching 90% by 2015; (b) mortality reduction campaigns; and (c) introduction of underused and new vaccines as rapidly as feasible. We developed a Microsoft Excel-based framework to generate country-specific coverage estimates and projections, the WHO Immunization Coverage Estimates and Trajectories (WHO ICE-T)[14] (Annex 1, available at: http://www.who.int/immunization_financing/analyses/givs_costing_annex1.pdf).

Four types of vaccination campaigns are included: for rapid mortality reduction (tetanus, measles); and in conjunction with the introduction of new or underused vaccines (yellow fever and meningococcal A). The schedule of campaigns occur in each country based on expected coverage levels, the joint UNICEF and WHO strategic plans for Measles Mortality Reduction[15] and Maternal and Neonatal Tetanus elimination,[16,17] and the assumed year of introduction of new or underused vaccines. If the expected routine coverage levels are achieved by 2015, we assume no further immunization campaigns are needed, except occasionally in isolated areas with very low routine coverage.

We assume measles campaigns are needed until adequate routine two-dose coverage is reached; and schedule the occurrence of such campaigns every three years when routine first-dose coverage is under 75% and then every four years until first-dose routine coverage reaches 95% and routine second dose coverage reaches 90%. We assume that measles second-dose routine is introduced when a country reaches 80% routine first-dose coverage, and rubella vaccine is introduced after the first campaign following the introduction of routine second dose. Including a second dose of measles vaccine to the routine schedule adds a new visit to the schedule, another opportunity for children to contact the health-care system and receive other complementary interventions. Because of the complexity of adding a new visit to the schedule, we (conservatively) assume a five-year roll out to introduce a second dose.

For the introduction of underused (where not already used) and new vaccines, we assume phase-in over several years, based on grouping of countries by current immunization coverage and economic status (Annex 1, available at: http://www.who.int/immunization_financing/analyses/givs_costing_annex1.pdf). The dates of introduction of the pneumococcal, rotavirus, Hib, and HepB vaccines are country-specific, based on expert opinion, and it was assumed that in countries at risk, the YF vaccine would be introduced in 2006–2007, and that introduction of the meningococcal and JE vaccines would begin in 2009 and 2008 respectively.

Estimating country-specific costs

Estimating baseline costs (costing block A).

We developed an econometric model based on country-level data from the GAVI Alliance Financial Sustainability Planning (FSP)[18,19] process to estimate current investments in immunization and how much will be needed to maintain immunization systems at the status quo, assuming no change in vaccination schedules and constant immunization coverage levels.

These baseline data from 40 countries (country groupings and characteristics are listed in Table 1), use a common methodology comparable across the subset of countries and are relatively recent (2002–2004). However, they are biased towards low-income countries (82%) because of GAVI Alliance-eligibility requirements and because the African Region is over-represented (57%).

All routine immunization-specific costs (see costing block C for a description of what is included in these costs), excluding spending on vaccines and campaigns, which we estimate separately in costing blocks B and D respectively, are included.[20] To these were added shared health systems costs (mainly personnel and transportation costs). Inflationary adjustments[21] are made to bring all costs to year 2000 US dollars for analysis, although all cost results are reported in 2005 dollars.

Various regressions using different linear combinations of Box-Cox[22,23] transformed variables were tested, with size-effect variables (either population or surviving infants), coverage,[34] rural population,[24] a dummy variable indicating the use of the hepatitis B vaccine, and GNI per capita representing the independent variables significantly correlated with costs. Standard model

Table 1. **Characteristics of countries and country groupings**

Country	2003 GNI per capita[11]	DTP3 2005 coverage[34]	U5MR 2005[13] (per 1000 live births)	Country	2003 GNI per capita[11]	DTP3 2005 coverage[34]	U5MR 2005[13] (per 1000 live births)
Low-income countries, GAVI Alliance-eligible (*n* = 60)							
Overall (across group)	**433**	**66**	**118**	Myanmar	NA	73	105
Afghanistan	NA	76	257	Nepal	240	75	74
Angola	740	47	260	Nicaragua	730	86	37
Bangladesh	400	88	73	Niger	200	89	256
Benin[a]	440	93	150	Nigeria	320	25	194
Bhutan[a]	660	95	75	Pakistan	470	72	99
Burkina Faso[a]	300	96	191	Papua New Guinea	510	61	74
Burundi[a]	100	74	190	Republic of Moldova	590	98	16
Cambodia[a]	310	82	143	Rwanda[a]	220	95	203
Cameroon	640	80	149	Sao Tome and Principe	320	97	118
Central African Republic	260	40	193	Senegal[a]	550	84	136
Chad	250	20	208	Sierra Leone[a]	150	64	282
Comoros[a]	450	80	71	Solomon Islands	600	80	29
Congo[a]	640	65	108	Somalia	NA	35	225
Cote d'Ivoire[a]	660	56	195	Sudan	460	59	90
Democratic People's Republic of Korea[a]	NA	79	55	Tajikistan[a]	190	81	71
Democratic Republic of the Congo[a]	100	73	205	Timor-Leste	430	55	61
Eritrea	190	83	78	Togo	310	82	139
Ethiopia[a]	90	69	164	Uganda[a]	240	84	136
Gambia[a]	310	88	137	United Republic of Tanzania[a]	290	90	122
Ghana[a]	320	84	112	Uzbekistan[a]	420	99	68
Guinea[a]	430	69	150	Viet Nam[a]	480	95	19
Guinea-Bissau	140	80	200	Yemen[a]	520	86	102
Haiti[a]	380	43	120	Zambia[a]	380	80	182
India	530	59	74	Zimbabwe	480	90	132
Kenya[a]	390	76	120				
Kyrgyzstan[a]	330	98	67	**Lower-middle-income countries, GAVI Alliance-eligible (*n* = 12)**			
Lao People's Democratic Republic[a]	320	49	79	***Overall (across group)***	**850**	**76**	**36**
Lesotho[a]	590	83	132	Armenia[a]	950	90	29
Liberia	130	87	235	Azerbaijan[a]	810	93	89
Madagascar[a]	290	61	119	Bolivia	890	81	65
Malawi[a]	170	93	125	Cuba	NA	99	7
Mali[a]	290	85	218	Djibouti	910	71	133
Mauritania[a]	430	71	125	Georgia[a]	830	84	45
Mongolia	480	99	49	Guyana[a]	900	93	63
Mozambique[a]	210	72	145	Honduras	970	91	40

(Table 1, cont.)

Country	2003 GNI per capita[11]	DTP3 2005 coverage[34]	U5MR 2005[13] (per 1000 live births)	Country	2003 GNI per capita[11]	DTP3 2005 coverage[34]	U5MR 2005[13] (per 1000 live births)
Indonesia	810	70	36	Jordan	1850	95	26
Kiribati	880	62	65	Kazakhstan	1780	98	73
Sri Lanka	930	99	14	Maldives	2300	98	42
Ukraine[a]	970	96	17	Marshall Islands	2710	77	58
				Micronesia (Federated States of)	2090	94	42
Lower-middle-income countries, not GAVI Alliance-eligible (*n*=45)				Morocco	1320	98	40
				Namibia	1870	86	62
Overall (across group)	**1569**	**90**	**33**	Paraguay	1100	75	23
Albania[a]	1740	98	18	Peru	2150	84	27
Algeria	1890	88	39	Philippines	1080	79	33
Belarus	1590	99	12	Romania	2310	97	19
Bosnia and Herzegovina[a]	1540	93	15	Russian Federation	2610	98	18
Brazil	2710	96	33	Samoa	1600	64	29
Bulgaria	2130	96	15	Serbia and Montenegro	1910	98	15
Cape Verde	1490	73	35	South Africa	2780	94	68
China	1100	87	27	Suriname	1940	83	39
Colombia	1810	87	21	Swaziland	1350	71	160
Dominican Republic	2070	77	31	Syrian Arab Republic	1160	99	15
Ecuador	1790	94	25	Thailand	2190	98	21
Egypt	1390	98	33	The former Yugoslav Republic of Macedonia	1980	97	17
El Salvador	2200	89	27	Tonga	1490	99	24
Equatorial Guinea	930	33	205	Tunisia	2240	98	24
Fiji	2360	75	18	Turkey	2790	90	29
Guatemala	1910	81	43	Turkmenistan	1120	99	104
Iran (Islamic Republic of)	2000	95	36	Tuvalu	NA	93	38
Iraq	NA	81	125	Vanuatu	1180	66	38
Jamaica	2760	88	20				

DTP3, Diphtheria-tetanus-pertussis, third dose; GNI, gross national income; NA, not available; U5MR, under-5-mortality rate.

[a] Countries that developed a GAVI Alliance Financial Sustainability Plan (FSP) that had been reviewed by the GAVI Alliance independent review committee and was not requested to be resubmitted (major revision) by September 2005.[18]

selection techniques of backward and forwards stepwise selection were used to find the optimal combinations of variables to include in the regression model.[25] We used nonparametric graphical modelling techniques[26,27] to find the optimal transformations of both independent and dependent variables, and the "leaps and bounds" regression technique[28] to determine which effects should be included in the model built from the transformed variables. Of over 270 models considered, the final model which simultaneously yielded good explanatory power ($R^2 = 81\%$), had no violation of regression assumptions and had relative parsimony, and did not appear to systematically underestimate the total costs across the 40 data points used in estimating the model. Further details on this model can be found in Annex 2 (available at: http://www.who.int/immunization_financing/analyses/givs_costing_annex1.pdf).

The fitted regression equation is used to estimate total non-vaccine costs (inflation adjusted) for the 72 poorest countries for the years 2000–2015. We applied the same model to estimate the costs in the 45 lower-middle-income countries (see Table 1), acknowledging the limitation that this is extrapolating outside the support of the fitted regression.

Uncertainty bounds are based on applying standard formulae[29] for predicting new observations from a fitted regression equation. The relative width of the uncertainty intervals for the baseline costing estimates was applied to estimates from other cost categories (B, C and D) to obtain overall uncertainty bounds.

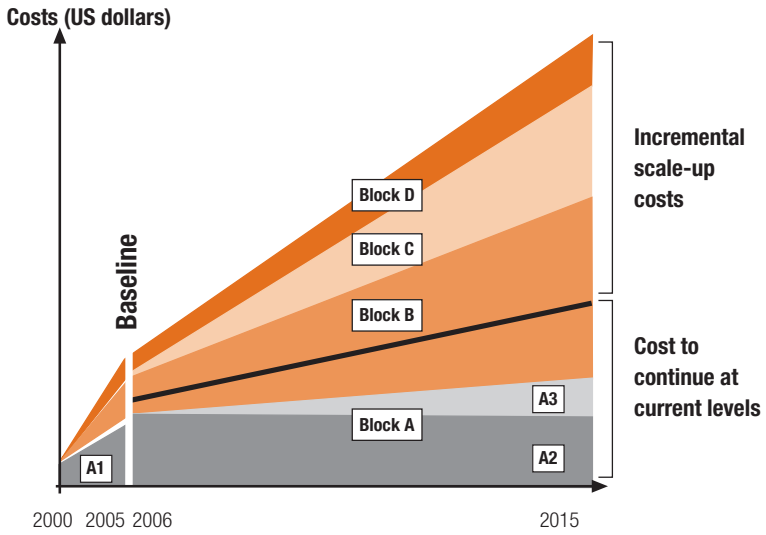
Vaccine costs (costing block B)

We estimate the costs of traditional, un-

derused and new vaccines for both campaign and routine use. For traditional and underused vaccines, UNICEF cost sheets, adjusted for inflation, provide price estimates, although this may be an underestimate of price for countries that are not using UNICEF or pooled procurement mechanisms.[30] For new vaccines, prices are based on assumptions derived from available data and expert opinion, together with an assumption that prices will drop towards a "mature" price as demand rises. Vaccines are estimated as "bundled" costs, including safe injection supplies (syringes and safety boxes), and adjusted for wastage (based on vial sizes) and buffer stocks needed. Shipping and freight are also included as a percentage of the price per dose. Table 2 gives the assumed prices and assumptions used for wastage and freight charges applied to all countries. Costs for disposable items (e.g. syringes, safety boxes) are based on 2005 international prices and adjusted for inflation (3%) assuming wastage of 10% of the auto-disposable syringes (US$ 0.074), reconstitution syringes (US$ 0.03) and safety boxes (100-syringe capacity, US$ 0.59).

The number of doses is based on the appropriate target population (births, surviving infants, women of childbearing age or as specified for a campaign) combined with expected coverage levels.[14,24]

Fig. 1. **GIVS costing blocks**



Block A: maintenance of current routine system (baseline cost)
Current levels of investment in immunization were estimated using available data from 40 Financial Sustainability Plans (Block A1), and extrapolated for the period 2006–2015 by accounting for the impact of inflation and population increases (Block A3). They assume no change in vaccination schedules and no improvement in immunization coverage levels (Block A2). This does not include campaigns or vaccine costs.

Block B: vaccine costs
Vaccine costs were estimated by using coverage targets, population projections and applying the most recent available data on unit prices of different vaccine presentations. The estimates account for wastage rates and the need for buffer stock. The cost of safe injection equipment is bundled in the vaccine cost estimates. The element "below the line" represents the vaccine costs to continue immunization at 2005 levels, and "above the line" is the vaccine portion of scaling-up.

Block C: scaling-up of routine system
This is estimated using an ingredients-based approach. See Table 3.

Block D: campaigns
A schedule of needed campaigns was generated based on a combination of the projections of vaccine coverage and the required epidemiological coverage required to rapidly reduce the burden of disease. Campaign costs include both operational costs and vaccine costs.

Systems costs (costing block C)

To estimate the costs of scaling-up coverage, we use country-specific variables to define likely production function rules for each component. The main assumptions and variables used for each component (both capital and recurrent costs) include a country classification used by the McKinsey[31] consulting firm in a report to the GAVI Alliance on barriers to immunization systems performance, the Commission on Macroeconomics in Health infrastructure index,[32] a transportation index based on types of available transport and communication,[33] district-level vaccine coverage and country-reported immunization-specific indicators.[34] The McKinsey classification groups countries into three types: TU or "turn around" countries, low performers where major system strengthening is required; SI, "strategic intervention" countries, middle performers in need of targeted interventions; and SA, "stand alone" countries, higher performers with good infrastructure. The classification is based on an assessment of political and financial commitment, physical infrastructure and equipment availability, monitoring and information systems, human resource availability and social mobilization strategies.[31]

Table 3 presents a summary of these assumptions. For example, the percentage of districts with less than 50% DTP3 vaccine coverage is used as an indicator as to whether additional supervisory visits at the district level are required. Media and information, education and communication costs are based on whether the country has reported an existing budget for social mobilization (and, hence, these costs were included in the baseline systems costs, rather than being new costs). Transportation costs related to the cold chain are linked to estimates of the average distance between facilities at the national, provincial, district and health service delivery levels, with the transport quartile[33] determining the type of vehicle to be used and the average distance that can be travelled daily.

The analysis builds on a large database of parameters developed for the WHO-CHOICE[35] project, e.g. country-specific prices for factor inputs such as stationery, fuel and other macro- and microeconomic parameters needed. Prices for immunization-specific items are obtained from Product Information Sheets.[36] Additional quantities are determined for items such as outreach personnel based on analysis of country financial sustainability planning documents.[19]

Campaign costs (costing block D)

Delivery costs per person vaccinated, exclusive of cost of vaccines and vaccine supplies, in the different types of campaigns are based on data collected from several different country-level costing studies[37–42] as well as those reported in the FSPs.[19] The unit costs per person

Table 2. **Vaccine cost assumptions, 2005–2015**

Vaccine	Average doses per course	Number of doses per vial	Packed cubic volume per dose (ml)	Actual weighted average price in 2005 per dose (US$)	Projected price in 2010 per dose (US$)	Projected price in 2015 per dose (US$)	% of vaccine price charged for freight	Average vaccine wastage rate (%)
Routine								
Baccillus Calmette-Guérin (BCG)	1	20	1	0.09	0.11	0.13	0.7	50
Diphtheria-tetanus-pertussis (DTP)	3	10	3	0.14	0.35	0.45	1.5	25
Measles (MCV)	1 or 2	10	3	0.17	0.22	0.29	2.0	40
Oral polio (OPV)	3 or 4	10	2.5	0.11	0.16		1.1	30
Tetanus toxoid (TT)	2	10	3	0.07	0.08	0.92	1.2	25
Underused								
DTP-Hib	3	1	32.3	2.38	1.53	1.14	4.8	15
DTP-HepB	3	10	3	1.27	1.02	0.78	2.5	25
DTP-HepB-Hib	3	1	19.4	3.65	2.56	1.92	5.5	10
Hepatitis B (HepB)	3 or 4	10	2.9	0.27	0.30	0.35	2.7	25
Haemophilus influenzae type b (Hib)	3	2	4.8	2.38	1.53	1.14	9.5	15
Measles rubella (MR)	1 or 2	10	3	0.49	0.71	0.92	7.3	40
Yellow fever (YF)	1	10	2.45	0.80	0.65	0.07	2.4	40
New								
Meningococcal conjugate	1	10	2.5		0.44	0.58	3.7	25
Japanese encephalitis (JE)	1	1	60		3.02	2.96	4.5	25
Pneumococcal conjugate	3	1	40		5.00	4.00	2.5	5
Rotavirus	3	1	11.5		5.75	1.88	6.0	5
Campaigns								
Measles	1	20	3	0.17	0.17	0.22	2.0	20
Meningococcal	1	6	2.5	0.37	0.44	0.58	3.7	15
TT	3	20	3	0.05	0.06	0.10	1.0	20
YF	1	10	2.45	0.06	0.07	0.77	0.2	15

targeted include training, cold chain equipment, social mobilization, waste management, salaries and per diem and transport costs.

Where a cost per person targeted, by campaign, is available for a country, we used that estimate; where it was unavailable, we estimated the costs by using averages across WHO subregions and regions, or by extrapolating the ratio between costs of other types of campaigns in another country and applying that to a single campaign cost estimate from the country. Measles catch-up (nine months to 14 years) and follow-up campaigns (nine months to four years) were estimated to cost between US$ 0.19–1.68 per person targeted. Campaigns associated with the introduction of yellow fever (nine months and up) and meningococcal vaccines (nine months to 29 years) ranged between US$ 0.17–1.53 per person targeted; and campaigns to reduce the burden of maternal and neonatal tetanus (targeted towards women of childbearing age, 15–49), were estimated to cost US$ 0.19–1.51 per person targeted.

Findings

The total cost for immunization from 2006 to 2015, including the costs to maintain the existing immunization system, is estimated to be US$ 35.5 billion in the 72 GAVI Alliance-eligible countries (range: US$ 13–40 billion), of which 54% maintains current immunization efforts and the remaining 46% is for scaling-up (5% campaigns, 16% systems, 25% vaccines). This shows a considerable shift in the distribution of spending from systems to vaccines as more expensive vaccines are introduced: of the costs to maintain current routine immunization, 25% are for vaccines; in scaling up, 60% of the costs are for vaccines.

Applying the same methods (despite the potential limitations) to the remaining 45 lower-middle-income countries, we estimate an overall cost of US$ 76.1 billion (range: US$ 23–110 billion). Among the 45 lower-middle-income countries that are not GAVI Alliance-eligible, where baseline systems costs are estimated to be higher, 71% of the projected costs for 2006–2015 are for maintaining the current programmes, of which 13% goes towards vaccines; of the scaling-up costs, 69% will be for vaccines (Table 4).

In GAVI Alliance-eligible countries, on average US$ 0.54 per capita (range: US$ 0.21–3.11 across countries), or US$ 24 (range: US$ 7–105) per child born, needs to be spent to maintain current immunization levels, varying with population size, DTP3 coverage and economic status. This needs to be nearly doubled to achieve the GIVS goals, resulting in a cost per capita of

US$ 1.18 (range: US$ 0.78–4.01), or cost per child of US$ 46 (range: US$ 27–167). This is comparable to the estimated spending level of the 45 lower-middle-income countries to maintain their current immunization levels.

Estimated spending on immunization in the 72 poorest countries has risen between 2000 and 2005, from an average of US$ 1.1 billion (range: US$ 0.9–1.6) in 2000 to US$ 2.5 billion (range: US$ 1.8–4.2) in 2005.[10] Despite using a different methodology, the year 2000 results are remarkably consistent with estimates from other approaches of US$ 1.1 billion in low-income countries in 2000,[43] and US$ 1.17 billion (range: US$ 0.717–1.48 billion)[44] in 2001.

The composition of immunization activities relative to baseline costs will differ depending on the timing of vaccine introduction. The highest-performing countries, which introduce new vaccines earlier, will need relatively more cold-chain training and supervision investment compared (34% and 22%, respectively, of systems costs) to the late introducers of new vaccines, whose current immunization systems are not as strong (18% and 4%, respectively) and who need to make more substantial investments in core areas such as personnel and outreach (2% and 5% for high performers/early introducers; 21% and 23% for low performers/late introducers). In addition, the average incremental systems costs of scaling-up per child is more in the latter group (US$ 9) than the former (US$ 8), while the average incremental vaccine costs are lower (US$ 13) for late introducers than for early introducers (US$ 23). Our findings that US$ 16.2 billion is required to scale up immunization in the 72 poorest countries over the next 10 years are sensitive to underlying assumptions. As an example, we have assumed that the cold chain volume of a rotavirus vaccine will be 11.5 ml per dose, but the currently available presentation is nearly 112 ml per dose. If the larger vial size had been used in the costing, then an additional US $1.9 billion would be required, doubling the costs of scaling-up the cold chain, and increasing associated vehicle and transportation costs by 60%.

For the subset of GAVI Alliance-eligible countries, Table 5 shows the breakdown of projected costs for each immunization activity by WHO region. The largest proportions are in the African (34%) and South-East Asian (46%) Regions. This reflects the size of the birth cohorts, as these regions have 35% and 47% of the 2005 GAVI Alliance-eligible birth cohorts, respectively.

A primary use of these costing figures is to provide a better understanding of where financing gaps will occur, to start mobilizing the necessary resources

Table 3. **Basic assumptions and cost categories for system scale-up costs**

Cost category	Ingredients	Basic assumption
Cold chain	Cold boxes, cold rooms, refrigerators, freezers, icepacks, generators, voltage stabilizers at national, provincial, district and health facility levels. Includes maintenance and running costs for new items purchased	Assume that countries have a cold chain of adequate capacity to meet the needs of their current immunization schedule, and estimates the size of the cold chain that would have to exist to support this schedule (based on standard cold room sizes, e.g.then assumes that any excess capacity is used first). Quantities are based on standard guidelines for equipping and managing cold chains at the central, provincial and peripheral levels in the Expanded Programme on Immunization[51,52,53] by calculating the volume of vaccines that require different types of storage space at various levels and the type of equipment most suitable based on factors such as vaccine volume, reliability and availability of electricity, climate, the amount of time required to transport vaccines at various levels, and the condition of road infrastructure.
Waste management	Incinerators and recurrent costs	US$ 0.02 per additional injectable vaccine dose delivered.[54,55]
Transport costs for outreach and vaccine distribution	Purchasing and operating costs of vehicles, including motorcycles. Includes maintenance costs for new items purchased, as well as fuel costs	*Cold chain:* the type (bicycle, motorcycle, small vans with different loading capacities, refrigerated vans) and quantities of vehicles used to transport vaccines from one level to the next is based on volume of vaccines to be transported,[33] transport conditions[33] (transportation index), distance and number of hours or days that transport would take. *Outreach:* number of additional vehicles required for outreach based on number of outreach contacts needed (see service delivery for basic assumption) and type of vehicle selected based on transportation index (4 wheel drive vehicles for categories 3 and 4, motorcycles for categories 1 and 2). Fuel costs based on estimated distances to be travelled.
Training of volunteers, refresher courses for current vaccines and training for new vaccines	Per diem, travel to training, printing training materials. For introduction of new and underused vaccines, includes development of training materials	*Countries with McKinsey Classification of TU (Turnaround; lowest) and SI (Strategic Intervention; intermediate):* additional training required for additional personnel only (the remainder is assumed to be covered under existing costs). Induction and refresher training costs are included. *All countries:* introduction training required when new or underused vaccines are introduced. Assumed to be included in annual refresher training after year of introduction.

(Table 3, cont.)

Cost category	Ingredients	Basic assumption
Supervision	Salaries for supervisors and support staff, stationery, transportation and per diem for supervisory visits	*All countries:* districts with less than 50% coverage require additional supervisory visits. Number of districts that can be visited per supervisory visit is linked to the average distance between districts and the capital.
Media, information, education and communication (M&IEC), and social mobilization	*M&IEC:* Media (radio time, flyers, television time, booklets, newspaper adverts, communication strategy). *Social mobilization:* additional staff, resources for planning and administration, supervision, and bicycles	*M&IEC, scaling up routine coverage:* TU and SI: development costs of strategy only in countries where there are no plans within the vaccine national budgets for social advocacy and mobilization (e.g. strategy development, meetings). Additional media and IEC materials included in all TU and SI countries. *Countries with McKinsey classification of SA (Stand-Alone; well-performing):* None. *M&IEC, introducing an underused or new vaccine:* All countries: development of a full media advocacy package *Social mobilization:* All countries: additional volunteers and supervisors for districts with coverage less than 50%.
Monitoring, evaluation, surveillance, laboratory	Computer hardware (including maintenance and running), development of SOPs, training, meetings and international technical assistance; immunization cards, coverage surveys. Laboratories including equipment (plus maintenance and running costs), lab supplies, refresher training, quality control; field officer operations, meetings. Annual gross salaries for international and local staff for country implementation support	*Infrastructure upgrade (computer, fax/telephone, voltage stabilizer)* TU: 1 per district SI: 1 for 50% of districts *Immunisation cards* TU and SI countries: cards for additional children above current coverage rates. *International and Regional Technical Assistance* Health system strength index was used as the basis for estimating number of minimum staff required for initial phase of scaling up (around 10% of total staff needs) in a joint consultation with WHO and UNICEF.[56] *Immunization coverage surveys* Every 3 years *Development of strategies* If not already being done, costs for consultants and workshops to develop: - a 3–5 year strategic plan every 4 years - annual work plan for immunization services - plan for measles control every 4 years - plan for safe injection every 4 years - annual district microplans (for districts which do not already have one). *Laboratory* Capital cost to equip a bacteriological lab (for meningococcal, pneumococcal and Hib): 2 years prior to introduction of vaccine. Training and annual lab supplies. Capital cost to equip a lab for ELISA-based testing: 2 years prior to introduction of rubella, rotavirus, yellow fever, HepB, JE. Training and lab supplies.
Service delivery	Per diem for outreach, additional personnel (salaries)	*All countries:* The annual number of outreach visits estimated by calculating 2005 capacity to deliver immunization visits, and assuming that 50% of the additional contacts will be delivered through outreach services, and the distribution of additional contacts across urban and rural areas. *TU and SI countries:* Annual estimates of the additional personnel at the district and health facility levels are estimated based on a regression model fit to FSP data,[19] using as covariates the number of nurses, DTP3 coverage changes, birth cohort size, population density, and urban/rural population distribution. The average salary of immunization staff at these levels is taken from the FSP[19] data where available, and from a regression model using FSP data to predict salaries from the size of the birth cohort, the proportion of the population living in urban areas, economic status, and government health expenditures where not available.

DTP3, Diphtheria-tetanus-pertussis, third dose; ELISA, enzyme-linked immunosorbent assay; FSP, Financial Sustainability Planning; HepB, hepatitis B; Hib, *Haemophilus influenzae* type b; JE, Japanese encephalitis; SOPs, standard operating procedures; UNICEF, United Nations Children's Fund.

Table 4. **Estimated costs of immunization in 117 low- and lower-middle-income countries, 2006–2015**

Cumulative total 2006–2015	All countries		72 GAVI Alliance-eligible countries (2003 GNI per capita < US$ 1000)		45 low- and lower-middle-income countries (GNI per capita < US$ 3035)	
	US$ billions	% of total[a]	US$ billions	% of total[a]	US$ billions	% of total[a]
Vaccine cost	24	31	12	35	11	27
Traditional vaccines	3.8	(16)	2.5	(20)	1.3	(12)
Underused vaccines	10.2	(43)	5.7	(46)	4.5	(40)
New vaccines	9.8	(41)	4.3	(35)	5.5	(48)
Systems cost	50	66	21	59	29	70
Maintaining current system	41.0	(82)	15.3	(73)	25.8	(88)
System scale-up (coverage and new vaccines)	9.0	(18)	5.6	(27)	3.4	(12)
Campaign (including polio) cost	2.3	3	2.2	6	0.2	<1
Total (lower and upper bounds)	**76** (23-110)		**35** (13-40)		**42** (11-70)	
Spending to maintain current	48.8	64	19.3	54	29.5	71
Spending to scale up	27.4	36	16.2	46	11.2	29
Average unit costs 2006–2015	**US$**	**5th and 95th percentiles**	**US$**	**5th and 95th percentiles**	**US$**	**5th and 95th percentiles**
Spending per child born	65	28–210	46	27–167	105	49–323
Maintenance costs per child born	41.6	8–150	24.8	7–105	74.8	18–169
Scaling up costs per child born	23.3	14–82	20.8	15–64	28.3	14–93
Spending per capita	1.38	0.78–4.63	1.18	0.78–4.01	1.66	0.80–6.41
Maintenance costs per capita	0.88	0.27–3.32	0.64	0.21–3.11	1.18	0.32–4.55
Scaling up costs per capita	0.50	0.30–2.09	0.54	0.32–1.88	0.45	0.29–2.57

[a] Number in parentheses indicate percentages within their categories.
Some totals may not add due to rounding.

to achieve the GIVS. We assume an optimistic funding scenario based on available data[18,19,45–47] from national programmes, the GAVI Secretariat and the WHO Polio Team, and the funding gaps are shown in Table 5.

For the 72 GAVI Alliance-eligible countries, about US$ 25 billion is estimated to be available for the 2006–2015 period, of which 16% is projected to come from national governments, 15% from the GAVI Alliance and 40% from external donors. Between 30% and 40% of need is unmet, an annual shortfall of more than US$ 1 billion.

The main unfunded area during the 2006–2015 period is vaccines. However, this becomes the case only when new vaccines become available in the longer term. In the medium term, the main unfunded elements will be for reaching more children, through strengthening systems and campaigns (Table 5). Regionally, the largest funding gaps in absolute terms are in the South-East Asia and African Regions; by percentage, the largest gap is in the Eastern Mediterranean Region.

Discussion

Putting a cost estimate to an immunization vision, 2006–2015 is no doubt subject to uncertainty around the data and methods used, individual strategies chosen by each country to reach its visions, price uncertainties around vaccines and other inputs to national immunization programmes, and the availability of funds to finance continuous expansions and improvements of immunization. The uncertainty bounds around the cost estimates reflect these limitations. These costing figures should be taken as indicative approximations of what it may take to scale up immunization to reach GIVS goals over the next decade. The estimates for lower–middle-income countries have additional limitations due to much of the input data for predicting baseline costs, and price data for vaccines, being specific to poorer countries.

A further limitation of this analysis is that only a finite set of potential immunization interventions is included. The newly licensed human papillomavirus vaccine is not included, nor are vaccines against seasonal influenza, nor are global public goods, including research and development, global capacity to assist countries in crisis situations with stockpiles of vaccines (e.g. for cholera). All of these are possible strategies identified in the GIVS[2] and many of them will be pursued. There is a need to periodically update this costing exercise to reflect the strategies being pursued at the country level, and our improved understanding of the dynamics of immunization costing and financing. Nonetheless, the present analysis is based on realistic and rigorous assumptions, the best available data (as of 2005), and fills an important gap in knowledge.

Recognizing these limitations, we estimate that reaching immunization goals is achievable at a cost of US$ 35 billion during 2006–2015. By 2015, more than 70 million children in the world's 72 poorest countries can be protected annually against 14 major childhood diseases if an additional US$ 1 billion per year can be invested towards immunization.[10] This equates

Table 5. **Projected costs and distribution of costs of increasing the coverage of traditional and underused vaccines and health systems requirements to reach the GIVS goals by 2015 in 72 GAVI Alliance-eligible countries, together with funding gaps**

Costing 2006–2015	AFR (US$ millions)	AMR (US$ millions)	EMR (US$ millions)	EUR (US$ millions)	SEAR (US$ millions)	WPR (US$ millions)	Total (US$ millions)
Vaccines	**4 621**	**214**	**1 301**	**342**	**5 400**	**559**	**12 438**
Traditional	*19%*	*15%*	*22%*	*14%*	*21%*	*15%*	*20%*
Underused	*53%*	*46%*	*49%*	*48%*	*38%*	*51%*	*46%*
New	*28%*	*39%*	*30%*	*38%*	*41%*	*34%*	*35%*
Systems	**6 537**	**666**	**1 790**	**608**	**9 957**	**1 318**	**20 875**
Maintaining system	*70%*	*77%*	*50%*	*74%*	*82%*	*53%*	*73%*
Scaling up	1 978	150	894	158	1 819	615	5 615
Cold chain	*25%*	*21%*	*16%*	*29%*	*27%*	*11%*	*23%*
Training & supervision	*6%*	*31%*	*6%*	*44%*	*21%*	*8%*	*13%*
Vehicles and transport	*18%*	*11%*	*20%*	*9%*	*7%*	*8%*	*13%*
Social mobilization	*12%*	*13%*	*13%*	*1%*	*7%*	*3%*	*9%*
Surveillance, M&E	*15%*	*10%*	*18%*	*9%*	*9%*	*4%*	*12%*
Waste management	*2%*	*1%*	*1%*	*1%*	*2%*	*1%*	*2%*
Personnel	*17%*	*9%*	*22%*	*2%*	*23%*	*63%*	*24%*
Overheads	*5%*	*5%*	*4%*	*5%*	*5%*	*2%*	*4%*
Campaigns	**875**	**12**	**303**	**3**	**970**	**22**	**2 184**
TOTAL	**12 033**	**892**	**3 393**	**953**	**16 327**	**1 899**	**35 496**
% of costs by region	*33.9%*	*2.5%*	*9.6%*	*2.7%*	*46.0%*	*5.3%*	*100.0%*
Probable funding gaps[a]	**17%**	**28%**	**42%**	**32%**	**33%**	**36%**	**28%**
Vaccines	*31%*	*46%*	*52%*	*52%*	*64%*	*38%*	*49%*
Systems	*2%*	*21%*	*31%*	*20%*	*14%*	*35%*	*13%*
Campaigns	*55%*	*71%*	*62%*	*97%*	*51%*	*65%*	*54%*
Total funding gap (in millions of US$)	2 019	246	1 418	301	5 364	687	10 036
% of funding gap by region	*20%*	*2%*	*14%*	*3%*	*53%*	*7%*	*100%*

AFR, WHO African Region; AMR, WHO Region of the Americas; EMR, WHO Eastern Mediterranean Region; EUR, WHO European Region; SEAR, WHO South-East Asia Region; WPR, WHO Western Pacific Region; M & E, monitoring and evaluation.

[a] Source of data on funding gaps: Assumes an optimistic funding scenario based on: (a) extrapolating the amounts national governments and external donors will contribute to immunization between 2006 and 2015 from the Financial Sustainability Plans[19] and reported data on immunization financing[18] (assuming that they will fund in the future at least as much as in the past); (b) taking funding scenarios provided by the GAVI Secretariat (as known in December 2005; optimistic expenditure scenario of approximately US$ 5.8 billion); (c) using the funding estimates for campaigns made by the WHO Polio Team and the Measles,[45] Tetanus[46] and Yellow Fever[47] groups in GAVI Alliance investment cases.

to an additional US$ 0.5 per capita per year above current levels (< US$ 1 per capita) of investment in immunization.

At such modest costs and high benefits, immunization continues to be one of the best values for public health investment today.[44] Not only do immunizations save lives, but in impoverished countries they boost economies, potentially yielding a rate of return of up to 18%.[48] In addition, immunization can serve as a platform to strengthen health systems and deliver other life-saving interventions such as those against malnutrition, malaria and intestinal worms.

Despite being a good buy for the health sector, financing for immunization remains a significant challenge. A funding gap of between US$ 11 billion and US$ 15 billion is estimated to remain if the goal of saving 10 million more lives is to be achieved by 2015. This financing challenge exists despite the favourable context of significant additional new resources for immunization that are available through the GAVI Alliance, IFFIm,[8] the AMC[9] and other global efforts. There are growing concerns about the financial sustainability of future immunization efforts, and for many of the poorest countries, shared financial responsibility between national governments and international donors will be required.[49]

In late 2005, WHO and UNICEF, together with GAVI Alliance partners launched the comprehensive Multi-Year Plan (cMYP) process for immunization with tools to estimate the financial requirements and gaps for reaching national goals in line with the GIVS.[50] The cMYP process is a first step in translating the global into the local: a national immunization plan to implement appropriate strategies at country level. With the implementation of these plans, countries are paving the way towards sustainability of their current programmes and preparing themselves for the later generations of vaccines and technologies where financing requirements will grow.

The real challenge will hinge on how national governments, WHO, UNICEF and the international community at large, manage their roles and responsibilities in reaching and financing the goals of the GIVS until 2015. ■

Acknowledgements
The staff of the Department of Immunization, Vaccines and Biologicals at WHO and in Immunization Plus at UNICEF have all contributed to the development of this paper. In particular, we thank Marta Gacic-Dobo and Sandra Garnier for providing underlying immunization data, UNICEF Supply Division for providing data on vaccine and equipment costs, GAVI Secretariat for providing details on expected current and future commitments and resources as of December 2005, and the GAVI Accelerated Introduction and Development Projects (ADIPS) for providing guidance on assumptions regarding the timing of introduction and pricing of new vaccines, and Taghreed Adam, Tracey Goodman, Logan Brenzel and Tessa Tan-Torres Edejer for intensive review of the work and their contributions. Early versions of this work were used as the basis for the GAVI/Vaccine Fund International Financing Facility for Immunization (IFFIm) proposal in October 2004.

Competing interests: None declared.

Résumé

Estimation des coûts pour réaliser l'objectif de l'initiative OMS-UNICEF « La Vaccination dans le monde : vision et stratégie » pour la période 2006-2015

Objectif Estimer le coût du développement à plus grande échelle des services de vaccination infantile nécessaires à la réalisation de l'objectif de l'initiative OMS-UNICEF « La vaccination dans le monde : vision et stratégie (GIVS) », consistant à réduire des deux-tiers d'ici 2015 la mortalité due aux maladies évitables par la vaccination.

Méthodes Un modèle a été élaboré pour estimer le coût total de la réalisation de l'objectif de cette initiative d'ici 2015 dans 117 pays à revenu faible ou faible à moyen. Les dépenses actuelles ont été estimées par une analyse des documents de planification nationale et les coûts du passage à l'échelle supérieure en utilisant une démarche partant de la base et des intrants. Les coûts financiers pour atteindre une couverture vaccinale de 90 % ont été estimés par pays et par année pour tous les vaccins existants, dans le cas où l'on introduirait une série discrète de nouveaux vaccins (vaccins antirotavirus, antipneumococcique conjugué, contre le méningocoque de type A et contre l'encéphalite japonaise) et dans celui où l'on mènerait des campagnes de vaccination pour protéger les populations à haut risque contre la polio, le tétanos, la rougeole, la fièvre jaune et la méningite à méningocoque.

Résultats Les 72 pays les plus pauvres du monde ont consacré US$ 2,5 milliards (plage de variation : US$ 1,8-4,2) à la vaccination en 2005, soit une augmentation de US$ 1,1 milliard (plage de variation : US$ 0,9-1,6) par rapport à l'année 2000. D'ici 2015, les coûts annuels de la vaccination augmenteront en moyenne d'environ US$ 4,0 milliards (plage de variation : US$ 2,9-6,7). Les coûts totaux de la vaccination pour la période 2006-2015 sont estimés à US$ 35 milliards (plage de variation : US$ 13-40), dont US$ 16,2 milliards de surcoûts, se répartissant en US$ 5,6 milliards pour le passage à l'échelle supérieure du système et US$ 8,7 milliards pour les vaccins. US$ 19,3 milliards seront nécessaires pour maintenir les programmes de vaccination aux niveaux de 2005.

Pour l'ensemble des 117 pays à revenu faible ou faible à moyen, les coûts totaux pour la période 2006-2015 sont estimés à US$ 76 milliards (plage de variation : US$ 23-110), dont US$ 49 milliards pour maintenir les systèmes actuels et US$ 27 milliards pour passer à l'échelle supérieure.

Conclusion Pour les 72 pays les plus pauvres, 30 à 40 % (soit US$ 11 à 15 milliards) des besoins en ressources ne sont pas couverts s'il on veut atteindre l'objectif de la GIVS. Les méthodes présentées dans cet article donnent des estimations approximatives et comportent des limites, mais elles permettent d'identifier les lacunes à combler sur le plan financier pour le passage à l'échelle supérieure des programmes de vaccination d'ici 2015.

Resumen

Estimación de los costos de llevar a término la Visión y Estrategia Mundial de Inmunización OMS-UNICEF, 2006-2015

Objetivo Estimar el costo de extender masivamente los servicios de inmunización infantil requeridos para alcanzar la meta de la Visión y Estrategia Mundial de Inmunización (GIVS) OMS-UNICEF de reducir la mortalidad por enfermedades prevenibles mediante vacunación en dos tercios para 2015.

Métodos Se elaboró un modelo para estimar el costo total del logro de las metas de GIVS para 2015 en 117 países de ingresos bajos o medios bajos. El gasto actual se estimó a partir de datos extraídos de los documentos de planificación de los países, y los costos de la extensión masiva se estimaron mediante un método ascendente basado en componentes. Se calcularon los costos financieros requeridos por país y año para alcanzar una cobertura del 90% con todas las vacunas existentes; introducir un conjunto de vacunas nuevas (contra rotavirus, antineumocócica conjugada, conjugada contra el meningococo A y contra la encefalitis japonesa); y realizar campañas de inmunización para proteger a las poblaciones de riesgo contra la poliomielitis, el tétanos, el sarampión, la fiebre amarilla y la meningitis meningocócica.

Resultados Los 72 países más pobres del mundo invirtieron US$ 2500 millones (intervalo: US$ 1800 - 4200 millones) en actividades de inmunización en 2005, lo que supone un aumento respecto a los US$ 1100 millones (intervalo: US$ 900 - 1600 millones) de 2000. Para 2015, los costos anuales de la inmunización aumentarán por término medio a unos US$ 4000 millones (intervalo: US$ 2900 - 6700 millones). Los costos totales de la inmunización para 2006-2015 se estiman en US$ 35 000 millones (intervalo: US$ 13 000 - 40 000 millones); de esa cantidad, US$ 16 200 millones son costos adicionales, de los que US$ 5600 millones corresponden a la expansión del sistema

y US$ 8700 millones a las vacunas; se necesitan US$ 19 300 millones para mantener los programas de inmunizacion a los niveles de 2005.

En el conjunto de los 117 países de ingresos bajos y medios bajos, se estima que los costos totales para 2006 - 2015 ascenderán a US$ 76 000 millones (intervalo: US$ 23 000 - 110 000 millones): US$ 49 000 millones para mantener los sistemas actuales y US$ 27 000 millones para expandirlos.

Conclusión Considerando los 72 países más pobres, se necesitan aún US$ 11 000 - 15 000 millones (30% - 40% de los recursos globales necesarios) para poder alcanzar las metas de la GIVS. Los métodos desarrollados en este artículo arrojan estimaciones aproximadas que presentan limitaciones, pero proporcionan una hoja de ruta para financiar los déficits que hay que cubrir a fin de expandir la inmunización para 2015.

ملخص

تقدير تكاليف تحقيق رؤية واستراتيجية منظمة الصحة العالمية واليونيسف للتمنيع على الصعيد العالمي 2006 - 2015

الهدف: تقدير تكلفة النهوض بخدمات التمنيع ضد أمراض الطفولة المطلوبة لبلوغ مرمى رؤية واستراتيجية منظمة الصحة العالمية واليونيسف للتمنيع على الصعيد العالمي المتمثّل في خفض معدلات الوفيات الناجمة عن الأمراض التي يمكن توقّيها باللقاح بمقدار الثلثَيْن بحلول عام 2015.

الطريقة: أعدَّ نموذج لتقدير التكلفة الإجمالية لبلوغ مرامي رؤية واستراتيجية منظمة الصحة العالمية واليونيسف للتمنيع على الصعيد العالمي، بحلول عام 2015 في 117 من البلدان ذات الدخل المنخفض وذات الدخل المتوسط الأدنى. وتم تقدير المصروفات الحالية بتحليل البيانات المستمدة من وثائق التخطيط في البلدان، كما قدرت تكاليف النهوض بخدمات التمنيع باستخدام نهج تصاعدي متدرج يرتكز على المكوِّنات. وقُدِّرت التكاليف المالية بحسب البلد، وبحسب السنة، لبلوغ نسبة تغطية مقدارها 90% بجميع اللقاحات الموجودة، وإدخال مجموعة جديدة منفصلة من اللقاحات (للفيروسات العجلية، المكورات الرئوية المتقارنة، المكورات السحائية المتقارنة أ، وفيروس التهاب الدماغ الياباني)، وإجراء حملات تمنيع لحماية القطاعات السكانية المختطرة من شلل الأطفال، والكزاز، والحصبة، والحمى الصفراء، والالتهاب السحائي.

الموجودات: أنفقت البلدان الاثنان والسبعون الأكثر فقراً في العالم 2.5 بليون دولار أمريكي (تـراوحت من 1.8 إلى 4.2) على التمنيع في عام 2005، بزيادة مقدارها 1.1 بليون دولار (تـراوحت من 0.9 إلى 1.6)، على ما أنفق في عام 2000. وستـزيد التكلفة السنوية للتمنيع، بحلول عام 2015 بنحو 4.0 بليون دولار في المتوسط (تـراوح من 2.9 إلى 6.7) ويقدر إجمالي تكلفة التمنيع على مدى الفتـرة من 2006 إلى 2015 بنحو 35 بليوناً (تـراوح من 13 إلى 40)، منها 16.2 بليوناً تكاليف تـراكمية تـتألف من 5.6 بليوناً للنهوض بالنظام، و8.7 بليوناً للقاحات، إلى جانب 19.3 بليوناً مطلوبة لإدامة برامج التمنيع على معدلات 2005.

ويقدَّر إجمالي تكاليف التمنيع في جميع البلدان الـ 117 ذات الدخل المنخفض وذات الدخل المتوسط الأدنى، خلال الفتـرة من 2006 إلى 2015، بستة وسبعين بليون دولار أمريكي (تـراوح من 23 إلى 110)، منها 49 بليوناً للحفاظ على الأنظمة القائمة، و27 بليوناً للنهوض بالخدمات.

الاستنتاج: هناك فجوة مقدارها 11 – 15 مليون دولار أمريكي (30% - 40%) من إجمالي الموارد المطلوبة للبلدان الاثنين والسبعين الأكثر فقراً، وذلك إذا ما أردنا بلوغ مرامي رؤية واستـراتيجية منظمة الصحة العالمية واليونيسف للتمنيع على الصعيد العالمي. ورغم أن الطرق التي أعدت في هذه الورقة هي مجرد تقديرات تقريبية ذات نقائص، إلا أنها توفر خارطة طريق توضح الفجوات المالية التي ينبغي سدها حتى يمكن النهوض بخدمات التمنيع بحلول عام 2015.

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