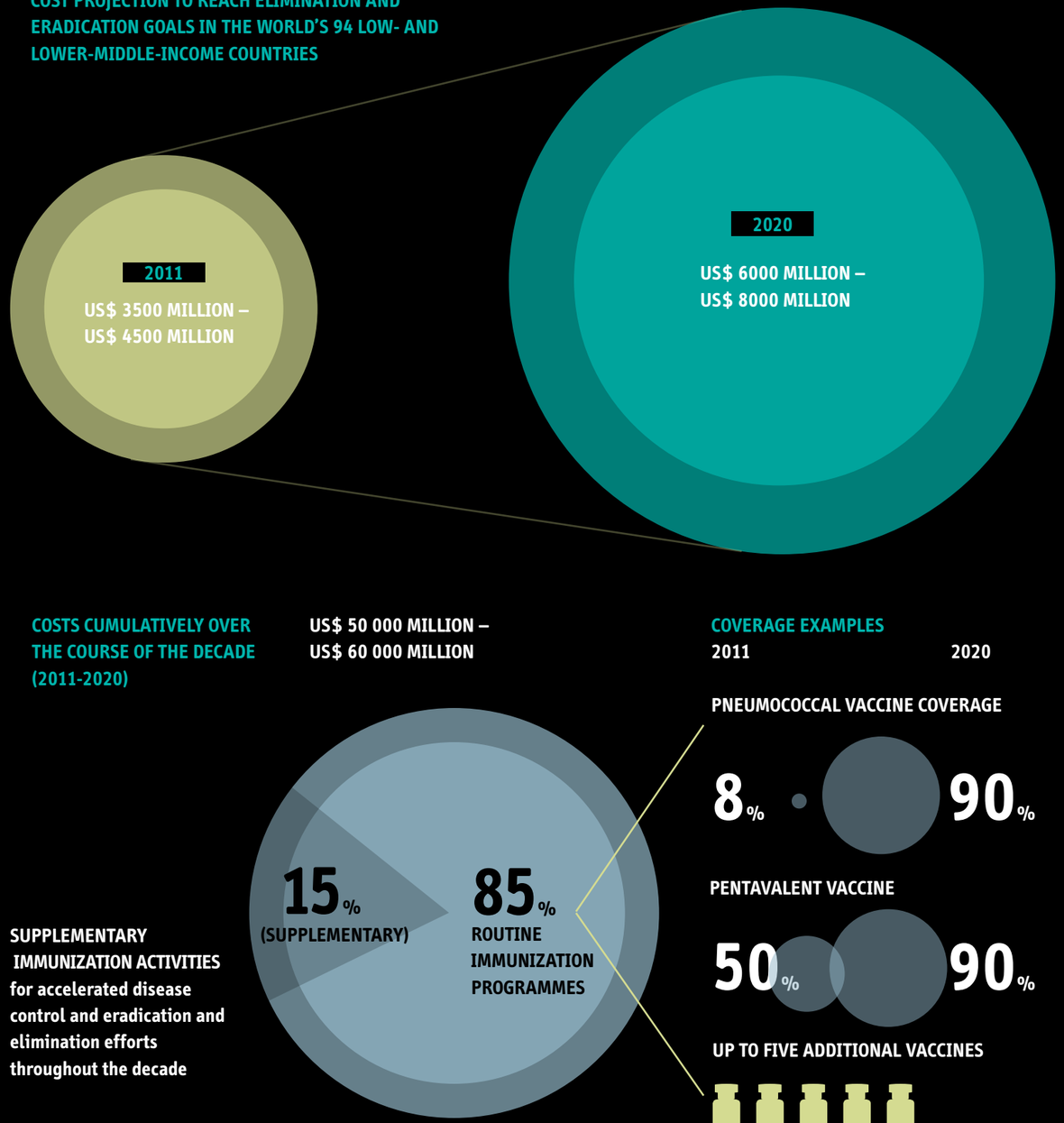
Health Returns on Investment in Immunization

The Global Vaccine Action Plan has outlined a set of ambitious goals and strategic objectives for the decade to broaden the impact and reach of immunization across the globe. By extending coverage for existing vaccines, introducing new vaccines and pursuing elimination and eradication for specific diseases, millions of deaths can be averted and billions of dollars in economic benefit can be generated.

All stakeholders investing together will drive a significant health and economic impact



It is projected that costs to sustain and scale up current immunization programmes, introduce new and underutilized vaccines, and conduct supplemental immunization activities to reach elimination and eradication goals in the world's 94 low- and lower-middle-income countries will rise from between US$ 3500 million and US$ 4500 million in 2011 to between US$ 6000 million and US$ 8000 million in 2020, costing approximately between US$ 50 000 million and US$ 60 000 million cumulatively over the course of the decade (from 2011 to 2020). The following estimates all pertain to these 94 countries.[9]

An estimated US$ 42 000 million to US$ 51 000 million of these costs (roughly 85% of the total) will support expanding routine immunization coverage and introducing additional vaccines to routine immunization programmes.[10] For example, pneumococcal vaccine coverage for the birth cohort in the 94 countries is projected to go from 8% in 2011 to approximately 90% by 2020. Similarly, coverage with the pentavalent vaccine (against diphtheria-tetanus-pertussis hepatitis B and Hib) is projected to move from 50% in 2011 to more than 90% by 2020. To take another example, it is anticipated that up to five additional vaccines that are currently not licensed or widely used in low- and lower-middle-income countries will be introduced across many of the countries in the analysis during the decade: vaccines against cholera, dengue and malaria, inactivated poliovirus vaccine, and typhoid Vi conjugate vaccine. Delivery programmes will need to be strengthened to ensure they meet current needs, are well-maintained over the decade, have sufficient capacity to accommodate additional vaccines that are planned to be introduced, and facilitate immunization coverage aspirations across low- and lower-middle-income countries. As a consequence, the costs of annual routine immunization will increase from approximately US$ 2500 million in 2011 to US$ 7500 million by 2020.

Of these costs, an estimated cumulative figure of between US$ 8000 million and US$ 9000 million (the remaining 15% of the total) will be for supplementary immunization activities for accelerated disease control and eradication and elimination efforts throughout the decade, which will complement routine immunization programmes. This analysis assumes that these efforts will be focused on measles, meningococcus A meningitis, poliomyelitis, rubella, tetanus and yellow fever.

24-26
million future deaths could be averted

9 Countries included in the scope of the costing analysis include 92 low- and lower-middle-income countries according to the July 2011 World Blank Classification (available at http://www.icsoffice.org/Documents/DocumentsDownload.aspx?Documentid=474, accessed 11 April 2012) in addition to two upper-middle-income countries (Azerbaijan and Cuba) which receive GAVI Alliance support for existing vaccines, but which have graduated from support for future vaccines.

The costs described above for routine and supplementary immunization activities encompass the projected costs of the acquisition of vaccines and injection supplies, as well as the delivery of those vaccines and supplies, including transportation and cold chain logistics, human resources, training, social mobilization, surveillance and programme management. These costs do not include the additional costs or efficiencies that may be generated through the actions recommended in the global vaccine action plan where there is an insufficient evidence base for these costs at this time. Specifically, it does not include the additional cost of scaling up seasonal influenza vaccination or the additional resource needs for increased surveillance, increased civil society engagement, and current and additional technical agency support to implement the Global Vaccine Action Plan. Nevertheless, the costs do represent the majority of the cost of achieving the strategic objectives of the Decade of Vaccines (2011–2020).

The governments of low- and lower-middle-income countries will continue to play a pivotal role in meeting resource needs. Assuming that country funding for immunization grows in line with projected gross domestic product and all GAVI Alliance-eligible countries fully meet its co-financing requirements, it is estimated that the available funding from country governments for routine immunization and supplemental immunization activities could total approximately US$ 20 000 million over the decade. In addition, if the GAVI Alliance renews its current level of funding for the 2016–2020 period, its resources will generate an estimated additional US$ 12 000 million of funds for the decade, approximately US$ 11 000 million for routine immunization programmes and approximately US$ 1000 million for programmes involving supplementary immunization activities. Based on these assumptions, country governments and the GAVI Alliance combined could provide a total of approximately US$ 32 000 million in funding for the decade. These estimates could be considered the minimum available financing over the decade because they do not include contributions from development partners beyond that provided through the GAVI Alliance (owing to the considerable uncertainty surrounding future levels of development partner financing).

Meeting the estimated US$ 18 000 million to US$ 28 000 million in additional funding will require commitment from all stakeholders, with governments needing to continue making immunization a priority in resource allocation decisions; development partners needing to sustain and bolster access to

If the GAVI Alliance renews its current level of funding for the 2016–2020 period, its resources will generate an estimated additional US$ 12 000 million for the decade:

11 000 million	1 000 million
routine immunization programmes	supplementary immunization activities

funding for immunization in spite of competing priorities; and the entire community needing to continue efforts to reduce the cost of vaccine acquisition and immunization service delivery.

All stakeholders investing together will drive a significant health and economic impact. Work to sustain or extend coverage of existing vaccines and efforts to introduce new vaccines, if undertaken together, have the potential to avert millions of future deaths, as well as hundreds of millions of cases of disease, and generate hundreds of billions of dollars in economic impact over the decade.

As an example of the potential impact of immunization, a sub-analysis of 10 vaccines, delivered during the decade, that represent an estimated US$ 42 000 million of the US$ 50 000 million to US$ 60 000 million cost for the decade,[11] have the potential to avert in total between 24 and 26 million future deaths (Table 8) as compared with a hypothetical scenario under which these vaccines have zero coverage.[12]

10 Diseases covered by the vaccines included in the scope of the costing analysis include: diphtheria-tetanus-pertussis, hepatitis B, *Haemophilus influenzae* type b, human papillomavirus, Japanese encephalitis, measles, meningococcus A, mumps, pneumococcus, poliomyelitis, rotavirus, rubella, tuberculosis and yellow fever.

11 Vaccines included in health benefits analysis cover the following diseases in countries representing 99.5% of the birth cohort of the 94 countries included in the costing analysis: hepatitis B, *Haemophilus influenzae* type b, human papillomavirus, Japanese encephalitis, meningitis A, pneumococcus, rotavirus, rubella, yellow fever and measles.

12 Data were insufficient to estimate morbidity averted through immunization in these countries.

The figures for deaths averted represent the full estimated benefits that can be achieved during the decade for these 10 vaccines, through sustaining or enhancing current immunization levels and introducing additional vaccines into the national immunization programmes of the selected countries, using no vaccination as the counterfactual. They are not limited to only the incremental benefits of the additional actions undertaken during the Decade of Vaccines (2011–2020).

The current projections of costs, available funding and health impact will evolve as additional analysis is completed and new and better data become available. Additional analysis will allow for the expansion of the scope described by this document, including increasing the number of diseases covered by the cost and health benefits analysis, quantifying impact on morbidity, quantifying economic benefits and further increasing the level of detail of costing and funding projections. Additional analysis is needed in order to better understand vaccine research and development costs and benefits, which are not included in the current projections. New and better data will, among other things, enhance the analysis with revised disease burden statistics, better vaccine price forecasts, improved population information and more consistent data across all countries. In addition, a process should be developed and maintained to allow for updates to cost, funding, and health and economic impact estimates at the country and global levels, ideally on an annual basis. This will facilitate enhanced planning, coordination and engagement among the many stakeholders that will be required to achieve the strategic objectives and goals of the Decade of Vaccines (2011–2020).

TABLE 8: TOTAL FUTURE DEATHS AVERTED, 2011–2020, ASSUMING NO VACCINATION AS THE COUNTERFACTUAL

GROUP	VACCINE	NO. OF FUTURE DEATHS AVERTED[a,b]
Original Expanded Programme on Immunization vaccine[c]	Measles 1st dose	10.6M
	Measles 2nd dose	0.4M
	Measles supplementary immunization activities	3.1M
New or underutilized vaccines	Hepatitis B[d]	5.3–6.0M
	Haemophilus influenzae type b	1.4–1.7M
	Pneumococcus	1.6–1.8M
	Rotavirus	0.8–0.9M
	Human papillomavirus	0.5M
	Yellow fever[e]	0.03–0.04M
	Meningococcal A meningitis[f]	0.03M
	Japanese encephalitis[g]	0.07M
	Rubella	0.4M
TOTAL (2011–2020)		24.6–25.8M

a The estimated future deaths averted was developed by a working group that included staff from WHO, the GAVI Alliance, the Bill & Melinda Gates Foundation and PATH. The estimate uses a mix of static and dynamic cohort models and various data sources across the 10 vaccines, including the Lives Saved Tool. Vaccine coverage projections are from the GAVI Strategic Demand Forecast 4.0 (4 October 2011) and from the GAVI Adjusted Demand Forecast.
b Ranges shown for estimates where alternative assumptions were considered for the scope of countries and the demand forecast.
c Data were insufficient to allow estimation of deaths averted from BCG, diphtheria, tetanus or pertussis vaccines.
d Scaled up in the decade 2001 to 2010.
e Disease burden limited to only a few regions.
f Same as above.
g Same as above.