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An Analysis Of How The GAVI Alliance And Low- And Middle-Income Countries Can Share Costs Of New Vaccines

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ABSTRACT Immunization is one of the "best buys" in global health. However, for the poorest countries, even modest expenditures may be out of reach. The GAVI Alliance is a public-private partnership created to help the poorest countries introduce new vaccines. Since 2008 GAVI has required that countries cover a share of the cost of vaccines introduced with GAVI support. To determine how much countries can contribute to the cost of vaccines—without displacing spending on other essential programs—we analyzed their fiscal capacity to contribute to the purchase of vaccines over the coming decade. For low-income countries, external financing will be required to purchase vaccines supported by GAVI, so co-financing needs to be modest. Relatively better-off "intermediate" countries could support initially modest but gradually increasing co-financing levels. The countries soon to graduate from GAVI can generally afford to follow a rapid path to self-sufficiency. Co-financing for these countries needs to ramp up so that national budgets fully cover the costs of the new generation of vaccines once GAVI support ends.

The GAVI Alliance is the main source of donor assistance for vaccination in developing countries. The organization was created in 2000 as a public-private partnership of developing countries, international development and finance organizations, foundations, the pharmaceutical industry, and others. Originally known as the Global Alliance for Vaccines and Immunization, the organization later shortened its official name to simply GAVI Alliance and is commonly referred to as GAVI.

GAVI now represents the largest source of external funding for the purchase of vaccines to provide immunization against, for example, hepatitis B and *Haemophilus influenzae* type b (Hib). Since its creation, the alliance has been concerned with the long-term sustainability of immunization programs in developing countries.

In 2008 GAVI introduced a "co-financing" policy requiring countries to share in financing vaccine purchases, by paying a small portion of the cost of new and underused vaccines introduced with the organization's support. Vaccines supported by the GAVI Alliance are in addition to other vaccines that governments purchase for their populations, which are typically polio, bacillus Calmette-Guérin (BCG) vaccine against tuberculosis, and measles.

In 2010 the GAVI Alliance contracted with the Results for Development Institute to support a review of the co-financing policy. The review prompted GAVI to revise the policy to better match the ability of countries to pay. The policy was also revised to help countries proceed toward the financial sustainability of vaccine programs after they "graduate" from GAVI's vaccine aid program. The new policy is to take effect in 2012.

As part of this process, the GAVI Alliance wanted to know what share of domestic budget-

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ary resources developing countries could reasonably devote to vaccines without jeopardizing other high-priority programs. To answer this question, we conducted what is called a "fiscal space" analysis, in which we reviewed the national expenditures of the countries that receive GAVI Alliance vaccine support. We aimed to determine individual countries' ability to finance a share of the cost of purchasing vaccines needed to immunize their populations against common diseases that are prevalent in their countries.

In this article we present the methods and the results of our fiscal space analysis and show how these results were used to calibrate appropriate levels of public financing for the new vaccines in countries with varying economic strengths.

GAVI's Role In Immunization

The GAVI Alliance was launched in 2000 to promote immunization in the poorest countries in the world, reversing the downward trend in global immunization rates that had occurred in the previous decade. GAVI also aimed to expand the introduction and use of new vaccines, such as hepatitis B and Hib vaccines. These were commonly used and available in wealthy countries but remained out of reach for people in the poorest countries.

This article focuses on GAVI's role in financing vaccines. However, the alliance also provides other forms of assistance. For example, GAVI financing addresses weaknesses in health systems that are barriers to immunization, such as problems in health workforce distribution or in the organization and management of health services. As of December 2010 the GAVI Alliance had disbursed US$2.8 billion to more than seventy countries, of which $2.2 billion was for purchases of new and underused vaccines and associated supplies.

The targets of the GAVI Alliance's efforts are developing countries that are unable to provide adequate vaccines to their populations. Eligibility is determined by reviewing individual countries' per capita gross national income, as reported by the World Bank.

In the alliance's first phase (2000–05), seventy-five countries were eligible for support. Eligibility was determined by 1998 per capita gross national income of under $1,000. In the alliance's second phase (2006–10), seventy-two countries were eligible, based on 2003 per capita gross national income of under $1,000.

The current eligibility threshold, established in 2011, is annual per capita gross national income of $1,500. The threshold will be adjusted annually for inflation, to remain constant in real terms, and it will be compared with a country's most recent estimate of per capita gross national income. Of the seventy-two countries in the alliance's second phase, sixteen now have per capita gross national income levels in excess of the $1,500 eligibility threshold and will therefore graduate from the organization's assistance when their current commitments end in 2015.

The GAVI Alliance's financing was initially targeted to the purchase of vaccines against Hib, hepatitis B, and yellow fever—highly cost-effective and life-saving vaccines that were not widely used by the poorest countries. In the case of Hib and hepatitis B, this was primarily because of the cost. GAVI engaged in financing yellow fever vaccine in the face of emerging outbreaks and to address a very limited global availability of the vaccine, which was the result of uncertain demand in the poorest countries. The GAVI Alliance's financing has strengthened the market for this important vaccine. It later expanded its support to pneumococcal, rotavirus, and other vaccines.

By financing the purchase of large volumes of vaccines, the GAVI Alliance initially expected to accelerate declines in vaccine prices over a period of just a few years, to levels that eligible countries could eventually afford with little or no outside funding.[1] By 2006, when price declines were slower than anticipated, GAVI recognized that external assistance would be needed longer, perhaps until prices drop to more affordable levels or countries achieved sufficient income growth to purchase vaccines on their own, or both.[2]

Some of the newer-generation vaccines in particular, such as pneumococcal conjugate vaccine, might not reach the price points of the older vaccines (such as yellow fever vaccine) precisely because of their complex technology—which is something that the GAVI Alliance did not fully appreciate at its start. Some of the newer vaccines are also more expensive because of limited competition among a small number of manufacturers. Older vaccines, such as measles, are produced by many manufacturers—a factor that helps lower costs.

GAVI's Initial Co-Financing Policy: 2008–11

In the GAVI Alliance's early years, some countries voluntarily financed a share of the purchase of vaccines supported by the alliance. Starting in 2008, GAVI required all recipient countries to contribute to vaccine funding. Countries were classified into four categories (fragile/postconflict, poorest, intermediate, least poor), based on a combination of factors, including their per capita gross national income levels, the United

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Nations' classification of least-developed countries, and GAVI's own determination of fragile or postconflict status. Contribution levels or requirements were established for each category, based on judgments of what countries could afford to pay.

Exhibit 1 presents the seventy-two countries eligible for GAVI Alliance assistance across the initial co-financing groups, compared to the new co-financing groups to be introduced in 2012 (which are discussed in detail below). Each initial group had a distinct co-financing requirement. For the "poorest" countries, this requirement meant that they contributed $0.20 per dose for the first vaccine purchased, say, for example, so-called pentavalent vaccine (which combines five different vaccines into one, for Hib, diphtheria, pertussis, tetanus, and hepatitis B), and $0.15 per dose for any subsequent vaccines, such as yellow fever. For "intermediate" countries, the co-financing share was $0.30 per dose for the first vaccine and $0.15 per dose for any subsequent vaccines.

As countries' resources increase, these co-financing rates change. For example, for the "least poor" countries, the rates increased 15 percent each year. In practice, this obligation meant that the country procured a certain number of doses, alongside those procured with the GAVI Alliance funds.

The ways that this policy was implemented in practice varied from country to country. The GAVI Alliance tracked countries' fulfillment of the co-financing requirements and followed up with those countries that did not meet their obligations. Over time, during 2008–10, both the GAVI Alliance–eligible countries and their international partners learned how to implement the new policy in terms of national budget and procurement arrangements.

Some countries defaulted in the first year, but this number declined significantly in the second year; all countries that defaulted paid their arrears in the following year.[3] Staff from ministries of health generally agreed that co-financing obligations helped build countries' sense of ownership over the vaccine effort and awareness of the value of the vaccines, because they were putting in their own resources rather just receiving a completely free good.[4]

EXHIBIT 1

Comparing The Initial And New Co-Financing Groups And Requirements For GAVI Alliance Countries

Initial co-financing policy: classification, 2008–11	Classification to be introduced in 2012 (country groupings revised annually thereafter according to latest data on per capita gross national income)		
	Low-income group	Intermediate group	Graduating group
Fragile/postconflict	Afghanistan, Burundi, Central African Republic, Democratic Republic of the Congo, Eritrea, Haiti, Liberia, Sierra Leone, Somalia	Côte d'Ivoire, Sudan	Angola, Republic of Congo, Timor-Leste
Poorest	Bangladesh, Benin, Burkina Faso, Cambodia, Chad, Comoros, Ethiopia, the Gambia, Guinea, Guinea-Bissau, Lao People's Democratic Republic, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Solomon Islands, Tanzania, Togo, Uganda, Zambia	Lesotho, Sao Tome and Principe, Senegal, Yemen	Bhutan
Intermediate	Ghana, Kenya, Democratic People's Republic of Korea, Kyrgyz Republic, Tajikistan, Zimbabwe	Nicaragua, Nigeria, Pakistan, Papua New Guinea, Uzbekistan, Vietnam	Cuba, Moldova, Mongolia
Least poor	—	Cameroon, Djibouti, Guyana	Armenia, Azerbaijan, Bolivia, Georgia, Honduras, Indonesia, Kiribati, Sri Lanka, Ukraine

SOURCES GAVI Alliance. Co-financing [Internet]. Geneva: GAVI; 2008 Aug [last updated 2011; cited 2011 May 2]. Available from: http://www.gavialliance.org/vision/programme_support/new_vaccines/cofinancing/index.php. Note 22 in text. **NOTES** Under the new classifications, low-income-group countries will be charged $0.20 per dose for all vaccines. Intermediate-group countries will be charged $0.20 per dose for all vaccines or the amount they were already paying upon entering the group, whichever is higher, and will face a 15 percent annual increase thereafter. Graduating-group countries will face a four-year ramp-up so that countries bear full cost when all GAVI support ends. Under the 2008–11 classifications, "fragile" countries are charged $0.10 per dose for the first vaccine and $0.15 for subsequent vaccines. "Poorest" countries are charged $0.20 per dose for the first vaccine and $0.15 for subsequent vaccines. "Intermediate" countries are charged $0.30 per dose for the first vaccine and $0.15 for subsequent vaccines. "Least poor" countries are charged amounts the same as for the "intermediate" group, but amounts increase by 15 percent per year. Because of its large population, India does not have to co-finance its GAVI vaccines and is excluded from Exhibit 1.

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Problems Surface With Review

Our review found two key problems with the initial policy. First, as countries experienced differential economic growth, the groupings no longer reflected countries' ability to pay. For example, Bhutan, classified as "poorest," now has a World Bank–estimated 2009 gross national income of $2,020 and is on track to graduate from the GAVI Alliance's support (Exhibit 1). Its categorization as "poorest," with its modest co-financing, was not revised each year to keep pace with its economic growth.

A larger concern was recognized as a result of our review, however. With the change in eligibility policy in 2011, the initial policy did not do enough to help prepare countries to take on the responsibility for financing a larger share of their vaccine purchases as they approach "graduation" from GAVI Alliance financing. Countries that would graduate in the short-to-medium term were unprepared for this transition.

'Fiscal Space' Analysis

To better assess the appropriate level of financial burden sharing by GAVI Alliance countries, the Results for Development Institute conducted a detailed fiscal space analysis in 2010. *Fiscal space* refers to the ability of a government to make budgetary resources available for desired purposes—in this case, immunization programs—consistent with responsible fiscal management.[5]

Countries can create fiscal space by broadening the tax base and improving tax administration, obtaining grants, reprioritizing expenditures, improving efficiency,[6] and, temporarily, by borrowing. Economic growth, for example, creates fiscal space from increased tax revenues. Fiscal space can focus on overall government expenditure or on government sectors, such as health or education. In this article we focus on the likely ability of the government health budget to absorb new expenditures.[7–9]

The GAVI Alliance's co-financing policy directly affects the public expenditures of recipient countries. If GAVI imposes a co-financing requirement that is beyond a government's ability to pay, the country might default on that obligation or meet it only by reallocating money from other key programs. When countries default, their support can be terminated. An analysis of the fiscal space available in individual countries allows us to gauge the burden imposed by co-financing levels and to see whether a country is on a path toward financial self-sufficiency after GAVI Alliance support ends.

Countries eligible for GAVI Alliance support range from the poorest countries in the world, with very low levels of government spending on health, to lower-middle-income countries that are growing relatively quickly and are poised to graduate from the alliance's vaccine aid program. Among these countries, per capita government spending on health (in 2008) varies from less than $2 (for example, in the Democratic People's Republic of Korea and Myanmar) to more than $100 (in Guyana and Ukraine).

In our fiscal space analysis, we asked: What levels of co-financing could reasonably be required of eligible countries at these different income levels? Which countries are likely to find it most difficult to meet their obligations to contribute to vaccine costs? And will graduating countries be able to fully absorb into their health budgets the cost of vaccines previously supported by the GAVI Alliance in order to maintain immunization gains?

Study Data And Methods

DATA SOURCES We projected costs for the vaccines supported by the GAVI Alliance over a ten-year period, 2011–20, using country-by-country estimated vaccine adoption rates based on population data, disease incidence, and other factors; the alliance's own (confidential) projections of vaccine prices; prices of associated supplies (syringes and safety boxes); and freight and insurance for vaccines. We did not include costs associated with expanding staff, vaccine storage, safe temperature control, or monitoring and supervision of vaccine introduction.

We projected government spending on health from World Bank gross domestic product projections. We undertook sensitivity analyses of vaccine price projections and future levels of government spending on health.

Our initial sample included the seventy-two countries eligible for GAVI Alliance funding in 2009. However, several countries—Eritrea, Democratic People's Republic of Korea, Somalia, and Zimbabwe—were excluded from the fiscal space analysis because we were unable to obtain recent data on per capita gross national income or government health spending. India also was omitted because it is excluded from co-financing requirements and because GAVI Alliance support is very small relative to its size. This left sixty-seven countries with an estimated annual birth cohort of 51.9 million in 2009. Results are reported in constant 2009 US dollars.

PROJECTED VACCINE ADOPTIONS WITH GAVI SUPPORT We modeled countries' eligibility for GAVI Alliance support, starting with per capita gross national income in 2009[10] and applying World Bank income growth projections. When a country's annual per capita income exceeded the alliance's eligibility threshold (currently

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$1,500, updated annually to remain constant in real terms), we assumed that the country would become ineligible for new GAVI support.

We used the alliance's data on vaccines already adopted and its demand forecasts presented to the GAVI Alliance board in November 2010 for the following vaccines: yellow fever, pentavalent, rotavirus, pneumococcal, Japanese encephalitis, rubella, typhoid, and human papillomavirus. The GAVI Alliance may finance other vaccines such as meningitis A for specific targeted campaigns, but these were not included in the model because such efforts do not have a co-financing requirement.

GAVI's vaccine adoption projections represent an upper limit of what countries would request, absent bottlenecks from the alliance's funding availability; vaccine supply; and domestic programmatic constraints, such as lack of staff or safe storage and transport capacity to support vaccine introduction.

PROJECTED COST OF VACCINE ADOPTIONS We used the GAVI Alliance's vaccine price projections, which are informed by the opinion of experts from international bodies such as the UNICEF Supply Division on factors such as the expected timing of new manufacturers' entry into the market. Most vaccines procured with the alliance's support are ordered by countries through the UNICEF Supply Division or through the Pan American Health Organization Revolving Fund. The projected costs of injection supplies, freight, and insurance are based on prices obtained by the UNICEF Supply Division and added to vaccine prices to constitute "fully loaded" vaccine costs.

Exhibit 2 shows these "fully loaded" vaccine costs for all countries eligible for GAVI Alliance support across all vaccines that the alliance already supports or is projected to support. These costs, shared by countries and GAVI, are estimated at about US$0.5 billion in 2010. They are projected to increase to US$1.1 billion in 2015 and US$1.6 billion in 2020.

Pentavalent vaccine accounts for the largest share through 2015. By 2020 pneumococcal, pentavalent, and rotavirus vaccines—in that order—are projected to represent the largest share of costs.

We also estimated the fully loaded cost of traditional vaccines that most countries deliver through their national vaccination programs, usually without donor support. In most countries this includes BCG, against tuberculosis; oral polio; and measles vaccines, now that the combination of diphtheria, pertussis, and tetanus vaccine is included in the pentavalent vaccine that the GAVI Alliance funds. The overall vaccine cost projections used in the fiscal space analysis include both traditional vaccine costs and costs of newer vaccines being introduced with GAVI assistance.

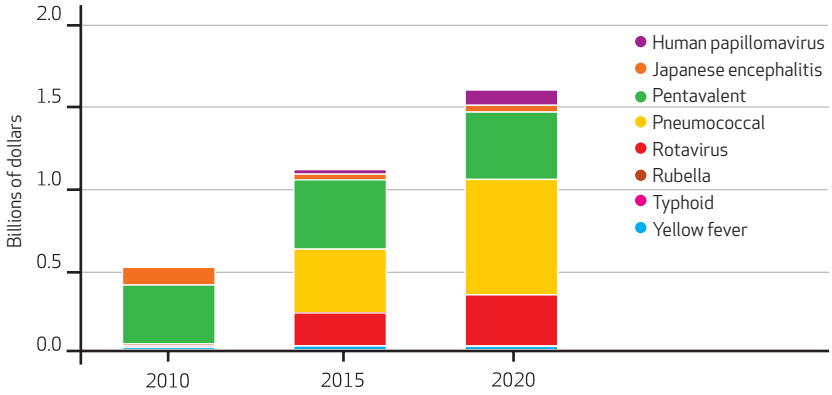
The traditional vaccines are all relatively inexpensive. For example, UNICEF's 2010 price per dose for the anti-tuberculosis vaccine BCG ranged from $0.06 to $0.14 per dose. Measles vaccine ranged from $0.19 to $0.30 per dose, and oral polio vaccine, from $0.13 to $0.16 per dose.[11] In contrast, the newer vaccines supported by the GAVI Alliance are much more expensive. For example, UNICEF's 2011 weighted average price for pentavalent vaccine varies from US$1.75 to $3.05 per dose for the three-dose course for countries that are eligible to participate in the GAVI Alliance.[12]

Our calculations do not include other immunization delivery costs, such as wages. These are important, but most are shared system costs not easily attributable to vaccination. They are challenging to estimate across a large group of countries. Our analysis focuses on recurrent costs only. The calculations do not include possible investment requirements such as expansion of the cold chain, the system required to ensure that drugs requiring refrigeration receive it as they are transported and stored throughout the country.

PROJECTED GOVERNMENT SPENDING ON HEALTH Estimates of government spending on health (general government health expenditure)—in absolute terms and as a share of total government spending—were exported from the World Health Organization National Health Accounts database for all GAVI-eligible countries for years up to 2008.[13] Although these data still have shortcomings,[14,15] the National Health

EXHIBIT 2

Fully Loaded Vaccine Costs For All GAVI Countries, By Vaccine, Selected Years 2010–20



SOURCE Internal and confidential GAVI Alliance vaccine demand and price projections. **NOTES** All values are in constant 2009 US dollars at market exchange rates. Values for rubella, typhoid, and yellow fever are so small relative to those for other diseases that they are barely perceptible in this exhibit.

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Accounts data nonetheless provide a useful basis for projecting government spending on health.

The numbers for government spending on health presented here include all funds the government actually expends—meaning not just its own sources of domestic revenue, but also any external assistance it receives that flows through the government budget. This is in contrast to the concept of government spending by "source"—for example, just from its own domestic revenue and not including other sources such as external assistance.

Under this reckoning, GAVI Alliance assistance for new and underused vaccines is delivered in kind as vaccines. As such, it hardly ever appears in the government budget, so it would not be included in the government spending data on which we base our projections.

We projected government spending on health per capita at the same rate as projected per capita gross domestic product growth because the two growth rates tend to be equal or nearly so (with a correlation of 0.85 from our calculations, which is similar to other analyses).[16,17] World Bank gross domestic product projections are country-specific until 2015. For fourteen countries where the World Bank had not made these per capita projections, we estimated gross domestic product growth based on recent past economic performance.

Study Results

COUNTRIES' ABILITY TO CONTRIBUTE TO VACCINE COSTS GAVI Alliance–eligible countries span a large income range. Burundi, Democratic Republic of the Congo, and Liberia are the poorest, with 2009 per capita gross national incomes of US$150, $160, and $160, respectively. At the other extreme, Angola, Armenia, Azerbaijan, and Cuba are examples of countries with 2009 per capita incomes above US$3,000.

To address this heterogeneity in countries' ability to pay for vaccines, GAVI needed a co-financing policy that distinguished among countries with widely differing fiscal capacities. We created the three categories presented in Exhibit 3—what we call low income (World Bank definition, 2009 per capita gross national income of $995 or less), intermediate (2009 per capita gross national income of $996–$1,499), and graduating (2009 per capita gross national income of $1,500 or more).

For 2012, the new groupings have many changes from the previous groupings (Exhibit 1). The new definition of *intermediate*, for example, includes countries from the previous fragile, poorest, intermediate, and least-poor groups.

Government spending on health averaged about US$15 per capita in the low-income countries in 2008, while the graduating countries spent, on average, more than seven times more (Exhibit 3). A few of the low-income countries eligible for GAVI Alliance support still rely on other donors to fund the relatively inexpensive traditional vaccines.

These large differences in per capita government spending on health reflect the very large differences in ability to pay for new vaccines across GAVI Alliance–eligible countries. Low-income countries are the least prepared to assume new vaccine financing. These countries also tend to have the highest fertility rates, so they have not only the fewest resources but also the largest birth cohorts—in other words, pop-

EXHIBIT 3

Government Spending Indicators, 2008, And Projected Vaccine Costs As A Share Of Government Spending , 2010 And 2015, By Income Group, In Countries Eligible For GAVI Alliance Assistance

New co-financing categories (effective 2012)	Per capita government spending on health (US$ 2009)	Health spending as percent of government spending	Government spending as percent of gross domestic product	Vaccines as percent of government spending on health	
				2010	2015
Low income	14.83	10.0	25.0	4.2	6.3
Intermediate	35.84	9.1	31.2	1.5	2.2
Graduating	107.43	8.7	37.0	0.5	0.6

SOURCES Note 13 in text. Authors' projections of country vaccine costs and government spending on health, 2010–20. **NOTES** All figures represent the country-weighted average for that group. Descriptions of the three co-financing categories are presented in Exhibit 1. National health accounts data (per capita government spending on health, government spending on health as a share of total government spending, and total government spending as a share of gross domestic product) are for 2008. Values are in constant 2009 US dollars at market exchange rates.

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ulations requiring vaccines—relative to population.

On average, health absorbs about 9 percent of all government spending in countries eligible for the GAVI Alliance.[13] Health's share of government spending declines slightly as income grows in our sample. But at the same time, as income grows, government spending as a share of gross domestic product increases (Exhibit 3), as tax administration and the economic base grow stronger. For example, low-income countries devote 25 percent of gross domestic product to government spending. This share rises to 37 percent for the countries graduating from GAVI Alliance support.

Exhibit 3 shows total vaccine costs (traditional and those supported by the GAVI Alliance) as a share of government spending on health in 2010 and in 2015. None of the countries in the analysis that are receiving support from the GAVI Alliance for new vaccines are currently paying these full costs from their domestic resources. These estimates simply show what would be needed if governments assumed the full cost.

For the low-income countries, the analysis suggests that donor assistance will be needed for many years to come, because total vaccine costs represent 4.2 percent of government spending on health in 2010 and 6.3 percent in 2015. In these countries, governments are struggling to fund other important public health activities and a basic health care system for their populations with an average of just $14.83 per capita per year in 2008 (Exhibit 3). It is unlikely that countries could quickly shift upward of 4–6 percent of their very limited resources into vaccines, despite the cost-effectiveness of immunization.

In sharp contrast, the current cohort of graduating countries—those with 2009 per capita gross national income of US$1,500 or more—would require a much smaller share of government spending on health to be devoted to vaccine costs. This suggests that they have much greater potential than the poorest countries to assume most, if not all, of the costs of their new vaccines.

SENSITIVITY ANALYSES We conducted sensitivity analyses on both vaccine prices and projected government spending on health (results are in the online Appendix).[18] Pentavalent, rotavirus, and pneumococcal vaccines are projected to be the GAVI Alliance's main cost drivers (Exhibit 2) in the medium term. Because pneumococcal price projections are more certain, given the agreements under the GAVI Alliance's Advance Market Commitment, the sensitivity analysis focused on pentavalent and rotavirus vaccine prices.[19]

In the low price projection, we lowered the base price projections by 20 percent for these two vaccines. For the high price projection, we increased price projections by 20 percent.

The low and high pricing scenarios make the most difference for the low-income countries—not surprisingly, given their lower levels of government spending on health. Even the low pricing scenario results in vaccine costs, at 5.8 percent of government health spending in 2015, that are still very high. The high pricing scenario raises our base projection from 6.3 percent to 6.9 percent of government health spending in 2015.

For the sensitivity analysis on projected government spending on health, we created a low government spending scenario by reducing the World Bank's economic growth projections by 10 percent. Government per capita spending on health was projected at the same rate as the lowered per capita economic growth projections

The high government spending scenario is much more optimistic than our projections. It is inspired by the 2001 Abuja Declaration—endorsed by African heads of state—which gradually expands the share of government spending for health to 15 percent. We assumed that the share of government health outlays for countries currently spending less than this level will increase by an additional 5 percent a year above projected growth in per capita gross domestic product until the 15 percent target is reached.

Only nine of sixty-seven countries in the sample had already reached the 15 percent level, according to 2008 data. Many countries have indicated that they cannot achieve these targets, and we view this high government spending on health scenario as unrealistic. However, we included it for illustrative purposes because of the frequent mention of the Abuja targets in recent years by advocates for higher health spending.

Under this scenario of higher government spending, countries have more budgetary room to pay for vaccines, but the situation still leaves the low-income countries with projected vaccine costs amounting to 4.9 percent of all government spending on health in 2015 (down from 6.3 percent in our baseline projections). For intermediate countries, the scenario of higher government spending would lower projected vaccine costs from 2.2 percent in our projections to 1.6 percent in 2015.

What level of government spending on vaccines is reasonable, given funding constraints and trade-offs with competing priorities? There are no generally accepted benchmarks for the share of government spending on health that a country might reasonably spend on vaccines.

For example, preliminary data from countries in Latin America show that vaccines typically

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Not all countries within the same income group have the same ability to co-finance their immunization programs.

account for slightly less than 1 percent of government spending on health (Pan American Health Organization, personal communication, 2010 Aug). Of the Latin American countries examined, the highest share is 1.8 percent (Ecuador). Latin American countries finance vaccines almost exclusively from national funds.[20] Most Latin American countries are not eligible for GAVI Alliance support because of their higher incomes. As a group, they have had strong political support for immunization and thus tend to be early adopters of new vaccines.

The share of the national budget that Latin American countries spend on vaccines is one indicator of the percentage of national budgets that countries with strong commitments to immunization could spend on vaccines. It would be useful to have similar data from other regions to serve as reference points.

Using this point of reference (1 percent of government spending on health), on average, low-income countries eligible for support from the GAVI Alliance would have difficulty bearing the full cost of the life-saving vaccines they are projected to adopt in the coming years. For intermediate countries, assuming the full costs would put many of them at the outer limit of this point of reference. On the other hand, GAVI Alliance countries poised to graduate should eventually be able to pay for their vaccine programs using domestic resources.

DIFFICULTY MEETING CO-FINANCING OBLIGATIONS Not all countries within the same income group have the same ability to co-finance their immunization programs. Countries with low levels of government spending on health relative to their income are likely to find co-financing payments harder to assume. Very low shares of government spending on health could also signal a lack of political will to invest in health and immunization, or problems in governance.

The fiscal space analysis can help identify these outliers in advance. In response, the GAVI Alliance and its partners can invest more effort in communicating to health and financing officials in these countries the value of immunization in terms of the country's disease problems and expected cost-effectiveness of vaccines and the importance of investing more in health.

DETERMINING CO-FINANCING LEVELS AND GROUPINGS Based on the fiscal space results, the GAVI Alliance created the three new country groups for the co-financing rules that were approved by its board in late 2010 and that will take effect in 2012. In contrast to the initial classification, the new groupings are not static. Thresholds will be adjusted annually to remain constant in real terms. Depending on its economic growth, a country can transition to another group with its corresponding co-financing requirements.

The GAVI Alliance considered many different levels of co-financing, including national contributions pegged to projected vaccine prices, amounts per dose, and amounts per course (including all doses of the vaccine needed).[21] In the end, co-financing per dose was chosen, except in the graduating countries. For these countries, co-financing is to be ramped up linearly over four years to reach the full cost of vaccines.[22]

Exhibit 4 illustrates the impact of three different co-financing levels for low-income countries—$0.15, $0.20, and $0.30 per dose—using our price and government spending on health projections. Because these countries are already paying $0.20 per dose for the first vaccine, the review team felt that co-financing of $0.15 was too low, even though countries might have to co-finance a larger number of vaccines in the future.

On the other hand, at $0.30 per dose, almost one-third of GAVI Alliance–eligible low-income countries would face co-financing requirements equal to more than 1 percent of their government health expenditures—a level that was not considered reasonable. For that reason, $0.30 a dose was rejected.

In the revised policy, the GAVI Alliance therefore settled on $0.20 per dose for the first and subsequent vaccines for this low-income group. At this level, it was estimated that twenty-one of thirty-four low-income countries would have to spend up to 0.5 percent of their health budgets on co-financing; a further nine would spend 0.5–1 percent; and just four would face the more challenging prospect of spending more than 1 percent.

For the intermediate countries, our modeling showed that co-financing of $0.20 per dose, with annual increases of 15 percent per year, would be reasonable and would help these countries start

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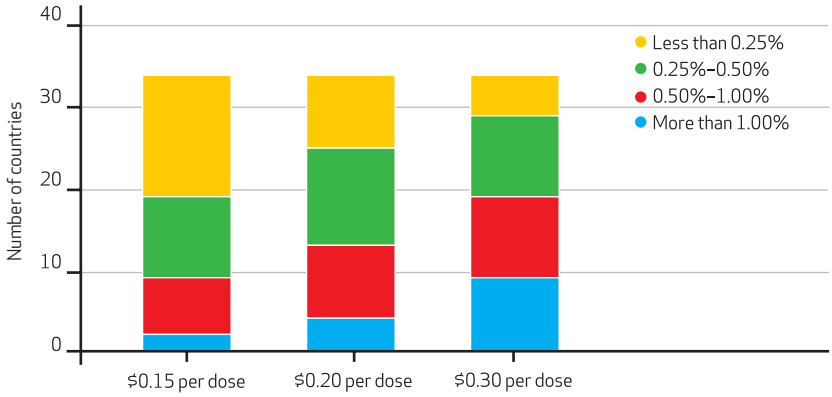
EXHIBIT 4

Impact Of Different Co-Financing Requirements On The Share Of Government Spending On Health Going To Vaccines In Low-Income Countries In 2015 (Assuming Co-Financing Requirements Were Met)



SOURCE Authors' projections of countries' vaccine costs and government spending on health, 2010–20. **NOTE** A total of thirty-four countries are projected to be classified as low-income countries in 2015.

to prepare for eventual graduation by gradually expanding budgets for immunization.

For the graduating countries, the previously low levels of required co-financing were changed to increase rapidly, starting in 2012, to put them on the path toward reaching financial sustainability in 2016 (Exhibit 5). This rapid rise in co-financing was considered reasonable (but still challenging) for most countries in this group. All but the Republic of Congo were projected to spend less than 0.8 percent of their health budgets in 2016 on vaccines (the year that they are expected to assume full financial responsibility for vaccine purchases).

In Exhibit 5, the Republic of Congo is the clear outlier. Given its low levels of government spending on health relative to income and the multiple vaccines it will have adopted with the GAVI Alliance's support, its new vaccines are projected to require 2.1 percent of government health spending by 2016.

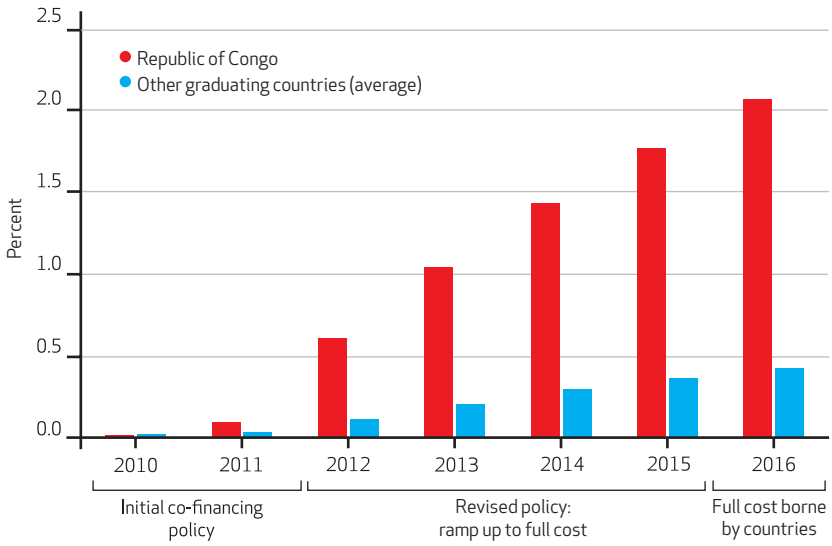
To achieve this ambitious goal, the alliance and other partners will have to engage actively in policy discussions with the ministers of health and finance and other national leaders of the Republic of Congo. They will need to highlight the large health benefits that the Republic of Congo will obtain from maintaining the new vaccines in terms of reduced morbidity and mortality, ways to pay for it from domestic resources, and the need for planning for increased expenditures in the budget process.

For the other graduating countries preparing to transition to financial self-sufficiency a few years from now, it may also be challenging to pay for the vaccines. Although most countries will probably need to steadily increase budgets from domestic resources, creative solutions can be found in some cases.

Bhutan and Mongolia, both graduating countries, have created trust funds from private and public donors that will help pay for vaccines over the coming years. Some countries not participating in the GAVI Alliance vaccine support program have introduced new revenue channels to support vaccines, such as earmarking revenues from oil, as in Mexico, and from the national lottery, as in Costa Rica.[23] These strategies may be options for some countries to expand the fiscal space available for vaccines and immunization programs.

EXHIBIT 5

Percentage Of Government Spending On Health Necessitated By GAVI Alliance Co-Financing Requirements, Republic Of Congo And Other Graduating Countries



SOURCE Authors' projections of countries' vaccine costs and government spending on health, 2010–16. **NOTE** "Other graduating countries" include an average of Angola, Armenia, Azerbaijan, Bhutan, Bolivia, Georgia, Honduras, Indonesia, Kiribati, Moldova, Mongolia, Sri Lanka, and Timor-Leste (Cuba and Ukraine are excluded because they are not receiving GAVI support for new vaccines).

Discussion And Conclusion

Our fiscal space analysis suggests that in low-income countries, the portfolio of vital vaccines being financed with the GAVI Alliance's support will not be easily absorbed by government budgets over the medium term without substantial external financing from GAVI.

GAVI can help these countries build national ownership and visibility for immunization by requiring them to finance a modest share of vaccine costs, set at $0.20 per dose. Intermediate countries can begin to prepare for their eventual graduation from the GAVI Alliance program by assuming co-financing rates that increase by

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The overarching objective is to encourage countries along a trajectory toward financial sustainability.

15 percent per year, starting at $0.20 per dose.

Countries with the highest per capita gross national income that are graduating from the alliance's support over the next five years are best positioned to absorb the cost of vaccines as external support is phased out.

This conclusion will soon be tested in the group of countries that are starting to graduate in 2011. One issue for these countries, which is not discussed in detail here, is whether they can obtain reasonable and predictable post–GAVI Alliance prices for vaccines.

Out of the vaccines that the GAVI Alliance is currently financing, this uncertainty is probably greatest for rotavirus vaccine. After their GAVI support ends, graduating countries will be able to continue to access pneumococcal vaccine at the Advance Market Commitment terms and conditions.

Countries that have graduated from the GAVI Alliance program may be able to procure pentavalent and yellow fever vaccines at near alliance prices, given the prices that the Pan American Health Organization Revolving Fund gets for these vaccines on behalf of middle-income countries in the Americas.

The overarching objective of the GAVI Alliance's co-financing policy is to encourage countries along a trajectory toward financial sustainability. Requiring all eligible countries to procure a portion of their vaccines themselves helps expand domestic funding for immunization programs.[24] To the extent possible, within its own funding constraints, the GAVI Alliance is also trying to make its assistance predictable and stable so that co-financing requirements are clear and countries have the needed time to build additional vaccine funding into their budgets.

As other donors—including the Global Fund to Fight AIDS, Tuberculosis, and Malaria and the US President's Emergency Plan for AIDS Relief (PEPFAR)—begin to reconsider their own co-financing policies, several lessons can be drawn from the GAVI Alliance's experience.

First, analyzing the fiscal space in countries helps donors determine what financial responsibilities countries at different income levels could reasonably absorb and over what time period external assistance may be phased out. Moreover, it allows policy makers to calibrate the level of country co-financing that is affordable, while encouraging governments to "buy in" to and move toward self-sufficiency of their donor-assisted health programs.

Finally, fiscal space analyses help identify countries that are committing very low levels of public funding to health relative to their income levels, such as Angola and the Republic of Congo, where additional policy dialogue may be useful or even necessary. Co-financing is a potentially powerful tool for policy makers at bi- and multilateral aid organizations, but its design and implementation must be grounded in the realities of countries' budgetary situations. ■

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NOTES

1 In the past, vaccine prices tended to fall to low levels as manufacturers recouped research and development costs and as economies of scale and technological change reduced production costs. Because of the complexity of manufacturing certain new and underused vaccines, price drops may be more limited, decreasing the prospect of affordability for poor countries.

2 GAVI Alliance. Revision and alignment of country support policies in phase 2 [Internet]. Geneva: GAVI; 2005 Dec 6 [cited 2011 Jan 23]. (Doc A.8). Available from: http://www.gavialliance.org/resources/17brd_8_CountrySupportPoliciesPhase2_6Dec2005.pdf

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4 For example, see UNICEF. Co-financing new vaccines and sustainability. Meeting report of the Africa Regional Workshop; 25–28 May 2009; Dakar, Senegal. New York (NY): UNICEF; 2009.

5 Heller P. Back to basics—fiscal space: what it is and how to get it. Finance and Development [serial on the Internet]. 2005;42(2) [cited 2011 Mar 15]. Available from: http://www.imf.org/external/pubs/ft/fandd/2005/06/basics.htm

6 We did not look at the scope for improving efficiency in immuniza-

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tion programs (or in the health sector) in this analysis. However, there are possible ways to improve efficiency: for example, by reducing wastage or better selection of vaccine presentation in procurement.

7 Williams G, Hay R. Fiscal space and sustainability from the perspective of the health sector [Internet]. Paper commissioned for: High-Level Forum on the Health Millennium Development Goals; Paris; 2005 Nov 14–15 [cited 2011 Mar 15]. Available from: http://www.hlfhealthmdgs.org/Documents/FiscalSpacePerspective.pdf

8 Tandon A, Cashin C. Assessing public expenditure on health from a fiscal space perspective [Internet]. Washington (DC): World Bank Group;2010 Feb [cited 2011 May 16]. (HNP Discussion Paper). Available from: http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1095698140167/AssesingPublicExpenditureFiscalSpace.pdf

9 Vos R, Sanchez M, Inoue K. Constraints to achieving the MDGs through domestic resource mobilization [Internet]. New York (NY): United Nations Department of Economic and Social Affairs; 2007 May [cited 2011 May 16]. (DESA Working Paper No. 36). Available from: http://www.un.org/esa/desa/papers/2007/wp36_2007.pdf

10 World Bank. World development indicators online [Internet]. Washington (DC): World Bank; 2011 [last updated 2010 Dec; cited 2011 May 25]. Available for download from: http://data.worldbank.org/data-catalog/world-development-indicators

11 UNICEF. Vaccine price data [Internet]. Geneva: UNICEF; 2011; [cited 2011 May 26]. Available from: http://www.unicef.org/supply/index_57476.html

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14 Ravishankar N, Gubbins BA, Cooley R, Leach-Kemon K, Michaud C, Jamison D, et al. Financing of global health: tracking development assistance for health from 1990 to 2007. Lancet. 2009;373(9681):2113–24.

15 Lu C, Schneider M, Gubbins P, Leach-Kemon K, Jamison D, Murray C. Public financing of health in developing countries: a cross-national systematic analysis. Lancet. 2010; 375(9723):1375–87.

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17 Similarly, Tandon and Cashin (see Note 10) estimate the elasticity of government spending to gross domestic product at about 1.16 percent across low-income countries, meaning that a 1 percent rise in income results in a 1.16 percent increase in government health spending.

18 To access the Appendix, click on the Appendix link in the box to the right of the article online.

19 Advance Market Commitments for Vaccines. The pneumococcal AMC: ready to save lives [Internet]. Geneva: GAVI Alliance; 2007 [cited 2011 May 3]. Available from: http://www.vaccineamc.org/pneu_amc.html

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21 For more information on the advantages and disadvantages of different approaches, see GAVI Alliance. Final minutes, GAVI Alliance Programme and Policy Committee, 2010 Oct 21–22 [Internet]. Geneva: GAVI; 2010 [cited 2011 Mar 15]. Available from: http://www.gavialliance.org/resources/PPC_Minutes___21_22_October_2010.pdf

22 GAVI Alliance. Revised vaccine co-financing policy [Internet]. Geneva: GAVI; 2010 [cited 2011 Mar 15]. Available from: http://www.gavialliance.org/vision/programme_policies/cofinancing_policy/index.php

23 World Bank, GAVI Alliance. Immunization finance toolkit, brief 7. Washington (DC): World Bank; 2010 Dec.

24 The GAVI Alliance recognizes that some countries may rely on development assistance to meet their co-financing requirement.

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Helen Saxenian heads up the team that worked together on an article in this month's *Health Affairs*. The article presents the results of their analysis of how the GAVI Alliance aims to finance the costs of providing life-saving vaccines to people in low- and middle-income countries.

Saxenian and her coauthors have a track record of developing and implementing novel ways to make immunizations available to people in poor countries, first within the World Bank and then through the GAVI Alliance (formerly known as the Global Alliance for Vaccines and Immunization, and now simply as GAVI).

Saxenian is a senior consultant to the Results for Development Institute and other organizations, following almost two decades at the World Bank in technical and managerial roles, mostly in the health sector. She is deeply familiar with GAVI's goals; she says that she and coauthor Rob Hecht "were involved in GAVI at its creation."

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The author of more than thirty articles and other publications, Hecht earned his doctoral degree in anthropology from Cambridge University.

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