RESULTS FOR DEVELOPMENT

Landscape Study of the Cost, Impact, and Efficiency of Above Service Delivery Activities in HIV and Other Global Health Programs

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Results for Development Institute (R4D) is a nonprofit organization whose mission is to unlock solutions to tough development challenges that prevent people in low- and middle-income countries from realizing their full potential. Using varied approaches in multiple sectors, including global health, global education, governance, and market dynamics, R4D supports the discovery and implementation of new ideas for reducing poverty and improving lives around the world.

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Introduction

Costs incurred by health programs for activities conducted above the front-line facility or community setting, referred to in this report as costs *above the point of service delivery* (ASD), constitute a substantial share of health program spending: for example, for 2014, ASD expenditures for the President's Emergency Plan for AIDS Relief (PEPFAR) reported through the PEPFAR dashboards amounted to over **1.5 billion USD**, or 45 percent of the total expenditures reported. Despite the vast sums spent above the point of service delivery, far less is known about ASD costs than costs at the point of service delivery.

Understanding the costs, impact, and efficiency of ASD activities should be a priority for all stakeholders, as policy-makers and funders seek their expenditures on large health programs to be more efficient and have a greater impact, and as beneficiary countries assume responsibility for a larger share of spending on programs as they transition away from donor funding. In instances in which spending on ASD activities is inefficient or wasteful, the funds could be reallocated to fund front-line services. Conversely, ASD activities that have a strong impact on the quality or efficiency of service delivery could be supported further to maximize scarce resources.

To better understand and assess the potential for future improvements in this area, the Bill and Melinda Gates Foundation (BMGF) asked Results for Development Institute (R4D) to assess the current state of knowledge and practice regarding ASD costs for HIV and other health programs (immunization, tuberculosis, malaria, nutrition, and family planning). From July 2015 to April 2016, R4D conducted desk research and expert interviews and facilitated a consultation between BMGF, experts, and other stakeholders.[1] This report represents the final output of this research.

The report examines the following critical questions relevant to three specific groups of stakeholders:

For **ministries of health**: How much money are different countries and disease programs spending on ASD activities? How important are investments in these activities and systems? In which might it be most feasible to improve technical efficiency?

For **donors**: What roles do ASD activities play in driving value for money in global health programs? As countries transition from donor funding, how can donors better evaluate their own ASD spending and provide transitioning countries with a clear rationale to fund these activities?

For **foundations, NGOs, and the research community**: What are the critical gaps in knowledge surrounding ASD activities, and how can they be filled? What actions should stakeholders take today based on the knowledge that already exists?

In this report, to answer these questions, we examine in detail publicly available data about ASD *costs*, discuss the current state of knowledge and ongoing efforts to understand the *impact* and *efficiency* of ASD activities, and offer recommendations based on our preliminary findings and the recommendations of experts and stakeholders that we consulted throughout the process.

In the first chapter of the report, we provide an overall taxonomy of ASD activities and provide an overview of the costs, impact, and efficiency of ASD activities. The second chapter focuses on ASD activities in the context of HIV programs, the primary programmatic area of interest in the report. The third chapter summarizes our findings in additional programmatic areas of interest to ministries of health and other stakeholders that provide additional context for HIV: immunization, tuberculosis (TB), malaria, nutrition, and family planning. The fourth chapter explores in more detail two cross-cutting topics of particular interest: Supply Chain and Procurement, and Laboratory Operations. The fifth chapter explores costs related to Aid Architecture. The sixth chapter summarizes the recommendations of the report. We provide additional background on our methodology and the sources that we consulted in the appendices.

[1] We provide further details on the experts who we interviewed and the literature that we reviewed in the appendices to this report.

Overarching Themes and Taxonomies of Costs

Definitions and working taxonomy

Above the point of service delivery (ASD) activities include *procurement* and *supply chain* activities, in which critical commodities and equipment are supplied to service providers, and *demand generation* activities like mass media campaigns at the district, regional, or national level, which seek to maximize the numbers of patients who visit service providers. Some ASD activities are systemic, such as activities that support the *laboratory system* or *health information infrastructure*, while other ASD activities are programmatic and take place at district, regional, national, or above-national level. Such programmatic activities are designed to ensure the proper operation of the program and the quality of front-line services, and include *program management*, *monitoring and evaluation*, *supervision*, and *surveillance*.

Several caveats are important to mention at the outset. First, while some activities, such as procuring antiretroviral drugs (ARV), are performed above the point of service delivery, many of the activities mentioned above also are performed by front-line facilities or have clear corollaries at the facility level. For example, to provide a vaccine to a child, supply chain activities above the facility level are a prerequisite, including cold chain maintenance and properly storing the vaccines at all times, but these activities must also occur at the facility level. The facility must have proper storage equipment and processes.

In this report, we examine the costs, impact, and efficiency of ASD activities in HIV and other programs. To do so, we provide an overall taxonomy of ASD activities. Specifically, in this report, we focus generally on the costs incurred by global health programs away from facilities, as they are less well accounted-for and are more opaque. As such, we have not included in our definition of "above the point of service delivery" activities that are performed at the facility level even if they are conceptually similar to activities that take place above the facility level. In addition, we consider as point of service activities those activities that are performed in communities (outreach or 'below facility' activities), such as community screening or vaccination drives.

Second, we do not include in our taxonomy all of the activities that are associated with the national (or international) response to a given health priority. In particular, we do not address non-health-related activities, such as social protection for Orphans and Vulnerable Children, that often are included in national assessments of spending on HIV programs, but which have an indirect impact on health outcomes, and for which the health benefit is only one of several potential justifications for the societal resources invested.

Third, the different health programs discussed in this report have different emphases and use different practices to estimate and account for costs. As such, there is no single accepted taxonomy of costs across (or even within) programs, and we have not attempted to reshape existing literature and data to match a detailed unified framework. Insofar as major health programs differ significantly in their key cost drivers, it may be logical to retain different taxonomies: when it comes to collecting data for analysis, it is most important that country programs capture costs comprehensively, and in a way that enables researchers to compare them with those of similar health programs in other countries. These comparisons are particularly relevant for donors funding programs in multiple countries, and also for health officials who seek guidelines to plan programs. Comparability across programs could benefit health officials, but is less likely to yield immediately helpful benchmarks unless significant adjustments are made for the nature of the different health areas.

For the purpose of this work and to frame and ground further discussion, we have created an illustrative taxonomy of costs by activity and level, designed to be broadly applicable across multiple disease areas, provided in Figure 1.

Figure 1. Illustrative taxonomy of costs incurred in the delivery of health services

		Below-facility level	Facility level	District level	Regional level	National level	Above-national level
Routine facility-based service delivery	Treatment						
	Prevention						
Outreach service delivery	Treatment						
	Prevention						
Procurement, collection, distribution and storage of medicines and commodities							
Social mobilization and demand generation							
Laboratory system							
HMIS and record-keeping							
Program management							
Monitoring and evaluation							
Supervision							
Surveillance							
Training							
				Core above-service delivery costs			

Additional dimensions could be added to this taxonomy. It is common in costing studies/analyses to break down costs into categories representing specific types of resources, sometimes referred to as 'inputs' and/or by categories representing specific functions or activities. In some cases (such as the EPIC studies), researchers distribute costs across a two-dimensional input-activity matrix. For simplicity, we have not included this 'input' line-item lens in this taxonomy, but we will refer to specific line items later in this report where relevant.

Finally, we did not make two additional distinctions in this taxonomy that may be relevant to policy-makers. The first is the distinction between *recurrent* costs (i.e., costs that represent inputs that are 'used up' in a given year—including employee time—and are likely to recur in the next year) and *capital* or *investment* costs, which typically reflect some investment that provides benefits over multiple years. The second is the distinction between *ongoing* costs (expected to occur each year to maintain a current level of service) and *set-up* costs (costs that are associated with the introduction of a new program or with the scaling up of an existing program, but are not expected to be incurred after the set-up period). These distinctions underline the importance of the specific country's and program's context to make comparisons: newly introduced programs, or programs that are rebuilt in conflict-affected countries, are likely to have quite different cost structures from mature programs that operate in stable environments.

Overarching themes: ASD costs

In this section, we introduce and discuss several overarching themes that emerged regarding ASD costs in health programs addressing HIV, immunization, TB, malaria, nutrition, and family planning.

Cost theme 1: Data on ASD costs are limited in availability and quality

Based on our review of published and grey literature, and interviews with cost experts, we found little high quality data on costs above the point of service delivery. The vast majority of cost studies that we reviewed concerned costs at the facility level. Few accounted for *any* activities above facility level, and almost none addressed ASD costs in a comprehensive fashion. For illustration, in a review of literature on the costs of antiretroviral therapy (ART) and prevention of mother-to-child transmission (PMTCT) interventions in LMICs, Galárraga et al., (2011) found 29 relevant articles that met their inclusion criteria, only 3 of which mentioned "programmatic" costs, and these did not provide sufficient detail for analysis.[2] We believe this may reflect that some researchers perceive costs above facility level to be fixed, or effort above facility level to be only indirectly tied to facility-level activities. Researchers also may find it too challenging to study costs above the facility level. Studying costs at the facility level may be more tractable analytically, and can be the basis to effect meaningful change at the facility level, but neglecting ASD costs has limited the improvements that stakeholders, donors, and implementing organizations can make to health programs more broadly.

In cases in which ASD cost data are available, we found that they may not have been gathered in ways that enable us to draw comparisons between programs with confidence. To assess comparability between ASD costs in HIV programs in different countries, for example, the relevant studies first must similarly define whether a cost is incurred ASD or at the point of service, and within the category of ASD costs, the studies should define similar categories of activities that either directly correspond with each other or can be easily manipulated to create comparable categories. To date, the lack of standardization makes it challenging to compare results from different studies, with the exception of those studies (such as the EPIC studies in immunization) that were prospectively designed to use a consistent methodology across countries.

In addition, even when researchers made a good faith effort to collect ASD cost data, we found that they encountered methodological challenges in doing so. ASD activities often involve resources that are shared by more than one health program, e.g., staff members in a district health office, medical warehouses to store drugs and commodities, or laboratory systems that service multiple diseases. Researchers often have difficulty accurately teasing apart how much of a shared resource is allocated to different programs because managers within programs/health systems do not typically account for this distinction in the course of day-to-day operations. To focus primarily on ASD costs, researchers could use methods like time-motion or work sampling techniques to achieve fairly rigorous estimates of the time allocations across different tasks, but generally in studies, ASD costs are just a small piece of a larger costing effort. Accordingly, researchers may rely on self-reported time allocations or on reports from managers that describe how they think their staff split their time across activities.

We did not find any studies in the literature review for this report that provide comprehensive ASD costing using the most rigorous (but time-intensive) research techniques. We anticipate that more precise estimates may be of interest to researchers and donors: the former, because investigating the impact of these activities might be confounded by poor measurement of the activity itself; the latter, to better understand the extent to which staff funded by donor programs are providing additional benefits to other disease programs or the primary healthcare system more generally. However, given the high cost of producing these estimates, the value to different actors must be carefully considered—both in the decision to commit resources for this type of study,

[2] "We intended to analyze all relevant cost components, including program–level (above-facility-level) activities and expenses including managerial overheads, administration, monitoring and evaluation and training borne at district, province and national levels. Only three ART studies however provided such programmatic costs, without sufficient description of the relevant activities or cost items to analyze the determinants of these potentially significant contributions to overall delivery cost." Galárraga, O., Wirtz, V. J., Figueroa-Lara, A., Santa-Ana-Tellez, Y., Coulibaly, I., Viisainen, K., ... & Korenromp, E. L. (2011). Unit costs for delivery of antiretroviral treatment and prevention of mother-to-child transmission of HIV. *Pharmacoeconomics*, *29*(7), 579-599.

and in how the studies are designed to maximize usefulness to decision-makers.

Cost theme 2: Among the largest relevant datasets, taxonomies vary significantly, reflecting broader differences in health area and program priorities

As mentioned in previous sections, there is no single unified taxonomy of program activities that can be applied across all relevant health programs; and even within the same program area, taxonomies are not fully consistent with each other. The three taxonomies that we find most relevant to this report are the EPIC study cost taxonomy in immunization, the HIV expenditure taxonomies in the National AIDS Spending Assessments (NASAs), and the United States President's Emergency Plan for AIDS Relief (PEPFAR) Expenditure Analyses (PEPFAR EAs).

The EPIC study provides the most useful example for this work. The study tracks costs by activity type, level at which the cost is incurred, and cost line item. The comprehensive costs of the programs are captured and allocated to the correct place in a three-dimensional matrix, of which the two-dimensional activity/level matrix is presented below in Figure 2.

The matrix in Figure 2 below reflects the particular interests of immunization programs, e.g., creating separate categories for the related activities, "Cold chain maintenance" and "Vaccine collection, distribution, storage," and, given the nature of service, does not include laboratory costs as a category. Despite the high value of these studies for elucidating ASD costs, it is important to note that in some cases these cost estimates were determined by higher level staff providing their opinions on how staff time and other resources were used, rather than by researchers collecting primary data directly. As with many cost studies, these studies are intended as one-off snapshots of the costs, rather than as multi-year efforts to examine trends in costs over time.

The taxonomies used in the two major sources of data on HIV spending, the NASAs and PEPFAR EAs, differ significantly from the EPIC study.

The NASAs track a detailed set of activities, but unlike in the EPIC study, they do not report on the multiple levels at which these activities take place. Conceptually, the NASAs aggregate expenditures into the following eight categories:

1. Prevention
2. Care and treatment
3. Orphans and vulnerable children
4. Program management and administration
5. Human resources
6. Social protections and social services
7. Enabling environment
8. Research

Within each of these large categories, a series of more detailed activities is tracked. Although the NASAs do not break out the level at which the expenditures occur, the activity definitions do allow some separation of service delivery and ASD. For

Figure 2. EPIC costs categories by activity and level

	Routine facility-based service delivery	Outreach service delivery	Social mobilization and advocacy	Training	Cold chain maintenance	Vaccine collection, distribution, storage	Record-keeping and HMIS	Supervision	Surveillance	Program management
Facility level										
District level										
Regional level										
National/ Central level										

Figure 3. PEPFAR taxonomy of program areas and cost categories					
	Recurrent	Investment	Strategic Information	Health System Strengthening	Program Management
Facility-based care, treatment and support (FBCTS)					
Community-based care, treatment, and support (CBCTS)					
Prevention of mother-to-child transmission (PMTCT)					
HIV testing and counseling (HTC)					
Post-exposure prophylaxis (PEP)					
Blood safety (BS)					
Laboratory (LAB)					
Orphans and vulnerable children (OVC)					
Sexual and other risk prevention-general population (SORP-GP)					
Sexual and other risk prevention-key populations (SORP-KPs)					
Voluntary medical male circumcision (VMMC)					
Infection control (IC)					
Strategic Information (SI)					
Surveillance					
Health System Strengthening (HSS)					

example, the UNAIDS technical guidance describing category 4 above explains that "Programme expenditures are defined as expenses incurred at administrative levels **outside the point of health care delivery**" (emphasis added).

The PEPFAR Expenditure Analyses track spending by PEPFAR-defined program area and by cost category, as shown in Figure 3, PEPFAR taxonomy of program areas and cost categories. This taxonomy is not fully intuitive, as Strategic Information and Health System Strengthening are hybrid classifications that serve as both program area and cost category.

In comparing the HIV taxonomies to the EPIC study, we found that the HIV taxonomies emphasize understanding exactly what types of distinct treatment and prevention interventions programs are carrying out. Researchers have focused less on understanding the 'level' at which the expenditures occur; accordingly, these data have not been included in publicly available datasets.

Cost theme 3: Where high level ASD costs or expenditures are estimated for a program area, very high variation is observed across countries, and is unlikely to reflect true variation in delivery models and/or efficiency within the program area

Overall, in cases in which we found data sources with which to make high level estimates of ASD costs/expenditures at a country-program level, estimates within the same health program varied very widely across countries, to an extent that we do not believe can be plausibly explained by differences in delivery model or efficiency between countries. This is less of a concern in the EPIC studies, for which the range is more compressed, but is a larger concern in expenditure analyses and in exercises estimating projected financial needs.

In addition to the EPIC, NASA, and PEPFAR EA reports, which deal with observed costs or expenditures, large exercises in family planning and nutrition attempt to estimate the projected cost of fulfilling health programs' goals in those countries. While these are not 'actual' costs/expenditures, they

may help illuminate the balance between ASD and point of service costs in these health areas.

As can be seen in Figure 4 below, which compares the percentage of 'cost' allocated to ASD activities,[3] there is significant variation across countries within health areas. Variation between health areas can also be observed in this chart, but the methodology for estimating ASD share differs substantially across health areas, and can only be considered moderately consistent *within* a health area.

As noted above, this high variation within programmatic areas may slightly call into question the accuracy of data on ASD activities, or, at a minimum, the consistency/standardization of data collection. We recommend that cross-program comparisons be made with extreme caution with these data; nevertheless, it is noteworthy that the EPIC data appear to have the smallest spread, which is consistent with our finding that these are the most carefully gathered data on ASD costs.

The PEPFAR EAs have a smaller spread than the NASAs, and a similar spread to the TB data. The nutrition and family planning data have wide spreads, which may be understandable given the more hypothetical nature of those exercises. The malaria data have the widest variation, some of which may reflect countries in different stages of malaria elimination deploying a different set of activities.

Figure 4. High variation in ASD estimates across countries within programs

Select data sources with nominally consistent methodology *within* programs across countries for estimating costs or expenditures

[3] With the exception of the EPIC studies, none of the other sources are strictly cost estimates, and the organizational level at which spending occurs is not explicitly reported. As such, the data summary here is based on some high level assumptions we applied to the data as reported. To calculate %ASD share, we applied the following rules:

- NASAs: %ASD = (Program management + HR)/(Total costs – OVC costs – Enabling Environment – Social Protection – Research)
- PEPFAR EAs: %ASD = (Health system strengthening + program management + strategic information)/(Total costs – OVC costs)
- Family planning (FP2020 Costed Implementation Plans): %ASD = (Demand creation + Contraceptive security + Policy and enabling environment + Financing + Stewardship, management, accountability, monitoring, and coordination)/(Total costs)
- Nutrition (SUN Costed Implementation Plans): %ASD = Governance costs/(Governance costs + nutrition-specific intervention costs)
- WHO TB: %ASD = (Laboratory operations + Operational research + National-level staff)/(Total expenditure)
- WHO Malaria: %ASD = (Monitoring and evaluation + Human resources & technical assistance + Management and other costs)/(Total expenditure)
- EPIC: %ASD = Percent of costs incurred above facility level (with cost of commodities defined to be part of facility-level service delivery regardless of where they were recorded)

We discuss these data sources further in the relevant sections of this report.

Overarching themes: ASD impact/efficiency

To evaluate whether current ASD spending is optimal, we considered the impact that ASD activities have on service delivery and outcomes, and determined whether there are opportunities for programs to achieve greater impact or become more efficient.

While some limited data are available on ASD costs, we found that data on the impact of ASD activities are almost non-existent. Given the nature (and location) of many ASD activities, few researchers have attempted to draw a direct causal link between ASD costs and impact at the point of service delivery, and none have sought to do so in a comprehensive fashion across multiple ASD activities.

One ASD activity that could have an impact of service delivery outcomes is the supervision of front line facilities and workers. For example, more regular supervision could reduce absenteeism among health workers and improve the quality of treatment that they provide. While we did not find any completed studies on this topic in global health in the literature review, there are ongoing research efforts on HIV prevention in Mexico, and on immunization delivery in Ethiopia, that may shed light on this topic.[4]

In some cases it may be possible to make significant gains in program performance and efficiency without linking ASD activities directly to service delivery. The performance and efficiency of some other ASD activities have been evaluated by program staff and researchers using metrics for intermediate outcomes rather than for direct health outcomes or quality of service received by patients. For example, a supply chain's functionality can be evaluated by using a battery of intermediate outcomes such as the number of stockouts of key commodities, where basic logic would hold that service delivery is harmed by stockouts even if this outcome for end users is not being measured. Similarly, procurement systems can be judged by metrics such as the difference between average price paid by the health system for a commodity over a period of time and a reference international price over the same period. Although the systems may not impact service delivery, procuring goods at a lower cost can benefit the system as a whole, assuming that the money saved in procurement is redeployed to other worthwhile activities. In both examples, if managers were to focus exclusively on a single indicator or a narrow set of indicators, this could have unintended negative consequences, particularly if staff were evaluated or had significant incentives tied to these indicators; as such, caution is needed when using intermediate metrics rather than ultimate health outcomes to evaluate policy options.[5] Nonetheless, thanks to the existence of useful intermediate indicators, supply chain and procurement are two areas of ASD activity in which greater strides have been made in improving performance and efficiency (described in more detail in a later chapter).

Based on the interviews that we conducted for this report, experts and stakeholders agree that (a) ASD activities are critical elements of a health program and prerequisites of successful service delivery, (b) ASD spending likely is not currently allocated in an optimal way, but (c) policy makers do not have sufficient data to identify the areas in which additional investments in ASD activities will have the most impact and increase efficiency. As donors' budgets tighten, and it becomes increasingly important to justify the impact on health outcomes from any given investment, understanding the link between ASD activities, costs, and impacts is important for the future of national and global health programs.

[4] See the HIV and Immunization chapters for further information.

[5] For example, it is possible to minimize stockouts by dramatically increasing inventory, but this could easily lead to significant increases in wastage and costs that might outweigh the benefits of the reduced stockouts. Similarly, focusing narrowly on minimizing the difference between procurement cost of drugs and an international reference price for drugs could lead to suboptimal decisions (e.g., buying in inappropriate quantities).

Above Service Delivery Costs in HIV Programs

What is the current level of publicly available data for HIV-related ASD costs?

We found very little data on the comprehensive costs of HIV programs that include both service level costs and costs incurred above the point of service delivery. In the absence of comprehensive cost data, expenditure data are the most helpful to understand activities and costs above the point of service delivery. Large, publicly available data sources that shed some light on HIV program expenditures include the National AIDS Spending Assessments (NASAs), the United States President's Emergency Plan for AIDS Relief (PEPFAR) Expenditure Analyses (PEPFAR EAs), and System of Health Accounts (SHA). While these publicly available data sources typically do not provide a lot of granularity on the location of spending (at point of service vs. above point of service delivery), they enabled us to perform some high-level analyses of activities, from which we can draw insights for ASD costs.

The different datasets have different strengths and weaknesses to understand HIV program expenditures above the point of service delivery. The National AIDS Spending Assessments (NASAs) provide a comprehensive assessment of spending on HIV/AIDS from all funding sources, and provide a reasonably detailed breakdown of their large "Program management" category into a series of constituent activities (e.g., planning, coordination, and program management; administration and transaction costs in managing and disbursing funds; monitoring and evaluation). In principle, the NASAs' methodology is meant to disaggregate the spending by line item costs within each activity (such as labor costs vs. commodities vs. travel/transportation); however, this has not always been executed consistently with the NASAs' guidelines. For example, while the "Program Management" costs are defined to be non-site costs, informants suggest that some NASAs' reports include site-level program management and administration in this cost category, leading to inflated numbers. Similarly, in a small number of NASAs' reports, the consultants who completed the NASAs included all PEPFAR-financed staff costs in the Program Management category, regardless of what these staff were being paid to do and where. Given these examples, even when NASAs' data may provide a good estimate of the total amount of a program's spending, any granular analysis at the activity level must be undertaken with caution. On an additional practical note, to review the detailed NASAs' data requires manual extraction from individual country reports and databases, sometimes with a limited number of years, and with some differences in reporting sub-categories from year to year. The database that is publicly available on the UNAIDS website provides the more aggregated country spending by two dimensions: source of funding and the activity.

The PEPFAR EAs**,** available on the PEPFAR dashboard, have several key strengths. Collectively, they comprise the most easily accessible large dataset on PEPFAR HIV spending, including both up-to-date data and some historic data for each country. By providing the data by activity and cost line item, these data also provide detailed information enabling researchers to understand the factors driving the costs within a particular activity. The greatest limitation that researchers encounter in using the PEPFAR data to analyze levels and variation in spending above the point of service delivery is that the data were not intended to include non-PEPFAR spending. Because PEPFAR may fund different activities in different countries depending both on what the country wishes to fund from national sources and on the other support that the country receives from international actors, patterns of PEPFAR spending within and across countries may be difficult to interpret. Additionally, the publicly available PEPFAR EA datasets do not include more granular breakdowns of high level activity categories such as Health Systems Strengthening, Program Management, and Strategic Information, nor any geographic breakdown within countries, currently.

Data that are currently publicly available from the National Health Accounts (NHAs) produced by the System of Health Accounts (SHA) provide the least

granular breakdown of spending of the three large data sources. To perform a detailed analysis of recent years of spending, we had to manually extract data from country level reports. The publicly available global database on the WHO website provides the compiled data from National Health Accounts. Based on our preliminary analysis of these data using the latest reports from select countries of interest from sub-Saharan Africa, we found a number of data anomalies, and variations within and across countries that we thought could not result from actual variation in program costs.[6] Because we consider these data to be suspect, we do not present results from this source in cases in which better data are available. We understand that there is ongoing work to refine and improve the methodology and data quality; when this process is complete, researchers may find it useful to reanalyze the date to determine service costs across programs and countries.

In addition to the large public datasets, we found a small number of academic papers that also provided high level estimates of costs incurred above the point of service delivery in HIV programs. On the treatment side, Marseille et al. (2012) examined the comprehensive costs of scaling up ART provision in Zambia, incorporating both costs incurred at facility level and "off-site" costs (primarily costs incurred at the national level in Lusaka). On the prevention side, Chandrashekar et al. (2014) examined the costs of scaling up the Avahan project, distinguishing between service-level costs of local NGOs, and above-service level costs incurred both by state-level implementing partners and by the national program level office.

We did not find any other papers that comprehensively captured costs incurred by HIV programs above the point of service delivery.

What are ASD activities and what share of program spending do they comprise?

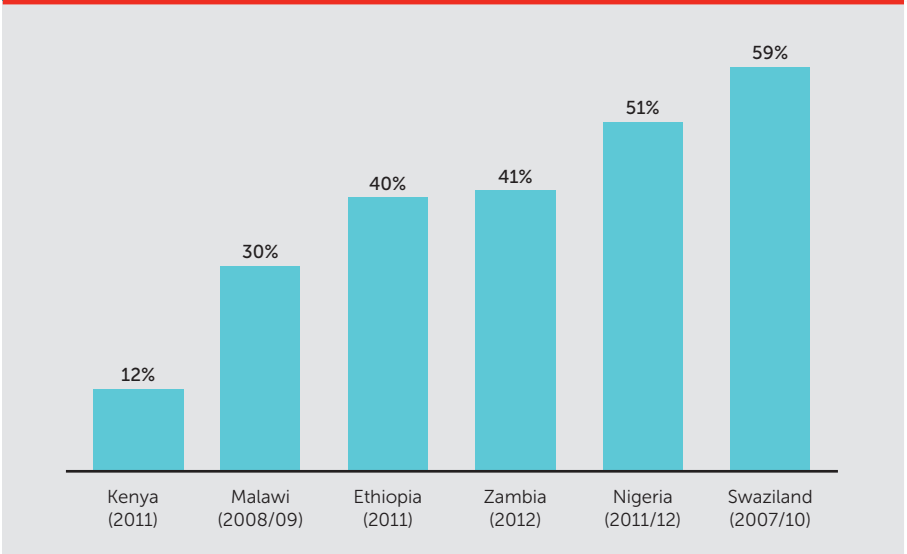
In this section, we focus on ASD activities and costs within Kenya, Malawi, Ethiopia, Zambia, Nigeria and Swaziland, and present data from both the NASAs and PEPFAR EAs before performing a more detailed analysis of PEPFAR EA data from South Africa.

ASD activities in the publicly available NASAs

As described in the previous section, we conducted granular analysis of NASAs' data, including on activity level expenditures, recognizing the source's limitations. Site-level activity categories are clustered under Treatment and Prevention overarching categories, while the overarching categories pertaining to above-service delivery spending are the Program Management category and the (typically much smaller) HR capacity building category.[7]

At a high level, as seen in Figure 5, the NASAs of Kenya, Malawi, Ethiopia, Zambia, Nigeria and

Figure 5. Select NASAs: Percentage of spending above the point of service delivery



Source: NASA, UNAIDS

[6] See Appendix 3 for further details.

[7] For the purposes of our landscape assessment of ASD activities, costs, and expenditures, we exclude spending for Orphans and Vulnerable Children (OVC), social protection, enabling environment, and research activities in our assessment of NASAs' data; these activities, though supportive of service delivery, are not within the scope of this project and, thus, are not classified as ASD activities for the purposes of our analysis.

Swaziland vary widely in the percentages of spending above the point of service delivery, ranging from 12 percent in Kenya (year) to 59 percent in Swaziland (year), with the four other countries grouped between 30 percent and 51 percent (the NASA reports relate to various years). The range expressed here is surprisingly wide. As mentioned previously, there may be an over-estimate of program management expenditures if site-level management has been included in the program-level management expenses. It is also possible that some of the variance in these percentages reflects differing impacts of ART on the NASAs' expenditure calculations: in countries reporting low ART spending, the share of treatment costs at facility level will be lower and costs above the point of service will be higher. Among the countries examined here, Swaziland's NASAs' reports only 12 percent of total costs going towards ART compared to an average of more than 20 percent in the other countries reporting this line item separately.

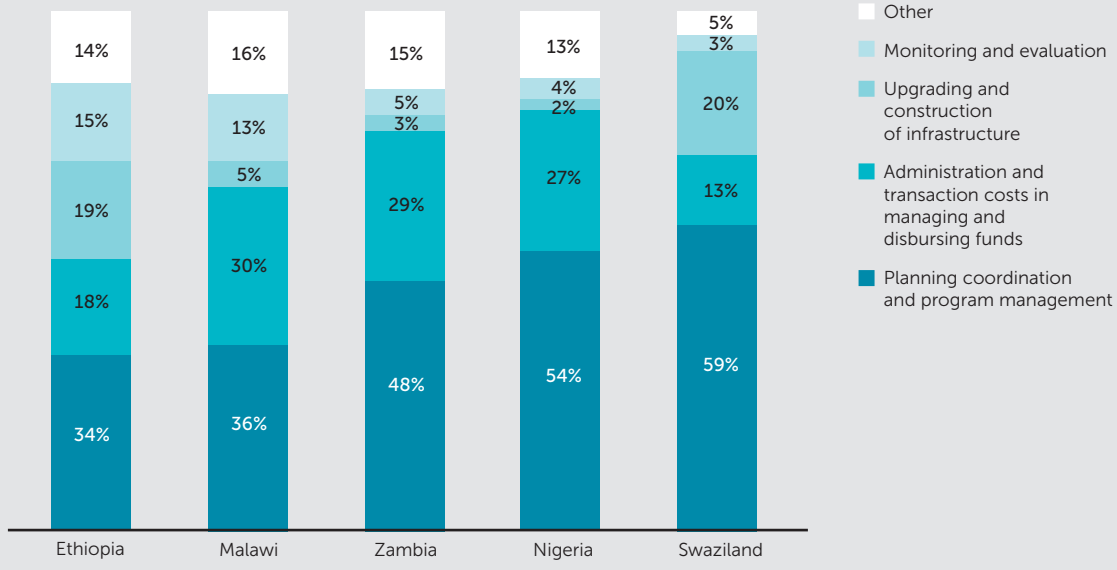
Looking at the more granular data, the Program Management (PM) category is defined as expenses incurred at administrative levels outside the point of healthcare delivery and includes a range of management/supervision activities, systems spending, and infrastructure investments. The following categories constitute the largest expenditures in these countries:

- Planning, coordination, and program management
- Administration and transaction costs in managing and disbursing funds
- Upgrading and construction of infrastructure[8]
- Monitoring and evaluation (M&E)

The PM "Other" category includes smaller amounts spent on operations research, serological-surveillance (serosurveillance), HIV drug-resistance surveillance, drug supply systems, information technology, patient tracking, and PM not disaggregated.

As seen in Figure 6 below, the largest component of the broader Program Management category is the Planning, coordination and program management category, ranging from 34 percent to 59 percent, with Administration and transaction costs in managing and disbursing funds also accounting for a

Figure 6. NASA Program Management costs disaggregated (percentage)



Source: NASA, UNAIDS

[8] It is unclear within the NASAs' data how much of this category would include infrastructure expenditures at point of service. However, this category is only a significant proportion of program management in Ethiopia and Swaziland, and most of these infrastructure expenditures in recent NASAs would be expected to be above-facility investments, e.g., in laboratory upgrades.

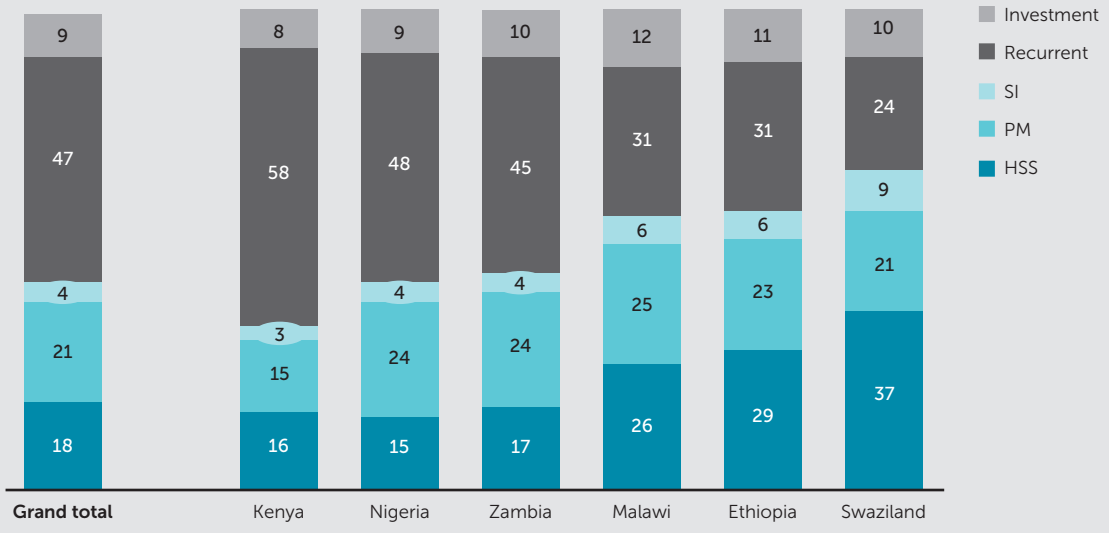
substantial proportion in each country (ranging from 13 percent to 30 percent). Monitoring and evaluation, a category that might be expected to have an impact on quality of service provision, varies significantly from Ethiopia at the top (15 percent of Program Management) to Swaziland at the bottom (3 percent of Program Management). A common benchmark figure cited for M&E expenditure is three to five percent of *total* program budget,[9] which Ethiopia and Malawi would be meeting while the other countries fall short.

ASD activities in the publicly available PEPFAR EAs

In its technical guidance on expenditure analyses, PEPFAR distinguishes between "site-level support" recurrent and investment expenditures, and "above site-level"/"system-level" support. The above site-level costs are divided into three major categories: Program Management (PM); Strategic Information (SI); and Health System Strengthening (HSS). While we treat these categories as the best proxy for spending above the point of service delivery, it is worth noting that the PEPFAR categories appear to be designed with greater focus on the activity rather than the precise location of spending; as such, it is possible that some site-level expenditures (e.g., general facility-level management or facility-level IT systems) might be reported in the system-level support categories.

As seen in Figure 7 below, approximately 45 percent of PEPFAR's expenditures in the focus countries was above site-level in 2014, ranging from approximately 34 percent in Kenya to approximately 67 percent in Swaziland. Less money typically is spent on SI (approximately 5 percent of total expenditures), with HSS and PM roughly equal in this sample of countries. As described in an earlier section of this report, the composition of PEPFAR spending likely varies significantly across countries based on the particular need of the country, so a wide variation here is not unexpected. In particular, variation in the needs that countries have for support to meet the costs of ARV drugs has a significant impact on the proportion of PEPFAR funding spent on point-of-service rather than above-service level. In Kenya, Nigeria, and Zambia, 11 to 15 percent of PEPFAR's

Figure 7. PEPFAR expenditures by high level cost category (percentage)



Source: PEPFAR, 2014

[9] See, e.g., Blue, R., Clapp-Wincek, C., & Benner, H. (2009, May). *Beyond success stories: Monitoring & evaluation for foreign assistance results.* Retrieved from https://www.usaid.gov/sites/default/files/documents/1868/060909_beyond_success_stories.pdf.

total expenditures was accounted for by ARV drugs, while in Malawi, Ethiopia, and Swaziland, the proportion was less than 0.1 percent.

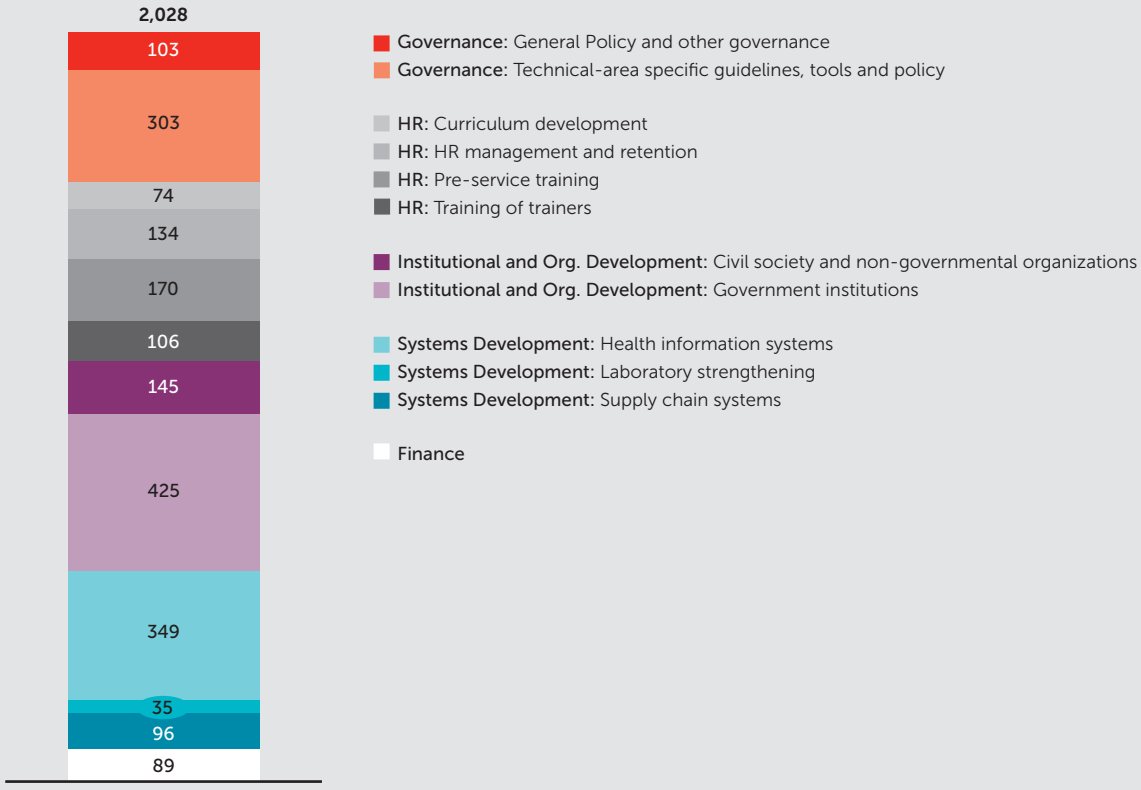
PEPFAR's publicly available expenditure analyses do not break down more granular activities within PM, SI, and HSS. However, in collecting the data, PEPFAR asks the implementing partners to estimate how much of this above-site spending directly benefits each of the specific program areas defined by PEPFAR.[10] All of the above-site spending is allocated to one of the program areas, with the majority of this spending typically estimated to directly benefit either the facility based care and treatment program, or the PMTCT program.

Further breakdown of ASD activities in the South Africa PEPFAR EA

In addition to the high level data that are publicly available through the PEPFAR dashboard, we have worked with more granular data in the context of South Africa, which provide a more detailed breakdown of spending within HSS.

As shown in Figure 8 below, South Africa's largest expenditures from 2012 to 2014 were on HSS, and specifically for institutional and organizational development of government institutions (425 million ZAR, approximately 45 million USD), and the development of health information systems (349 million ZAR, approximately 37 million USD).

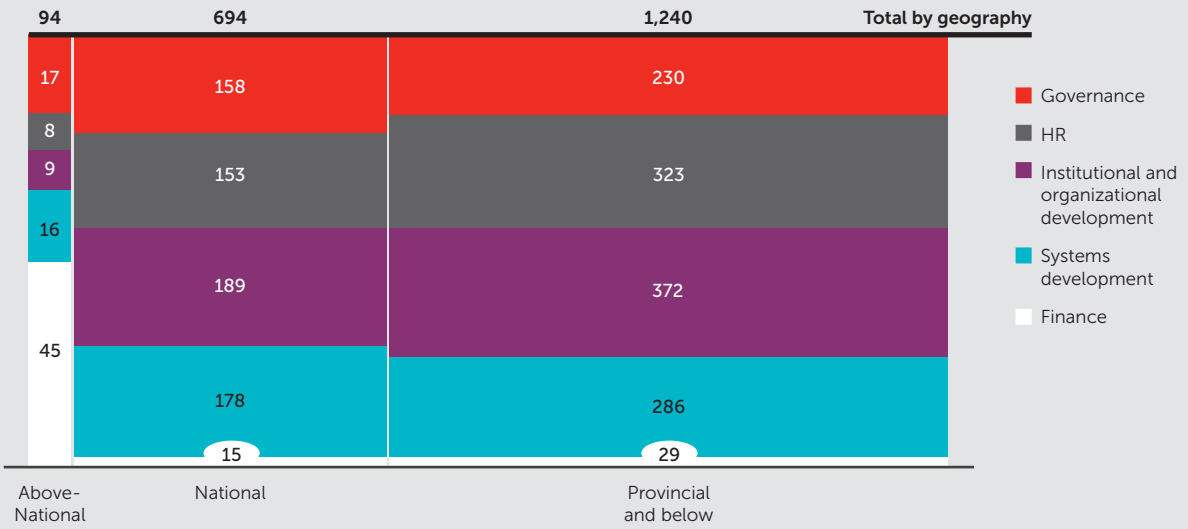
Figure 8. PEPFAR HSS expenditures in South Africa, 2012 to 2014 (ZAR millions), by detailed category



Source: PEPFAR

[10] The full list of program areas is: Facility-based Care, Treatment and Support; Community-based care, treatment, and support; Prevention of mother-to-child transmission; HIV testing and counseling; Post-exposure prophylaxis; Blood safety; Laboratory; Orphans and vulnerable children; Sexual and other risk prevention-general population; Sexual and other risk prevention-key populations; Voluntary medical male circumcision; Infection control; Strategic Information; Surveillance; Health System Strengthening.

Figure 9. PEPFAR HSS spending in South Africa, 2012 to 2014 (ZAR millions), by category and geographical location



Source: PEPFAR

Figure 9, PEPFAR HSS spending in South Africa, 2012 to 2014 (ZAR millions), by category and geographical location, above, illustrates that the South Africa EA data enable analysis by geography. We found that the majority of PEPFAR's HSS spending in South Africa occurs at the provincial or sub-provincial level, approximately 61 percent, and roughly 34 percent is spent at the national level, and approximately 5 percent is spent above the national level.

Unfortunately, public data and analysis of South Africa's national budget and expenditures do not categorize health system strengthening in a similar way to PEPFAR's data. Therefore, we were unable to compare PEPFAR's spending to South Africa's national public spending. To place this HSS breakdown in context, PEPFAR's total HIV expenditures in 2013 to 2014 were roughly a quarter of the size of South Africa's own government expenditures on HIV.[11] For the two-year period from 2013 to 2014, HSS represented roughly a fifth of PEPFAR's funding to South Africa.[12]

ASD costs in the academic literature

In addition to what we gleaned from NASAs and PEPFAR EAs, we found two relevant academic studies that provided insights into ASD costs for HIV.

Marseille et al. (2012) studied the costs of scaling-up ART in Zambia, and estimated that roughly a third of the cost was in "off-site" activities above the point of service delivery. The division of costs was by cost category rather than by activity, so there is some ambiguity in what the off-site costs were designed to do, but 18 percent of the total cost of the program supported off-site personnel in Lusaka (of which 6 percent represented salaries for expatriates, and 12 percent for Zambian nationals), and a further 15 percent was incurred in procuring goods and services in Lusaka.

Chandrashekar et al. (2014) studied the Avahan prevention program in India, and found costs above the point of service delivery to be around 65 percent

[11] Guthrie et al. 2015. South African Expenditure on HIV and TB in 2011/12-2013/14. Investment Case.

[12] PEPFAR funding data extracted from PEPFAR Dashboards, available at https://data.pepfar.net/.

of total costs, of which approximately 35 percent were costs incurred at the national program level, and approximately 30 percent were costs incurred by the state-level lead implementing partners. As such, only 35 percent of costs directly supported the NGOs working to deliver the prevention program. By comparison with the full programs discussed in NASAs and PEPFAR, this appears to be a high proportion of above service delivery spending, but there are a few differentiating factors here. As a prevention program rather than a treatment program, the program did not pay for high cost ARVs, which reduced the relative cost of service delivery versus above-service delivery. In addition, the rapid scale-up nature of the program, and extensive capacity-building required, may have both contributed to higher above-service costs in the early years of the program.

Additional views on ASD costs

To gain an additional view on ASD costs at a global level, we talked with a source at the Clinton Health Access Initiative (CHAI) who summarized a high-level triangulation exercise which estimated that approximately 40 percent of global HIV spending can be attributed to ARVs and other direct treatment and prevention activity costs at facility level. The remaining 60 percent of global spending is spent on activities above the facility level. Based on what donors and implementing partners have shared with CHAI, roughly $1.50 is spent above the facility level for every dollar spent at facility level. The source also reported that based on CHAI's experience, ARV drugs make up roughly 50 percent of costs incurred at facility level, and spending on ARVs globally is estimated to be $1.7 billion, out of a total of around $10 billion spent in HIV prevention and treatment worldwide. Building up from this number implies a facility/above facility split of approximately 35 percent to 65 percent.

What are current, ongoing, or planned efforts to improve the knowledge base of HIV ASD costs, impact, and efficiency?

Among the health areas that we reviewed in this report, HIV is an area in which increased efforts are underway to better understand the costs and the impact and efficiency of ASD activities.

As PEPFAR continues to maximize the impact of dollars that it spends on the HIV response, its country teams are beginning to work more closely with countries to demonstrate the impact of strategic investments in ASD activities, either directly on service provision or on upstream measures that demonstrably impact service provision. PEPFAR is performing detailed reviews of its expenditures in countries, scrutinizing whether ASD investments are made at appropriate levels and in the right geographies, and recommending reallocations where appropriate. Working with countries to understand how ASD activities lead to improved coverage, performance, efficiency, and health outcomes will be critical for PEPFAR's optimization of funding allocations.

To better understand the amount that countries should request for investments in broader health systems rather than in narrow program activities, the Global Fund has been in discussions with WHO regarding assessments of the efficiency of health systems, with a view to performing systematic evaluations across countries. In addition, the Global Fund and WHO are jointly pursuing health facility assessments; while these do not directly capture ASD costs and activities, they do capture data on whether facilities have the supplies and providers that they need to deliver standard service. These data in turn may shed light on whether facilities are receiving the necessary support from activities and services above facility level.

As part of its ongoing efforts in this space, UNAIDS continues to develop its resource tracking and analysis. Through this process, UNAIDS hopes to clearly align inputs (including above the facility level) with outputs and eventually outcomes to better assess the impact and efficiency of activities.

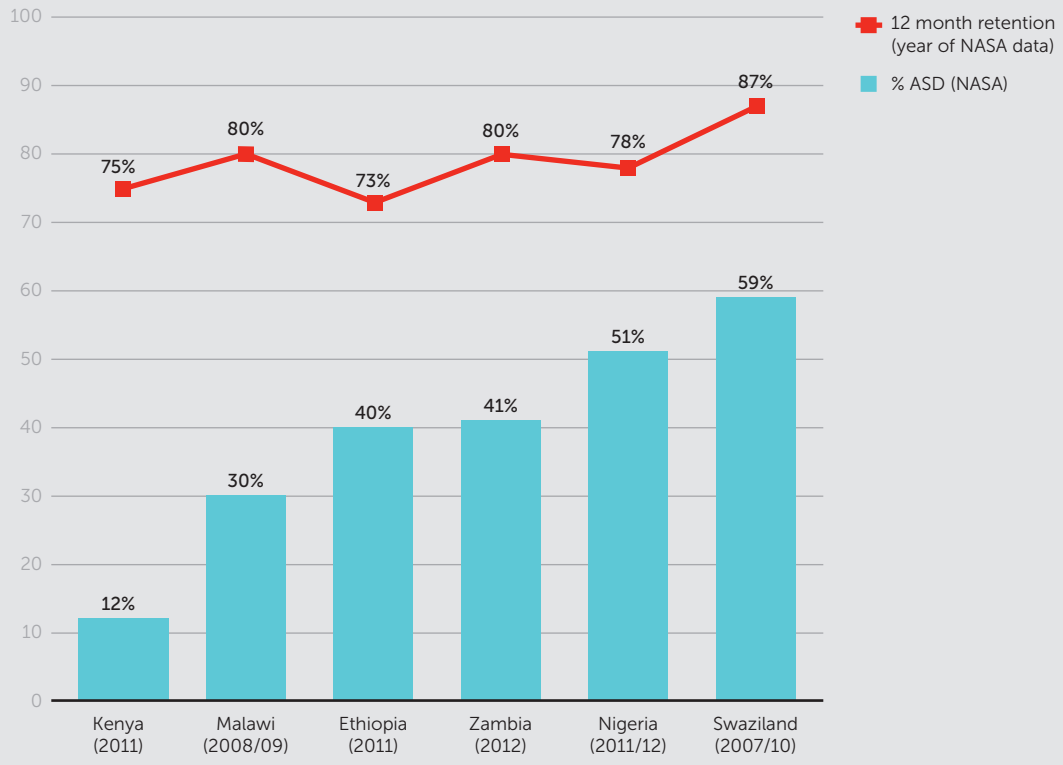
In discussions with countries regarding their current national programs, UNAIDS already distinguishes between activities that have been shown to have a strong impact on health outcomes and those for which the evidence is inconclusive. Assessments of this type will be enhanced if data provide a more complete picture of how ASD activities interact with service delivery activities and health outcomes.

At a more specific research level, the ongoing Optimizing the Response in Prevention: HIV Efficiency in Africa (ORPHEA) study will provide interesting insights into the impact of one ASD activity: among its various research questions concerning site-level service delivery, the study will track the number of supervisory visits each facility receives from district-level supervisors, and, therefore, will enable researchers to examine the relationship between supervision and service delivery.

What are the key gaps in the HIV ASD knowledge base?

Overall, researchers need higher quality descriptive data on ASD costs to identify areas that warrant additional investment or should be targets for improvements in efficiency. As described in this chapter, we have found that the best data available to understand ASD activities comes from analyses of large expenditures whose primary goals are to track how much money is spent on HIV activities. Given the purpose of these analyses, and the fact that a number of major ASD categories may involve cross-program activities and resources that are difficult to allocate, the estimates from expenditure tracking are unlikely to provide a precise estimate of true costs. Comprehensive efforts to determine costs (ideally, that estimate ASD costs accurately) would

Figure 10. Percent of spending above the point of service delivery, reported in selected NASAs against 12-month ART retention rates



Source: UNAIDS

[13] %ASD is defined here as (Program management + HR)/(Total costs – OVC costs – Enabling Environment – Social Protection – Research)

significantly enhance current levels of understanding of ASD activities. Moreover, these data, if collected in a standardized fashion across multiple countries (or across multiple geographies within a country), would enable researchers to make useful comparisons that could form the basis for future resource allocation.

To fully optimize resource allocation to (and across) ASD activities, researchers and stakeholders must understand the link between ASD activities and impact on service delivery. Collectively, our current level of understanding is limited. As a first step, researchers should collect *high quality* ASD cost data and map it against HIV prevention and treatment performance indicators to enable researchers to provide helpful insights and generate hypotheses as to the impact and efficiency of ASD activities. An illustrative example of the type of analysis that could be conducted and refined is provided above in Figure 10 on the preceding page. The figure displays NASAs' reported HIV spending above the point of service delivery against one possible performance indicator: the percentage of adults and children with HIV known to be on treatment 12 months after initiation of antiretroviral therapy.[13] This simple (and non-causal) analysis appears to suggest a moderate relationship between percentage of ASD spending and 12-month ART retention rates. With higher quality, robust and disaggregated cost data, these types of simple analyses could yield useful observations and generate important hypotheses regarding the relationship between (levels and composition of) ASD spending and the performance of HIV programs.

In the longer term, researchers should aim to generate plausible causal analyses between ASD activity and impact, to provide the most robust evidence for policy-makers to make decisions in this space. With high quality data collection, longitudinal data exploiting natural experiments could provide some insights into how ASD activities have an impact on service delivery; in the event of planned scale-ups or drawing down of donor support in particular HIV programs, a randomized staggered design could provide an alternative strategy to enhance understanding.

Several more specific questions may also be of particular relevance to understanding ASD expenditures in HIV programs, and the implications of these expenditures for the future. First it is important to understand potential economies of scale and scope in ASD activities, and the implications for how ASD costs might be expected to change as countries attempt to broaden coverage to more difficult-to-reach populations, and for how they may change as HIV treatment increasingly moves towards a chronic care model. Second, given the necessity of optimizing the impact of dollars that are spent on HIV response, it is important to understand whether and the extent to which investments made through national and donor HIV programs have a broader impact or benefit on other health programs or the health system at large. Investments in systems such as laboratories or blood safety are absolutely critical for an effective HIV response; intuitively, these investments have clear benefits in fighting other communicable diseases that should be factored into any societal view of the impact of these investments. In cases in which only a certain level of investment can be justified by reference to HIV outcomes alone, additional investment (whether financed from HIV programs, or from other sources) may well be justified in light of other benefits.

Finally, given the rapid expansion of HIV programs throughout the last decade and the increasing amounts of donor money to support them, HIV programs are at risk of high organizational overhead, above-national costs, and over-utilization of expatriate labor and international technical assistance. (Further discussion of this topic is contained in the Aid Architecture chapter of this report.) The urgency of the global epidemic and the imperative for rapid treatment and prevention expansion may have justifiably led to a greater emphasis on impact than on efficiency during the scale-up period, but as countries and donors move towards more mature programs, the role of high-cost support activities should be evaluated and the spending levels should be made transparent.

Above Service Delivery Costs in Other Programs

Immunization

What is the current level of publicly available data for immunization-related ASD costs?

The most current publicly available data on the economic costs of national immunization programs in low- and middle-income countries was generated by the six-country Expanded Program on Immunization Costing and Financing (EPIC) study, supported by the Bill & Melinda Gates Foundation (BMGF). The first phase of the EPIC study was conducted between 2012 and 2014, using a common methodological approach to estimate costs for program year 2011 in Benin, Ghana, Honduras, Moldova, Uganda, and Zambia. Data from this study—and associated materials, including data documentation, data collection instruments, publications, and presentations of analytical results—reside in a DataVerse data repository.[14] The EPIC data repository is one of the few sources that provides a sense of ASD costs across immunization activities and operational levels. We discuss the results from the EPIC study's first phase of data collection in greater detail in the following section.

Additional cost data are emerging from the PAHO ProVac Initiative, which is currently providing technical support to immunization cost studies in Latin American countries. The methodology of these studies is very similar to the methodology used in the EPIC study (Brenzel, 2014). Current studies in progress include those in Brazil (data collection complete) and Costa Rica (data anticipated 2016). These studies use the ProVac "CostVac" Toolkit, which includes Excel tools and guidance documents to design and implement the data collection and analysis. CostVac's paper-based survey instruments capture ASD activities, such as supply chain management and administrative/central level activities. Researchers enter these data into the tool's spreadsheets, which define resource use at three different levels: the central level, intermediate administrative levels (department and municipality), and the level of service delivery. Costs at each level are disaggregated across six major cost categories using the CostVac tool: "vaccines and supplies (only captured at the central level), personnel, cold chain, vehicles, buildings, and other costs (only captured at the central level)" (Castañeda-Orjuela et al., 2013).

The WHO Immunization, Vaccines and Biologicals Department (WHO IVB), in conjunction with UNICEF, also has developed a tool and guidelines for comprehensive multiyear strategic planning (cMYP) for national immunization programs.[15] More than 75 countries have used the cMYP tool for budget planning. To receive financing from Gavi, applicants must develop strategic plans; many countries have used the cMYP tool for this purpose. Cost related data in the cMYP are primarily financial data used to plan national immunization program budgets for a forward-looking five-year time horizon. The cMYP includes special modules to assist countries in planning for new vaccine introductions. The WHO IVB stores data from all cMYP analyses; researchers have used these data to conduct a number of cross-country analyses on the costs and financing of national immunization programs (Brenzel, 2015; Brenzel & Politi, 2012).

The cMYP data provide a general indication of ASD costs for immunization programs, to the extent that ASD costs can be mapped to a subset of the cMYP components. Earlier iterations of the cMYP analyses were organized around the following seven immunization program components:

1. Immunization services delivery;
2. Program management;
3. Human resource management;
4. Costs and financing;
5. Vaccine cold-chain and logistics;
6. Surveillance and reporting; and,
7. Demand generation, communication, and advocacy.

[14] Available at http://www.immunizationcosting.org.

[15] The Excel based cMYP Tool and corresponding guidance documents are available at http://www.who.int/immunization/programmes_systems/financing/tools/cmyp/en/.

Table 1. Health system components of the most current cMYP analysis framework

Health system components	Inputs	Activities
Leadership & governance	Program management, computers and office equipment	Meetings, planning, research, data management, expanded program on immunization (EPI) reviews, cold chain assessment, etc.
Health workforce	Human resources/salaries, outreach per diems	Supervision, training, workshops, etc.
Finance	Financial resources	Budgeting and monitoring expenditures
Medical product and technology	Vaccines, auto-disable (AD) syringes, safety boxes, other injection supplies, cold-chain equipment vaccines, cold chain and logistics	Vaccine procurement and storage; monitoring; vaccine stock management activities
Service delivery	Transport, operational cost for routine immunization and campaigns	Operations for immunization delivery
Information	Information, education and communication (IEC) materials, such as posters, etc.; surveillance and laboratory equipment	Social mobilization, IEC, development of advocacy and communication plan, surveillance

Table extracted from cMYP: A Tool and User Guide for cMYP Costing and Financing: Update 2014. WHO/IVB/14.06.

The current version of the cMYP is aligned with the WHO Health Systems Framework consisting of six 'building blocks,' which is presented in Table 1, Health system components of the most current cMYP analysis framework, above.

The cMYP is organized primarily around inputs rather than activities, which makes it challenging for researchers to map ASD costs to health system components. The standard summary data show how the costs of an immunization program are disaggregated by different inputs, many of which do not clearly fall into either service delivery or ASD cost, as illustrated below in Figure 11.

Figure 11. Prototypical cMYP results presentation, indicating the breakdown of cost data by input rather than by activities

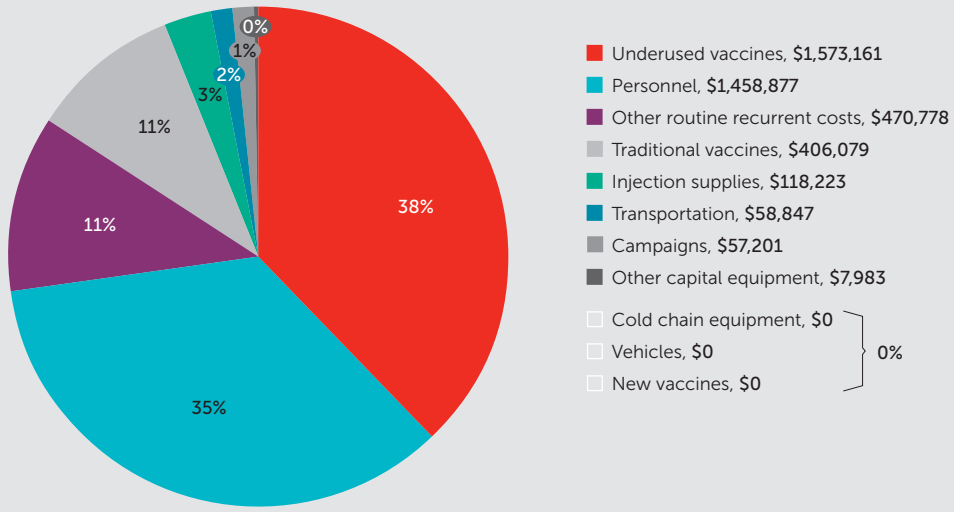
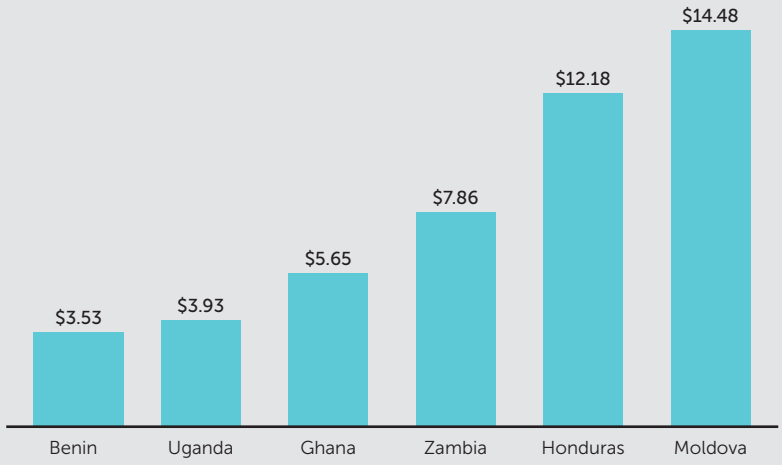


Figure extracted from cMYP: A Tool and User Guide for cMYP Costing and Financing: Update 2014. WHO/IVB/14.06.

What are immunization ASD activities and for what share of program spending do they account?

We examined the breakdown of immunization costs for six countries by *input* (resource type), *program activity*, and *organizational level* using data from the EPIC study. Some ASD activities of immunization could occur in health facilities; however, in our analysis we used organizational level as a proxy for service delivery. In other words, we focused on "above the facility-level" costs. We considered any costs incurred in facilities to be part of service delivery. We also defined the cost of vaccines and injection supplies to be part of service delivery regardless of the organizational level at which they were accounted for in a particular country.

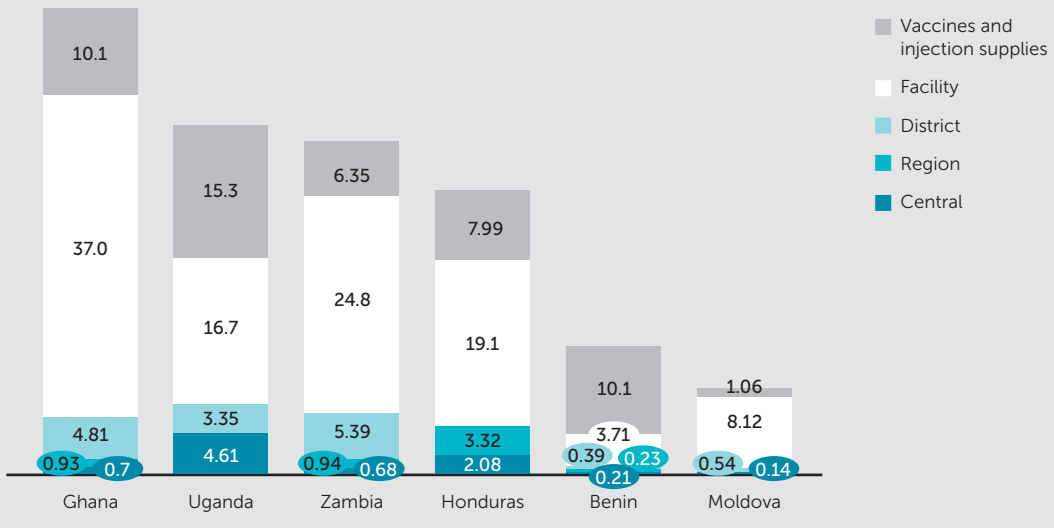
Figure 12. Immunization program cost per dose in EPIC study countries (USD, 2011)



Source: EPIC studies

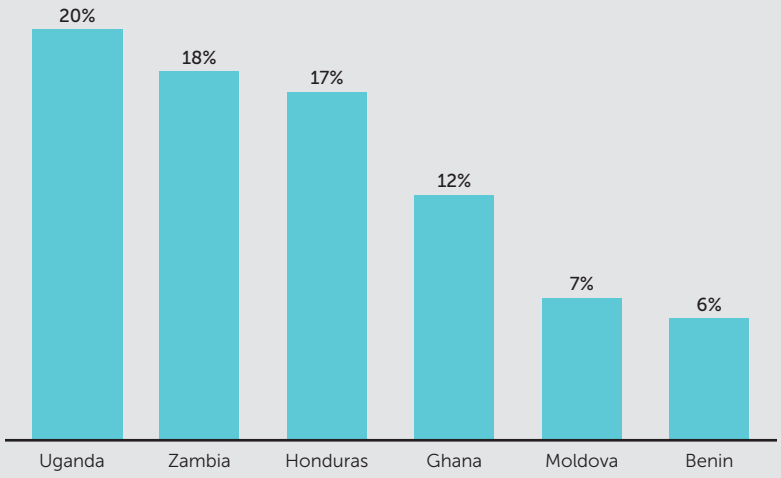
The six countries of the EPIC included four Gavi-recipient countries in sub-Saharan Africa, Benin, Ghana, Uganda, and Zambia, and two Gavi-transitioning countries in other regions, Moldova and Honduras. The total amount spent on immunization programs ranged from 10 million USD to 54 million USD for 2011. The cost of immunization programs

Figure 13. Distribution of immunization program costs by organizational level in EPIC study countries (USD millions, 2011)



Source: EPIC studies

Figure 14. Percent of total immunization program costs incurred at the district, region, and central levels in EPIC study countries



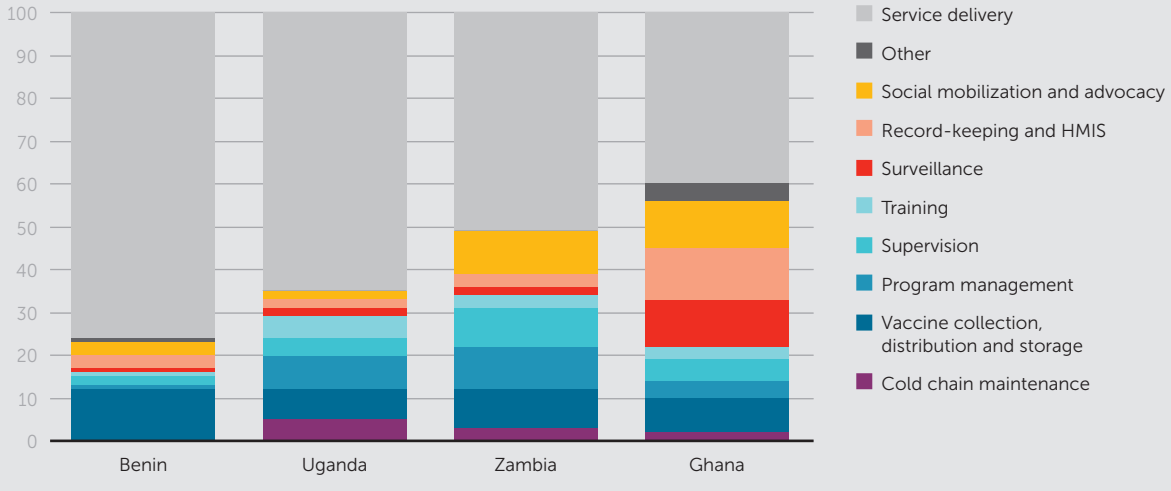
Source: EPIC studies

Figure 13 illustrates the distribution costs of the EPIC country immunization programs across organization level, while Figure 14 displays the share of total costs occurring above the facility level. Across all 6 countries, 13 percent of the costs (minimum of 6 percent in Benin, maximum of 20 percent in Uganda) occurred outside of health facilities at sub-national levels (e.g., districts, provinces, regions) and the central level.

varied in part due to scale (number of infants), scope (number of vaccines in routine schedule), and price levels for non-tradable inputs (e.g., wages). The average cost of delivering a dose of vaccine ranged from 3.53 USD to 14.48 USD, including the cost of the vaccine and injection supplies, as illustrated in Figure 12.

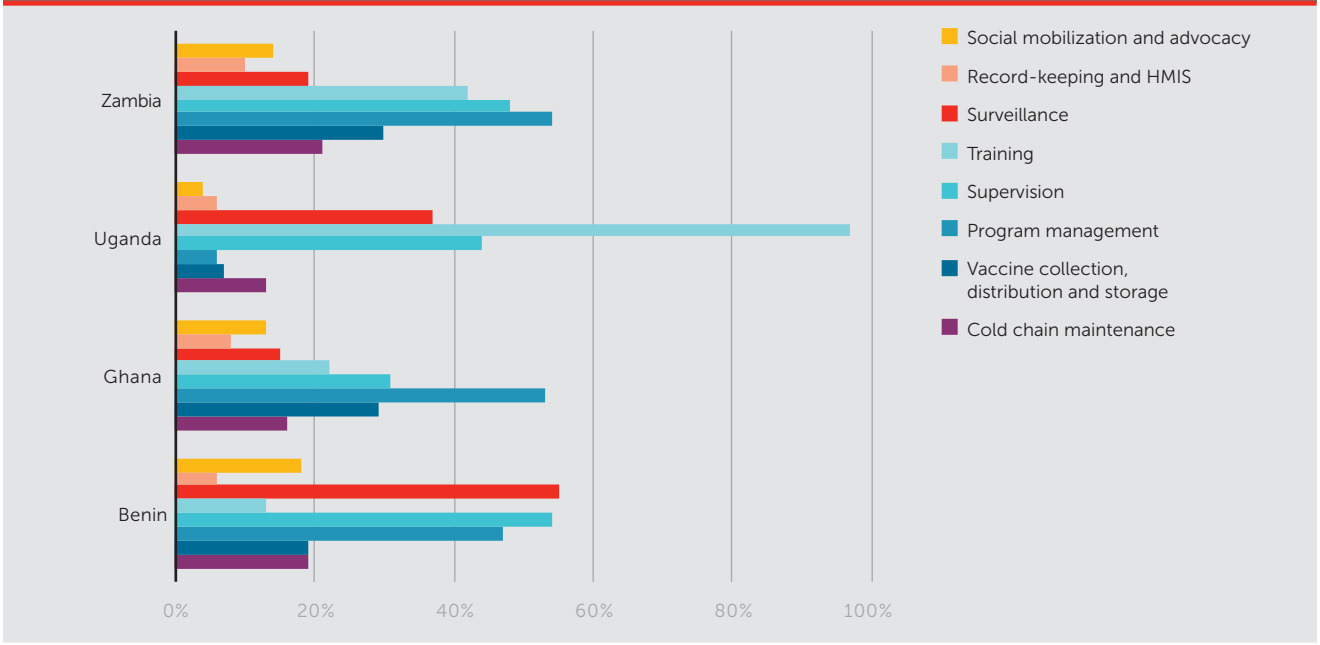
Figure 15, below, illustrates the distribution of program costs by program activity in the four sub-Saharan African EPIC countries. Routine vaccination in facilities and outreach vaccination collectively made up 59 percent of program costs on average; the major expenditures were vaccines, injection supplies (i.e., syringes), and health worker labor. Costs for the other activities included primarily labor, cold chain equipment, and vehicles.

Figure 15. Breakdown of immunization program costs by activity for four sub-Saharan African EPIC countries, including vaccine and injection supplies



Source: EPIC studies

Figure 16. Share of each program activity cost incurred above the facility level in 4 sub-Saharan African EPIC countries



Source: EPIC studies

We also looked at the program activities and parsed them according to whether their costs were incurred at the health facility level or at a higher organizational level, as displayed in Figure 16, above. In the four sub-Saharan African countries, the activities that occurred above the facility level included vaccine collection, storage, and distribution (21 percent), program management (40 percent), supervision (44 percent), training (44 percent), and surveillance (32 percent).

To what extent are regularly reported ASD expenditure data available for immunization?

Since 2006, WHO member states have reported their government's immunization expenditures annually via a Joint Reporting Form (JRF). More recently, the JRF has been used to monitor progress on the Global Vaccine Action Plan (GVAP), approved by World Health Assembly in 2012.[16]

Though over 100 countries regularly report figures for government expenditure on vaccines used for routine immunization campaigns through the JRF, there are noticeable gaps and inconsistencies in reported data across multiple indicators. Figure 17 shows trends of completeness with respect to countries' reporting of six of the JRF expenditure tracking indicators.[17] The WHO IVB, which conducted an analysis of the extent to which countries reported JRF data from 2006 to 2012, noted that the following challenges frustrated countries' abilities to collect accurate and complete JRF data:

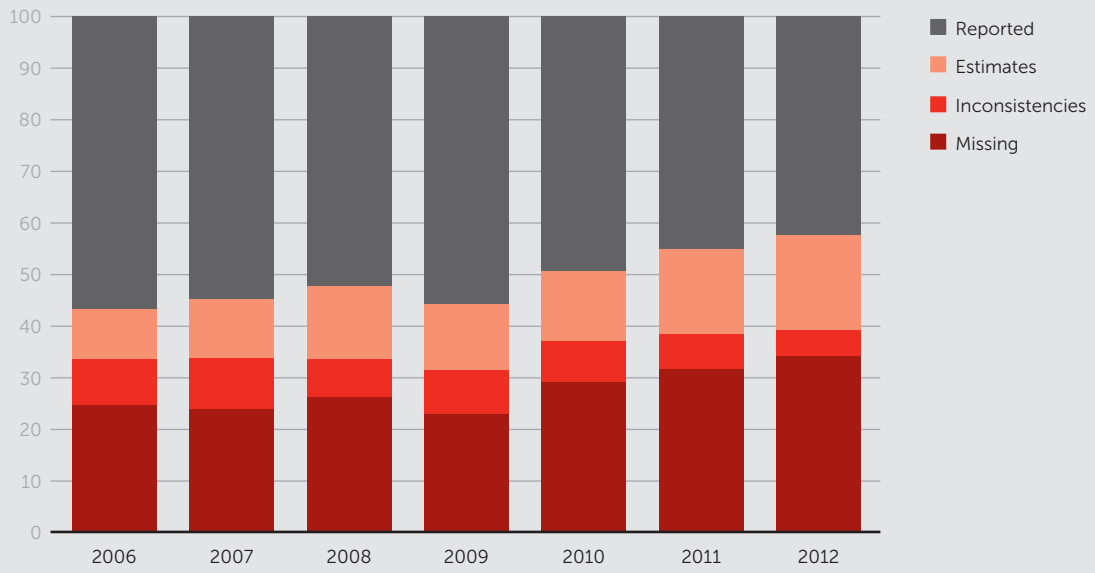
- lack of information in countries with poor financial management information systems;
- lack of accounting and financial skills within Expanded Immunization Program (EPI) staff to record, track and report expenditure data;

[16] JRF data is publicly available through the WHO's website, http://www.who.int/immunization/programmes_systems/financing/data_indicators/en/.

[17] The following are six of the JRF indicators:

- What amount of government funds was spent on vaccines used in routine immunization?
- What is the total expenditure (from all sources) on vaccines used in routine immunization?
- What percentage of all spending on vaccines was financed using government funds?
- What amount of government funds was spent on routine immunization?
- What is the total expenditure (from all sources) on routine immunization?
- What percentage of all spending on routine immunization was financed using government funds?

Figure 17. Trends of completeness for JRF reported data, as reported by the WHO IVB; trend data highlights gaps and inconsistencies in reporting over time



Source: WHO, 2014

- difficulty in clearly identifying what is included and what is excluded in routine immunization;
- degree of EPI integration within the various service delivery platforms (e.g., outreach, facility-based), making it difficult to quantify shared inputs and related costs; [and]
- lack of incentive to estimate routine immunization expenditures. (WHO, 2014).

Researchers at the Sabin Institute recently analyzed immunization financing data reported via the JRF (Nader et al., 2014), which included a comparison of reported JRF data to data from cMYP analyses. The study found that "on average, mean JRF immunization expenditures were 81 percent of the corresponding cMYP baseline year immunization costs," suggesting "some degree of consistency in how countries capture and report their health and immunization expenditures." (Nader et al., 2014).

We found that the JRF data are useful to analyze expenditures, but JRF reporting is very high-level. At present, none of the JRF's financing indicators provide data on the service delivery and above service delivery expenditure split. The lack of specificity in the indicators and the corresponding data limit our ability to analyze these data to gain insight into ASD expenditures. In addition, JRF data do not include expenditures on shared resources or on capital expenses, which further limits comparisons with cMYP and EPIC cost data.

What is known about the impact/efficiency of immunization ASD activities?

We found little empirical research examining the impact of ASD spending on the efficiency of immunization activities. The EPIC team currently is analyzing technical efficiency using data that it collected in its first phase.

Some of our informants noted that the study of technical efficiency in ASD activities such as program management is not as a high a priority for immunization programs as for other health programs (e.g., HIV/AIDS). Our informants emphasized that this lower prioritization does not reflect a lack of concern or attentiveness for ASD efficiency, but rather the view that immunization programs are fairly 'lean' and spend most resources on activities that directly contribute to service delivery. Programs might save the most resources by improving technical efficiency at the facility level and reducing the access prices of vaccines.

We found that the clearest relationships between ASD activities and service delivery impact within immunization programs are demonstrated by supply chain and procurement. Vaccines are one of the primary drivers of total immunization program spending, thus, by maximizing efficiencies in the supply chain, programs could incur substantial savings by reducing waste and improving performance. Poor supply chains result in programs overstocking, allowing vaccines to expire, and wasting procured vaccines. By improving logistics and data collection and by using transport loops, level jumping, informed push, and dedicated personnel, programs can reduce these inefficiencies. We discuss the supply chain and its impact on service delivery in greater length in a separate chapter of this report.

What current, on-going, or planned efforts improve the knowledge base of immunization-related ASD costs and their efficiency?

A second phase of the EPIC study is currently underway, and a public dissemination workshop is planned for May 2016 at the project's end. EPIC II aims to analyze the determinants of program costs using data pooled across countries. EPIC II will seek to disseminate lessons learned and technical guidance for conducting, interpreting, and making use of costing data in the context of national immunization programs.

Additional research is also being conducted on the impact and effectiveness of supervision. In Ethiopia, an ongoing study seeks to document the costs and outputs for interventions that will address program management and supervision by the local health office. The project is expected to terminate in early 2016, with the results from the study to be disseminated later in the year.

What are the key gaps in the immunization ASD knowledge base?

Data on the costs of immunization programs are more robust than analogous data for other health programs, including many of those presented in this report. Recent and ongoing costing studies—chiefly, those of the EPIC study—have generated a foundation of granular costing data, which provide insights into the costs of ASD activities and the related share of program costs they comprise.

Although the EPIC studies have generated a strong assessment of ASD costs for six countries, we found that there is a paucity of baseline and longitudinal cost data for immunization programs. The EPIC study provides an estimate of costs for program year 2011, establishing a baseline by which to compare future spending within the six original EPIC countries; additional research is needed to understand the relationship between shifts in program scope and scale and changes in cost over time. Most countries, however, lack these baseline data, and thus would be candidates for future iterations of EPIC-like assessments of immunization costs.

Our informants considered the methodologies of EPIC studies, and stated that EPIC's ASD questionnaires to allocate health worker time to immunization and across immunization activities have not been robustly validated. It is possible that EPIC's costing analysis inaccurately captured estimated personnel costs for immunization. We anticipate that future studies may improve upon this area of data collection. In addition, the EPIC studies do not explicitly link cost data to outcome or process metrics, which limits researchers' abilities to estimate ASD spending's impact on service delivery.

Although regular immunization expenditure data are reported through the JRF by a large number of countries, the JRF financing indicators do not collect the granular data that researchers require to analyze ASD spending. Further, the JRF reporting documents countries' self-reported expenditures, rather than costs. Consequently, the JRF also does not provide reliable longitudinal cost data, which would enable policy makers and analysts to study the relationship between ASD spending and various other indicators—most critically, coverage and quality of service delivery.

Finally, our informants observed that as country immunization programs become more mature and successful in providing high coverage of initial vaccines, most national programs fail to adequately administer booster campaigns, whose strategies may differ from initial vaccination campaigns. Immunization programs still are developing delivery strategies for booster campaigns; these campaigns may have implications for ASD programming and spending, though the scope and scale of their impact remains to be seen.

Tuberculosis

What is the current level of publicly available data for ASD costs?

Among the six global health areas that we surveyed in this landscape analysis, we found a scarcity of data on ASD activities and costs related to tuberculosis (TB) programming. We found little publicly available data for costs of TB prevention, diagnosis, and treatment programs in general, extending from ASD activities to unit costs for site-level activities.

We found no studies on TB ASD activities, and no information on the costs thereof in our literature review. The TB Modelling and Analysis Consortium—a collaboration of health modelers, analysts, researchers, and epidemiologists working in TB—anticipates conducting more detailed analyses on costs and priority setting in the future, but these studies have yet to be initiated.

Data on TB allocations through Global Fund grants are recorded in individual program grant agreements, which we discuss in the subsequent section on malaria ASD. The Global Fund program grant agreement budgets are available on the Global Fund website as scanned PDFs, but these PDFs are not machine readable. To determine the representative size of budget ASD allocations within the Global Fund's TB portfolio based on these data, we would have to analyze each grant's budget individually in order to extract the relevant data.

With respect to budgeting tools and costing models, the WHO's Global TB Programme currently is overseeing and implementing a transition between two tools for countries' programs and policymakers. The WHO's Budgeting and Planning Tool was developed in 2006—just as the seven-year Global Plan to Stop TB was being implemented (2006-2015)—to provide countries with support in developing budgets for both domestic and donor sources to use to mobilize TB resources. An Excel based tool, the Budgeting and Planning Tool, enables users to generate a wide number of budget estimates, including for ASD activities (such as monitoring and evaluation). However, the tool is not pre-populated with respect to these activities, and, thus, requires users to provide substantial country-specific inputs to generate ASD budget estimates.

The WHO currently is encouraging health program and policy planners to use the newly developed OneHealth software tool, developed by Avenir Health, and launched in mid-2011. This tool provides users with a unified framework to analyze costs and finances for all major disease and health system areas. The analytic framework is more horizontal than vertical. The OneHealth tool is similar to the Budgeting and Planning Tool in that it is capable of estimating ASD activity budgets; however, the OneHealth tool does not have built-in assumptions about ASD costs, and also requires substantial user-provided inputs to generate these estimates. Due to the number of inputs needed to calculate ASD line allocations, these tools require that users have robust knowledge of country-specific costs to generate ASD budget estimates for tuberculosis programming.

The WHO National Health Account (NHA) repository also includes TB expenditures for some countries, which we describe in more detail in the following section. See Appendix 3 for additional discussion of these data and the challenges of using them to identify ASD costs.

What are ASD activities and for what share of program spending do they account?

Our informants expressed that ASD spending could be an important component of TB expenditures, particularly with regard to the introduction of new technologies, such as new drugs or new diagnostics. Many of our informants noted that these new technologies require large training efforts to ensure that healthcare practitioners implement the technologies effectively, prescribe and apply new drugs correctly, and use new diagnostic machines correctly and in adherence to clinical guidelines.

Since 2002, the WHO has monitored government and international donor financing for TB. Each year, the WHO asks countries to complete a questionnaire, which includes questions on their estimated spending for TB programs. The survey yields expenditure data disaggregated across the following categories:

- Laboratory infrastructure, equipment, and supplies;
- National TB Programme staff (central unit staff and subnational TB staff);

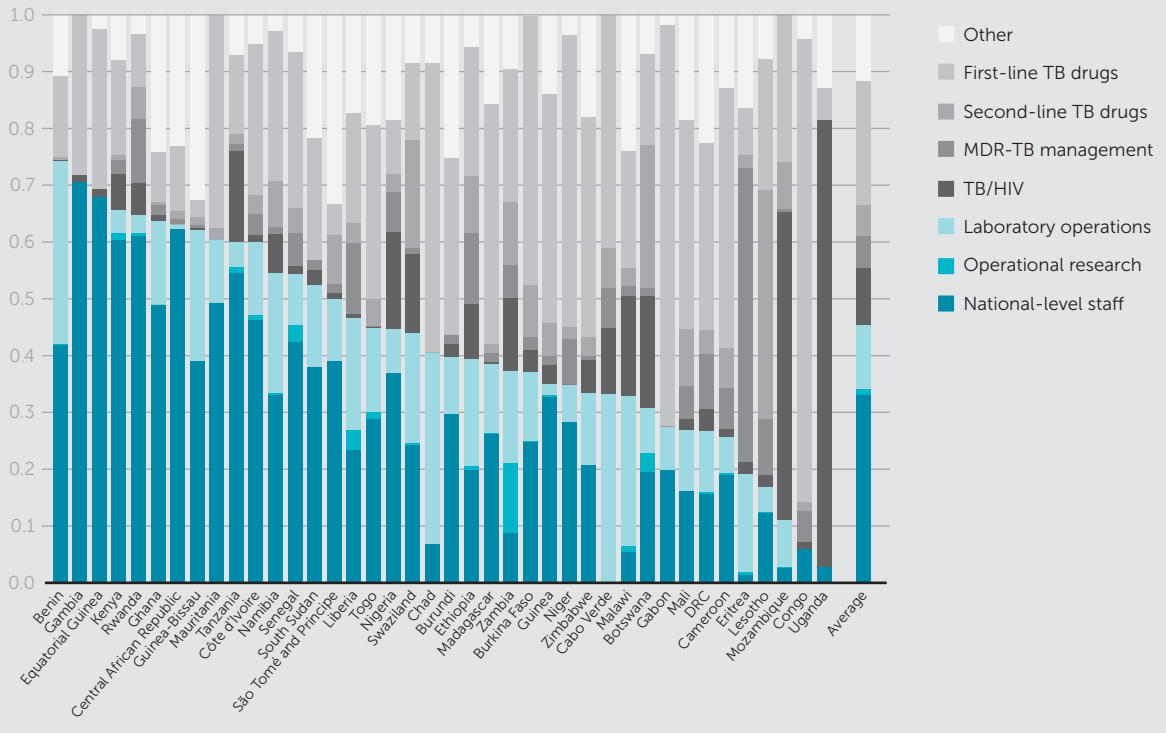
- Drug-susceptible TB: drugs;
- Drug-susceptible TB: programme costs;[18]
- Drug-resistant TB: drugs;
- Drug-resistant TB: programme costs;
- Collaborative TB/HIV activities;
- Patient support;
- Operational research and surveys; and
- All other budget lines.

The WHO's global TB database stores the data from this spending survey. The expenditure tracking data undergo a month-long validation process between WHO and TB endemic countries. The data ultimately inform the financing section of the *Global Tuberculosis Report*. Although the data are accessible upon request, they are not released by the WHO as a publicly accessible data repository.

Aggregated financing figures, which report total program expenditure (without any disaggregation by the budget lines mentioned above), are accessible on the WHO's website, but do not provide any indication of ASD activities or spending.

We requested and obtained TB expenditure data from the WHO's global database. Specifically, the data we obtained provide self-reported expenditure estimates for 47 countries, between 2010 and 2014, as illustrated in Figure 18 below. The data provided by the WHO were disaggregated by eight categories; three categories—national-level TB program staff, operational research, and laboratory operations—were identifiable as ASD-related expenditures. The available data indicate pronounced variation in the relative size of ASD-related expenditures against total program spending, ranging from roughly 74 percent of spending (Benin) to just under 3 percent (Uganda). On average, the TB expenditure data indicate that

Figure 18. WHO tracked TB expenditure data (USD, 2010-2014), disaggregated by program activity/category



Source: WHO

[18] Including program management, supervision, training, policy development, office equipment/vehicles, construction of buildings, surveillance, advocacy and communication, public-private mix activities, community engagement, active case-finding, infection control, procurement and distribution of TB drugs, and other line items

countries spend roughly 43 percent of total program spending on ASD activities/costs.

Besides the WHO's TB country spending data, the only other publicly available source of ASD expenditure data is the National Heath Account module on TB expenditures. As in other NHA modules, TB expenditures are reported for different activities, including for "governance and administration," as illustrated in Table 2.

Table 2. Percent of total health expenditures for TB identified by NHA analysis for governance and administration

	Percent of expenditures for governance and administration
Kenya (2012-13)	18%
Tanzania (2009-2010)	No data
Malawi (2011-2012)	No data
Benin (2012)	16%
Burkina Faso (2013)	32%
Ghana (2012)	0%
Niger (2013)	60%
DRC (2013)	12%

Source: SHA, WHO

NHA data for tuberculosis expenditures are not reported across all country NHAs. We found in the sample of countries that we examined in this study that the reported values range from 0 percent (Ghana, 2012) to 60 percent (Niger, 2013), when countries reported the percent of program spending directed to governance and administration. *Prima facie*, it is unlikely that this wide variance reflects the true differences between countries' expenditures on governance and administration to support TB programs. Rather, the data call into question how consistently the data have been gathered in different countries.

What is known about the impact/ efficiency of TB ASD activities?

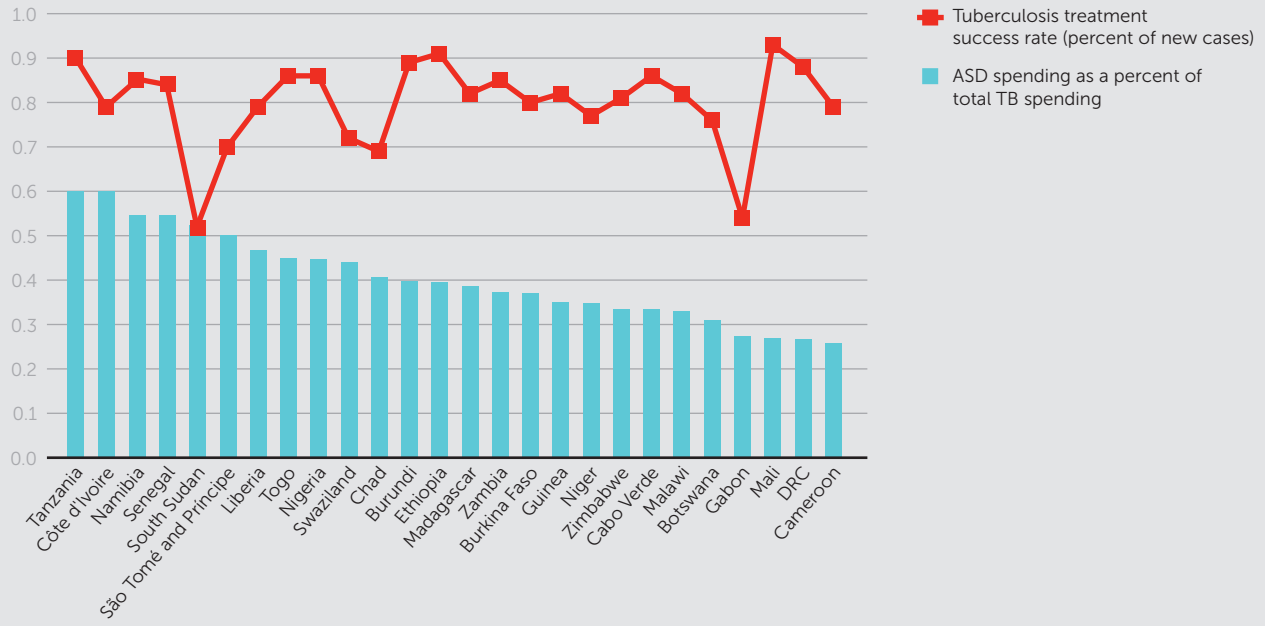
In spite of the scope and size of TB programs worldwide, we found a lack of analysis on the impact and efficiency of ASD within TB programming. Our informants speculated that ASD activities were necessary for the successful operation of TB treatment and prevention initiatives, and for the success of the Global Plan to Stop TB overall. Many commented, however, that researchers have barely studied these activities and their costs, impact, and efficiency.

We found it difficult to evaluate the efficiency of ASD activities in TB without better costing data. Some of our informants speculated that the dearth of TB costing data could be attributed to a large funding vacuum within TB. One informant noted that donors do not support TB costing work to the full extent needed, notwithstanding the funded activities of the TB Modelling and Analysis Consortium (TB-MAC). Informants noted that the lack of available funding for broader costing studies has a chilling effect on the interest for TB cost research.

TB is a health area that collects a number of treatment outcome indicators that can serve as overall performance proxies for national responses to TB, which researchers can use to examine the impact of ASD activities. In this regard, with better data on costs/expenditures, we anticipate that researchers could examine how changes in ASD activities within a country relate to changes in performance. At a high level, researchers could measure impact and efficiency by comparing the high-level WHO country-reported spending data with TB treatment outcome indicators. For example, in Figure 19, we plotted the percent of a country's total expenditures dedicated to ASD activities against the country's TB treatment success rates for select countries.

The data that we present in Figure 19 display no significant correlation. It is important to note, however, that the self-reported TB expenditure data are incomplete for various cost categories and across various years, and, thus, may not present a comprehensive assessment of ASD spending. More robust spending data could inform additional analyses against treatment success indicators; such data collected over time could inform longitudinal analyses, capable of being disaggregated by individual

Figure 19. WHO tracked TB expenditure data indicating the percent of total country ASD-related expenditure plotted against TB treatment success rates (percent of new cases, 2012)



Source: World Bank

ASD cost components, providing initial indications of the impact of (changes in) ASD spending.

What current, on-going, or planned efforts improve the knowledge base of ASD costs and their efficiency?

The TB-MAC recently received funding to conduct detailed analyses to provide greater analytic data on costs and priority setting. These analyses will focus on site level and patient costs; our informants indicated that ASD cost data may be part of the analysis.

Our informants indicated that tracking expenditures—particularly by using NHAs—may help to capture both ASD and site level costs in a systematic and comprehensive way. As more NHAs are conducted using the WHO's new System of Health Accounts framework, it is likely that additional NHAs will provide new data on TB governance and administration costs. However, we do not know whether these data will eventually provide any greater granularity of focus within these categories.

What are the key gaps in the TB ASD knowledge base?

We found a lack of comprehensive data encompassing both service delivery costs and ASD costs for TB interventions, which hindered our ability to analyze above service delivery spending and efficiency. This was the case in several of the other health areas we examined in this study as well. Our informants noted that research on cost and efficiency of ASD activities in TB is frustrated by a lack of data for basic unit costs even at the site-level; this differs from some other health areas, in which site-level unit costs are highly researched. Without good site-level data, we found it to be impossible to judge the impact of ASD activities on site-level costs or performance. A recent survey of cost data availability for TB indicated that there is a range of data on treatment costs, but much of these data are out of date. Furthermore, there are fewer data available on the costs of diagnosis and detection, and little to no data on the costs of improving TB service efficiency (Lawrence & Baena, 2015). A stronger foundation of cost data would provide researchers with a clearer sense of the costs of ASD activities for TB, and more readily accessible and reliable expenditure

data would enable program staff and researchers to monitor the impact of activity spending on programs' performance.

Another emerging issue within TB is the current effort to increase the use of PCR assays, such as the Xpert automated cartridge-based machine. The WHO currently is engaged in an initiative to promote the procurement and distribution of Xpert machines, which, though more expensive than conventional microscopy diagnostics, are more sensitive and reliable. Numerous modeling studies have estimated that the implementation of Xpert MTB/RIF is cost-effective for the diagnosis of TB and multidrug-resistant TB in counties with a high burden (Langley et al., 2014; Pantoja et al., 2013; Theron et al., 2012; Vassall et al., 2011). However, many of these studies differ in assumptions regarding rates of disease transmission and the sensitivity of baseline laboratory testing protocols (Dheda, Theron, & Welte, 2014).

Our informants noted that the success of Xpert integration depends on training laboratory staff successfully so that they are able to use the new equipment that is introduced. These trainings—in addition to the costs of new equipment—may contribute to TB ASD spending. However, the extent to which they contribute to overall spending is unclear as training costs are not included in the cost-effectiveness analysis of Xpert integration consistently. Other considerations related to laboratory operations are discussed in greater detail in a subsequent chapter.

Malaria

What is the current level of publicly available data for malaria-related ASD costs?

Although malaria is one of the largest global health areas that we considered in this landscape assessment, we found limited high-quality, publicly available data for ASD costs across its three programmatic stages: control, elimination, and post-elimination.

In our literature review we found a single academic study on malaria ASD activities (Sabot et al., 2010). This study's authors conducted a literature review to estimate the costs incurred by malaria programs across the years in which the programs' phases shifted, from controlled-low endemic malaria (CLM), to elimination, to prevention of reintroduction (POR). The five case studies provided estimated costs over time for malaria programs in China's Hainan and Jiangsu provinces, Mauritius, Swaziland, and Tanzania's Zanzibar archipelago.

Consistent with the findings of our literature review, Sabot et al. found a paucity of contemporary published data on the costs of malaria elimination programs. The authors note that the most recent robust analysis of program costs in malaria "examined the 5-year expenditures of most countries participating in the GMEP," the Global Malaria Eradication Programme, which was conducted between 1955 and 1969. Although data from this era may provide researchers with some helpful insights into current costs, the GMEP cost data do not describe the program's components or epidemiological context, and, thus, do not help researchers ascertain the costs of ASD associated activities.

The country case studies described by Sabot et al.—constructed from national health accounts, donor proposals, and informant interviews—indicated that program management costs tend to rise as countries advance from controlled-low endemic malaria (CLM) to elimination,[19] in both absolute amount and as a share of total annual costs. The trend in costs described by Sabot et al. is illustrated in Figure 20 below. The average share of total annual costs dedicated to program management was 23 percent, with a minimum of 9 percent (Zanzibar, CLM 2009-13) and a maximum of 40 percent (Jiangsu, China, elimination 2010-2014).

In Figure 20, we display the average annual malaria program management costs as a percent of total annual cost (primary axis) and in absolute value (secondary axis) for the four regions that we identify. Lightly colored bars indicate percent of total cost in CLM phase; darkly colored bars indicate percent of total cost in elimination phase.

[19] The Sabot et al. case study for Mauritius examines the transition between elimination and prevention of reintroduction from 1983 to 2008, and is thus not included in the analysis.

In addition to the data on these few countries provided by Sabot et al, data for a larger group of countries and time periods are available on Global Fund grant budgets, which are documented across the Global Fund's program grant agreements. These budget data are disaggregated by the following expenditure categories:

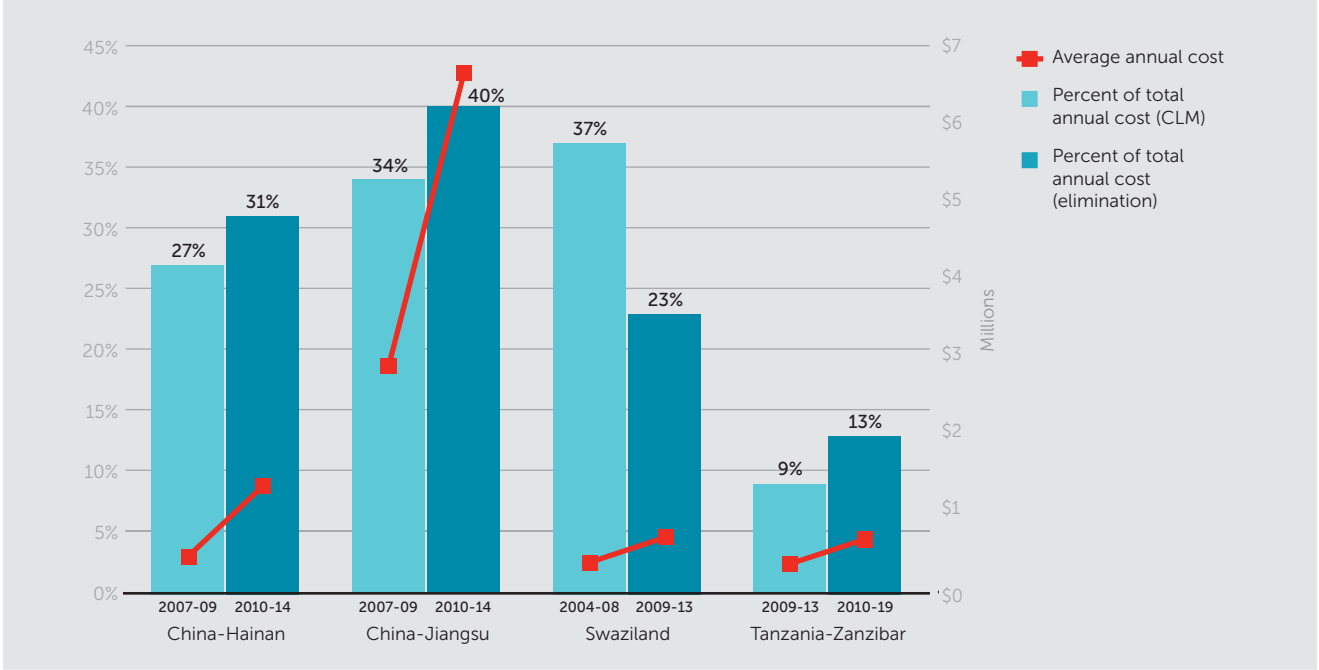
- Human resources
- Technical assistance
- Training
- Health products and health equipment
- Medicines and pharmaceutical products
- Procurement and supply chain management costs
- Infrastructure and other equipment
- Communication materials
- Monitoring and evaluation
- Living support to clients/target population
- Planning and administration
- Overhead
- Other

Although several of these categories include ASD activities (e.g., monitoring and evaluation, training, planning and administration, etc.), the Global Fund does not publish grant budget data via a repository or in a machine readable format. The program grant agreements that collect these data are available on the Global Fund website as scanned PDFs; however, without Excel compatible data on grant budgets and expenditures, we cannot ascertain budget ASD allocations within the Global Fund's malaria portfolio without engaging in a time-consuming grant-by-grant review.

The WHO National Health Account (NHA) repository also includes malaria expenditures for some countries, which we describe in more detail in the following section. See Appendix 3 for additional discussion of these data and the challenges of using them to identify ASD costs.

Additional data on malaria ASD costs are available through costed national malaria strategic plans. Government officials—under the Roll Back Malaria Initiative—have developed a number of strategic plans that include costed components of varying detail and disaggregation; those for Namibia, Nigeria, Malawi, Sierra Leone, and Uganda provide sufficient detail for comparison.

Figure 20. Average annual program management costs for malaria by program phase and territory, from Sabot et al.



Source: Sabot et al. 2010

In Figure 21, we present the breakdown of total program costs associated with national malaria strategic plans for the year 2014. The costed national plans each contain different cost categories and were not conducted using a standardized approach; in order to present comparative cost data, we cross-walked cost categories across the various national plans into standard categories. These categories echo those used in the EPIC studies for immunization program costs and the Global Fund's malaria grant budget data.

Across these five plans, the average share of total projected costs for 2014 dedicated to ASD activities was 22 percent, with a minimum of 5 percent (Malawi) and a maximum of 46 percent (Namibia).

What are malaria ASD activities and what share of program spending do they comprise?

ASD activities with malaria are similar to those of other communicable disease programs, like HIV/AIDS and TB, and may include surveillance, monitoring and evaluation, HMIS, training, administration, and supply chain. We were unable to estimate the relative share of program spending that these activities comprise given the lack of granular data on ASD spending.

With regard to expenditure data on malaria programming, we found only one publicly accessible database, the WHO National Health Account (NHA) repository, which has a module dedicated to capturing malaria expenditures. This information is presented in Table 3 below.

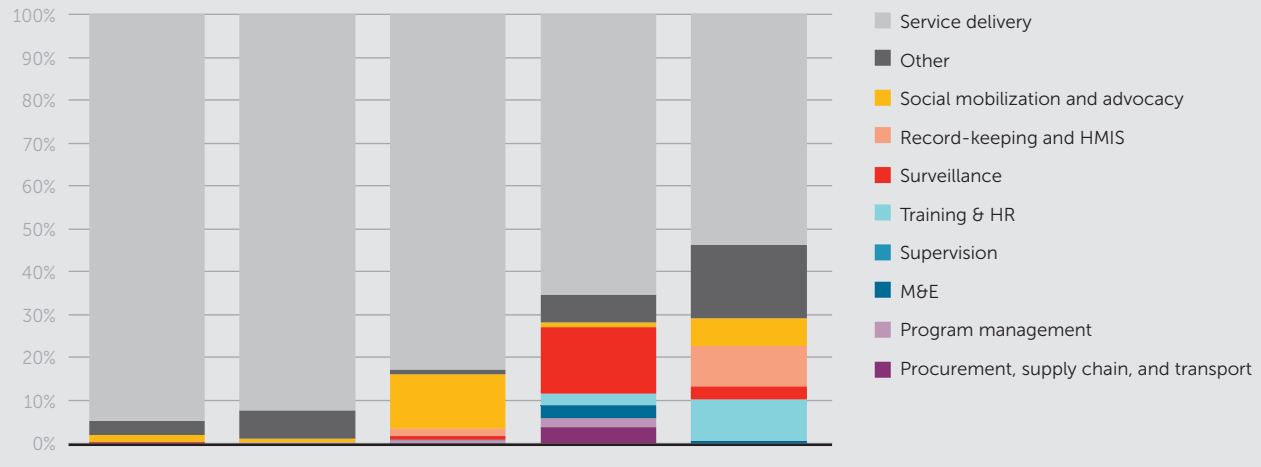
Table 3. Percent of total health expenditure for malaria identified by NHA analysis for governance and administration

	Percent of malaria spending for governance and administration
Kenya (2012-13)	16%
Tanzania (2009-2010)	1.4%
Malawi (2011-2012)	13.4%
Benin (2012)	16%
Burkina Faso (2013)	19%
Ghana (2012)	0%
Niger (2013)	30%
DRC (2013)	5%

Source: SHA, WHO

In cases in which NHA data on ASD activities are available for malaria expenditures, we have captured these data under the category "Governance and health system and financing administration."[20] Across different country NHAs, this cost category varies as a share of total program cost, from 0 percent (Ghana, 2012) to 30 percent (Niger, 2013). Among the countries that have available data, the average share of malaria related expenditures dedicated to governance and administration was 13 percent of total program expenditures.

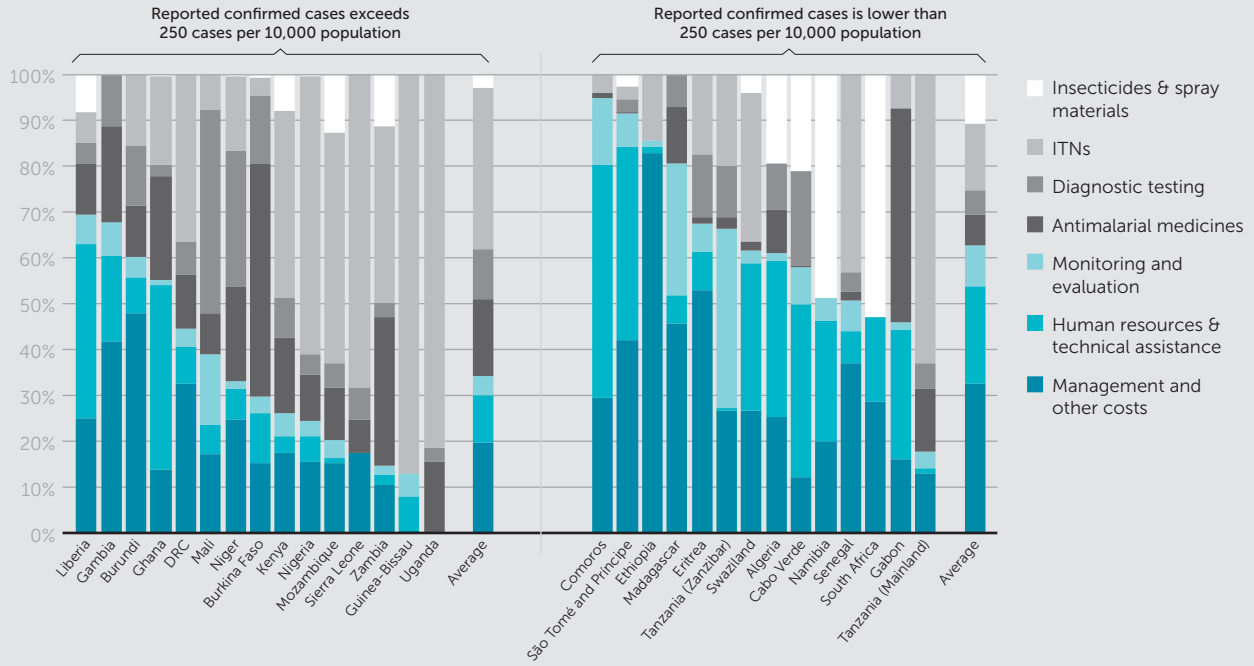
Figure 21. Breakdown of projected malaria program financial need for five sub-Saharan African countries, disaggregated by program activity/category (USD, 2014)



Source: Roll Back Malaria costed national plans

[20] See Appendix 3.

Figure 22. WHO tracked malaria financing data (USD, 2014), disaggregated by program activity/category



Source: WHO

The NHA data do not provide granular insights into how governance and administration expenses may be disaggregated by activity or functional level within the health system. Data from the President's Malaria Initiative and from the World Malaria Report similarly do not include granular expenditure data on ASD activities.[21] The World Malaria Report does include country profile data on financing by intervention, which includes financing for monitoring and evaluation; this information is presented through graphical read-outs, however, and does not include the source data.[22]

Using the graphical read-outs from the World Malaria Report's country profiles, we were able to manually extract data on financing by intervention for twenty-nine sub-Saharan African countries. These data are presented in Figure 22.

The data obtained from the World Malaria Report reflect self-reported financing estimates for 2014, disaggregated by seven categories. Three categories—monitoring and evaluation, human resources and technical assistance, and management and other costs—were identified as ASD-related activities for the purposes of our analysis.

The available data indicate substantial variation in ASD-related financing as a share of total program financing, ranging from 95 percent (Comoros) to 0 percent (Uganda). Excluding countries for which data was not reported for 2014, the malaria financing data indicate that countries in sub-Saharan Africa direct roughly 48 percent of funding for malaria to ASD activities. This contrasts with the data presented earlier in this chapter extracted from the Roll Back Malaria costed national plans, which found a significantly lower share of costs for ASD activities. These data are derived in a very different way and cannot easily be compared; costed plans refer to planned costs rather than actual financial flows, and the categories used are not identical. It is also possible that some costs are included in the costed plans but excluded in the financial flows, or vice versa, given the different perspective of these analyses.[23]

[21] Data on the President's Malaria Initiative funding for FY 2006-FY2013 can be accessed in Appendix I of PMI's Eighth Annual Report to Congress, available at http://www.pmi.gov/docs/default-source/default-document-library/pmi-reports/pmireport_final.pdf?sfvrsn=14. Data from the World Malaria Report 2015 may be accessed at http://www.who.int/malaria/publications/world-malaria-report-2015/report/en/.

[22] The WHO team is considering publishing this data in future annexes of the World Malaria Report, but were unable to release these data to us on request.

[23] As an example of how different perspectives can lead to different activities being captured: a report of financial flows for malaria may *exclude* the costs of some healthcare workers who are paid for as part of the general primary healthcare system (as these workers are not part of a 'malaria budget'), while the labor of these workers may be *included* in a costed national plan (as the time and effort that these workers dedicate to malaria response constitutes a drain on the resources of the healthcare system, ultimately requiring either that additional workers are hired (at some financial cost) or that workers are diverted from other activities (with some associated opportunity cost)).

Our analysis further indicated that malaria financing in countries where the prevalence of malaria exceeded 250 cases per 10,000 primarily went to service delivery activities—on average, only a third of financing went to ASD activities. By contrast, ASD-related malaria financing in countries with prevalence rates below 250 cases per 10,000 comprised, on average, 63 percent of total program financing. A simple regression analysis indicates a statistically significant negative relationship between prevalence and the portion of financing dedicated to ASD activities.[24] Although these data reflect differences across countries rather than across time, and cannot be interpreted causally, these findings are consistent with the idea that as prevalence declines, a lesser share of malaria resources may be dedicated to broad vector control efforts and treatment, and a greater share may be dedicated to ASD activities such as surveillance.

What is known about the impact/ efficiency of malaria ASD activities?

As discussed above, we found little research addressing the impact or efficiency of ASD activities in malaria programs in the published or grey literature. Our interviews with experts corroborated our finding. However, our informants stated that ASD activities were likely to be critically important as malaria programs shifted their focus from control to elimination and, finally, prevention of reintroduction. In countries in which there is consistently high prevalence of malaria, pushing prevention and treatment services to all areas of the affected country may be a reasonable (and politically palatable) policy, but as prevalence decreases and outbreaks become more sporadic, a more differential approach may be needed (particularly as budget allocations for malaria decline). Our informants expressed that better surveillance systems for malaria enable more strategic targeting and prioritization of efforts, which results in more efficient deployment of resources. Just as elimination campaigns require a "heavy push" and strong surveillance services, our informants aver that post-elimination malaria programs likely will require strong surveillance, monitoring, and evaluation throughout at-risk areas.

Our informants also suggested that as malaria prevalence declines within a country many malaria programs increasingly rely on a horizontal approach. When malaria is highly endemic, malaria programs often use a vertical approach for prevention activities and commodity supply that run parallel to the primary healthcare system.

As prevalence declines, however, and as countries pursue elimination as a goal, malaria programs require increased coordination and horizontal distribution across the health system. In this scenario, central level planning and administration may again contribute to a higher relative share of ASD spending, although researchers have yet to examine this.

What current, on-going, or planned efforts improve the knowledge base of malaria ASD costs and their efficiency?

At present, CHAI is attempting to gain a comprehensive estimate of the costs associated with malaria prevention, particularly for indoor residual spraying (IRS) campaigns. This analysis is meant to provide a thorough understanding of IRS costs incurred at every level of the campaign; CHAI has not yet released results of this analysis.

Focusing on the costs of preventing malaria, as CHAI is, may be more tractable for researchers than broader malaria costing. From a conceptual standpoint, calculating the comprehensive vertical costs of malaria, which incorporate treatment as well as prevention, and costs at every level, is complicated by the nature of detecting cases of malaria. One of the most common symptoms of malaria infection is fever; patients who present with malaria-like fevers enter the primary healthcare system, which acts as a catchment for cases of malaria and other fever related illness. It is, thus, unclear to what extent researchers should consider the primary healthcare system within the context of malaria program costs; as one our informants noted, it is often difficult to assess where primary healthcare systems end and malaria programs begin.

What are the key gaps in the malaria ASD knowledge base?

We found that comprehensive costing data for malaria interventions, prevention, and treatment are

[24] The regression of *[percent of financing to ASD activities]* against *[Natural logarithm of: confirmed malaria cases per 10,000 population]* is statistically significant at $p<0.05$, with a coefficient that suggests that when prevalence doubles, the share of finance for ASD activities decreases by 2.5 percentage points. This negative relationship is more pronounced if analysis is restricted to countries with at least 1 case per 10,000 (i.e., excluding Algeria and Cabo Verde).

missing from the knowledge base. If researchers were able to perform a robust analysis of programs' costs, based on up-to-date data from countries that are implementing malaria programs in varying stages, researchers would have greater insight into the relative size and share of programs' costs for which the above service delivery activities account. Our informants noted that understanding what specific surveillance activities are required in different circumstances, and what these activities should cost, should be a particular priority for further investigation.

With regard to expenditure tracking, we found that more granular financial data on spending towards individual ASD activities, such as a program management and surveillance, could be used to empirically study the relationship between prevalence and ASD spending. By linking expenditure data to programs' outcomes related to prevalence and coverage, researchers would be able to estimate the impact and efficiency of ASD activities for countries for which granular data are available.

Finally, as countries reduce the prevalence of malaria, their health systems must increasingly work to maintain the cost-effectiveness and quality of malaria programs across larger coverage areas that have declining prevalence and more sporadic incidence of malaria, and hence less predictable demand for medicines. Ensuring that affected individuals have access to antimalarial medicines may be a challenge for the system, particularly given the sharp growth in global demand for artemisinin-based combination therapy (ACT) since its implementation as the standard first-line treatment for malaria (WHO, 2011). Creative solutions above the point of service delivery—including rotating buffer stock and non-rotating emergency buffers—are needed to avoid stockouts, expiry, and supply chain disruptions in access to ACT (Shretta & Yadav, 2012).

Nutrition

What is the current level of publicly available data for nutrition ASD costs?

Of the six global health areas that we analyzed in this report, nutrition is among the most varied in both focus and interventions. Nutrition is a broad field, encompassing multiple indicators and dimensions of illness. Nutrition programs may target undernutrition—evidenced in stunting, wasting, and vitamin deficiency—or overnutrition, as in the case of obesity. These conditions have unique interventions, which may further be characterized by whether the interventions directly target the immediate causes ("nutrition-specific interventions") or the underlying determinants of the conditions ("nutrition-sensitive interventions").

In this chapter, we focus on nutrition-*specific* interventions, which are more analogous to the targeted interventions described in other health areas in this report, but we refer to the broader definition of nutrition (including nutrition-sensitive interventions) where appropriate. Nutrition-specific interventions include the distribution of supplementary foods, community-based management of acute malnutrition (CMAM), biofortification of staple foods, exclusive breastfeeding promotion, and vitamin A supplementation for infants and pregnant women. Nutrition-sensitive interventions, by comparison, encompass a wide range of program areas, including agriculture; education; social welfare; water, sanitation, and hygiene; and women's empowerment. Efforts by researchers to cost and finance these programs have been especially challenging, because of this broad inclusion criteria for nutrition sensitive programs.

Researchers have found it difficult to capture cost data that are standardized across all facets of nutrition programming; comprehensive basic cost data have yet to be gathered for a number of nutrition interventions. Data on ASD costs are similarly limited; there are few studies or repositories that capture these costs in any systematic way. In this section, we examine four sources of cost data: academic studies published on the costs of CMAM, the World Bank's 2010 report *Scaling Up Nutrition: What Will It Cost?*, the Lives Saves Tool (List), and the Scaling Up Nutrition (SUN) Movement cost national nutrition plans.

In our literature review, we identified only two relevant academic studies published since 2010 that discussed ASD activities and costs within the context of nutrition programming, both of which focused on the costs of a CMAM intervention. CMAM is a community mobilization program that requires training, supervising, and monitoring a large number of community health workers (CHWs). These studies—one in Malawi and one in Bangladesh—reported that ASD costs related to management and overhead comprised 51 to 53 percent of program costs, respectively (Puet et al., 2012; Wilford et al., 2010). Although this expenditure split may suggest that these CMAM programs were management-heavy, the high ASD costs associated with the community

case management of severe acute malnutrition (SAM) in these two studies can be understood as a consequence of the high initial start-up costs of launching the CMAM programs. Generally, the start-up ASD costs are higher for CMAM programs due to the volume of training and field-level management necessary to operate the programs effectively. As CMAM programs mature, costs decline, as new staff require less training, and the programs utilize more cost-effective CHWs and create new monitoring systems.

We found in the grey literature on nutrition costs that the leading costing analysis is the World Bank's 2010 report *Scaling Up Nutrition: What Will It Cost?* (Horton et al., 2010). This flagship paper provides costs for a range of recommended nutrition interventions and analyzes the resources necessary to scale up nutrition programming worldwide. Nonetheless, the report contains relatively little discussion of ASD activities needed to support the programs' delivery. While ASD costs are not directly considered within the analysis, the authors estimate that $200 million USD of the $11.8 billion USD needed to scale up nutrition globally is necessary for operations research, technical assistance, and monitoring and evaluation of large-scale programs. Within each intervention, ASD activities such as supply chain and procurement are discussed as *delivery costs* within the analysis. These costs are estimated to account for varying shares of different total intervention costs, ranging from less than 5 percent for iron fortification and salt iodization to 96 percent for vitamin A supplementation. The report estimated that for complementary feeding delivery costs comprised 12 percent of the total intervention costs; the authors note that this allocation is "probably an underestimate; further research is needed" (Horton et al., 2010). The varying costs can be understood, in part, as a function of commodity costs (e.g., vitamin A supplementation commodity costs are far lower than those for iron fortification and salt iodization); however, the report does not directly address this variance in delivery and ASD costs among interventions.

The World Bank currently is engaged in a second global nutrition scale-up costing project (in partnership with R4D and 1,000 Days, with the support of the Children's Investment Fund Foundation and BMGF), whose results are anticipated to be released in August 2016. The costing methodology for the ongoing project estimates the costs of ASD activities by increasing the cost of the intervention by 12 percent, pursuant to the estimate by Horton et al. (2010). In the emerging analysis, policy development (9 percent), monitoring and evaluation (2 percent), and capacity strengthening (1 percent) contribute to the estimated 12 percent for ASD activities.

The leading impact model for nutrition interventions, the Lives Saved Tool (LiST), contains a costing module that includes intervention-specific costing estimates. The tool provides users flexibility in accounting for ASD activities under its *indirect costs* category for outpatient and inpatient days. This category captures "support service costs like central support/management staff, international consultants, maintenance workers, and supervision of staff, as well as insurance, utilities (telephone, electricity, etc.), publicity and other promotional activities, office furniture, other equipment such as autoclaves and typewriters, vehicle maintenance, other electronic maintenance, and monitoring and evaluation" (LiST, 2015). By default, however, these inputs are not populated, and users must estimate and account for these costs in the analysis.

The most comprehensive data available on the costs of countries' plans for nutrition has been assembled by the Scaling Up Nutrition (SUN) Movement, a member-led consortium of countries and networks of civil society, business, and UN organizations working to improve nutritional outcomes worldwide (SUN Secretariat, 2014). The SUN Movement, under its Synthesis Report ("Planning and costing for the acceleration of actions for nutrition: experiences of countries in the Movement for Scaling Up Nutrition") presents costed national plans for 20 countries.[25]

The analytical framework that classifies nutrition costs for the country plans' separate costs into three sub-categories: nutrition-specific, nutrition-sensitive, and governance. ASD activity costs considered in these plans generally fall under the governance sub-category, which is defined by the Synthesis Report as including "coordination and information management, systems and capacity building, and policy development, advocacy and capacity building" (SUN Secretariat, 2014). Among the 13 sub-Saharan African countries whose national nutrition plans were analyzed under the SUN Synthesis Report, governance costs reflected an average of 25 percent of total program cost (when nutrition-sensitive costs were excluded), ranging from 3 percent (Mozambique) to 62 percent (Uganda).

[25] This guidance documents can be accessed at http://scalingupnutrition.org/wp-content/uploads/2015/06/CRF-TOOL-Guidance-Notes.pdf.

The SUN Movement also hosts the Common Results Framework (CRF) Planning Tool, an Excel database that houses disaggregated costing data for country nutrition plans.[26] The CRF Planning Tool is managed by Maximising the Quality of Scaling Up Nutrition Programmes (MSQUN), an association of technical experts. Countries participating in the SUN Movement are invited to share their plans with the SUN Secretariat; MQSUN then reviews the costed national plans and inputs the data into the CRF Planning Tool.

We found that the cost categories presented in the SUN Synthesis Report and the CRF Planning Tool captured a wide range of program activities (SUN Secretariat, 2014). The CRF Planning Tool presents disaggregated costs for the following governance activities, as represented in Figure 23 for a selection of sub-Saharan African countries:

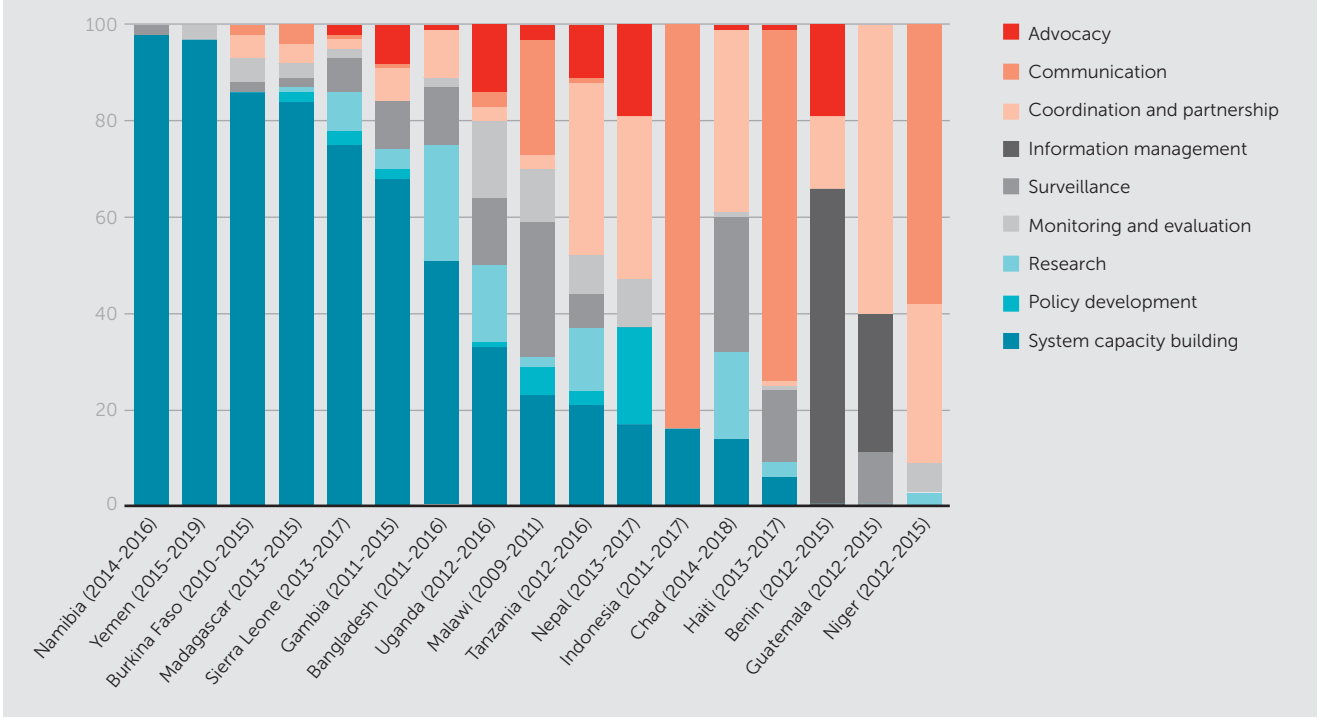
- System Capacity Building
- Surveillance
- Research
- Policy Development
- Monitoring and Evaluation
- Information Management
- Governance
- Coordination and partnership
- Communication
- Advocacy

Across many of these plans, the costs for system capacity building activities are the largest within the governance sub-heading. These activities are defined by the CRF Planning Tool guidance document as activities "which are system-wide, i.e., they support the systems and functionality of all nutrition activities and services" (SUN Secretariat, 2015).[27]

What are ASD activities and for what share of program spending do they account?

With regard to actual nutrition spending, one of the few sources of data that we identified is the WHO National Health Account repository (NHA), which

Figure 23. Governance costs by activity for selected SUN costed national plans, indicating the heavy proportional costs of system capacity building as a share of total governance costs



Source: SUN Movement CRF Planning Tool

[26] The CRF Planning Tool can be accessed at http://scalingupnutrition.org/resources-archive/financial-tracking-resource-mobilization/aggregated-planning-tool.

[27] This guidance documents can be accessed at http://scalingupnutrition.org/wp-content/uploads/2015/06/CRF-TOOL-Guidance-Notes.pdf.

Table 4. A sample NHA profile of expenditures for nutritional deficiencies by use function (Niger)

	2013	2012	2011
Curative care	35%	38%	40%
Medical goods	28%	31%	
IEC programs		0%	
Immunization programs	1%	0%	
Early disease detection programs		0%	
Healthy condition monitoring programs	1%	2%	
Epidemiologic surveillance and risk & disease control programs	5%	1%	
Unspecified preventative care	2%		
Governance and health system and financing admin	28%	28%	60%
TOTAL	100%	100%	100%

Source: SHA, WHO

tracks expenditures within various program areas. A sample NHA profile of expenditures for nutrition is illustrated in Table 4.

We found that the quality of expenditure tracking data for nutrition within the NHAs is inconsistent; indeed, many NHAs do not include expenditure figures for nutrition. Countries for which NHA data on nutrition are available may not include sufficient granularity to indicate an expenditure split between ASD and service delivery costs, as demonstrated by the data in Table 5. The implementation of the WHO's 2011 System of Health Accounts aims to standardize reporting such that these granular data are available for all countries' NHAs moving forward (OECD et al., 2011).

In instances in which NHA data on ASD activities are available, ASD expenditures that are captured are included within the category, "Governance and health system and financing administration." Across different countries' NHA reports this cost category varies substantially as a share of total program cost, from 1 percent in Burkina Faso (2011) to 60 percent in Niger (2011).

Table 5. NHAs that include expenditure tracking for nutrition rarely include tracking for ASD activities (e.g., "Governance, health system, and financing administration")

	2010	2011	2012	2013
Benin				
Burkina Faso		1%	3%	6%
Burundi	6%			
Cambodia				
Cameroon				
Cote d'Ivoire				
DRC			3%	6%
Ethiopia				
Haiti				
Kenya				22%
Mauritania				
Myanmar				
Niger		60%	28%	28%
Philippines				
Seychelles				2%
Uganda				

Source: SHA, WHO

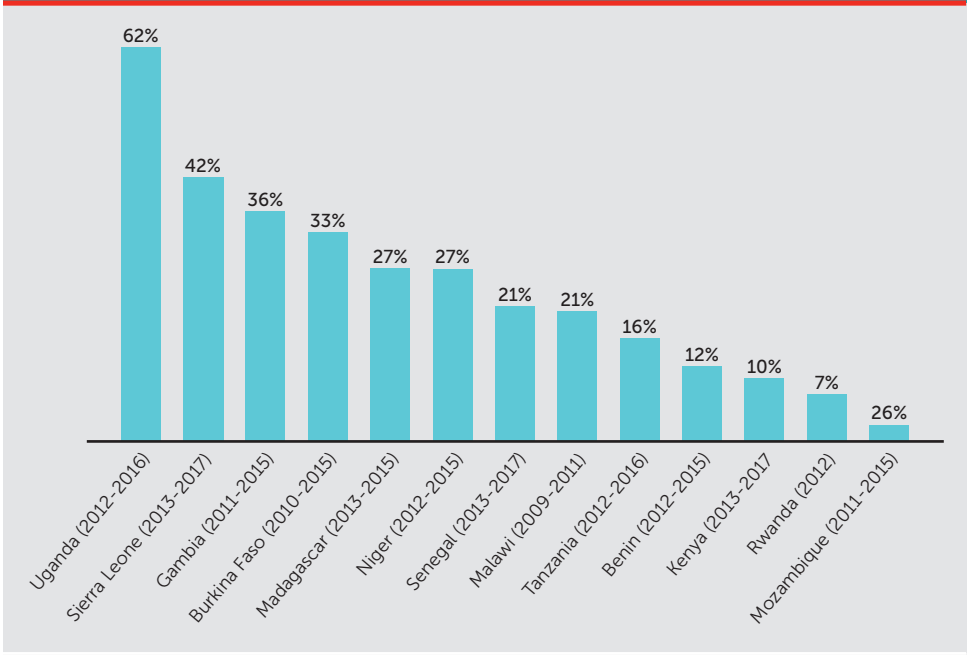
What is known about the impact/ efficiency of nutrition ASD activities?

In our review of the relevant literature and in interviews with informants, we found that little research has been conducted to understand the relationship between and impact of ASD spending and efficiency of nutrition programs, and that there is a resulting lack of relevant data. While we found some research on the impact of nutrition-sensitive interventions within water, sanitation, and hygiene (Dangour et al., 2013) and agriculture (Berti, Krasevec, & Fitzgerald, 2004), these activities generally are not considered to be ASD activities and more aptly are considered ancillary activities (*cf.* HIV supportive activities, like OVC and social protection).

We posit that the lack of analysis in this space is explained by a number of factors. Our informants

[28] Niger's governance spending data are conspicuously high in 2011 (60 percent of total), especially given that governance spending only accounted for 28 percent of program costs in 2013. Prior to 2012, Niger's nutrition NHA portfolio only reported expenditures across two lines, "Governance and health system and financing administration" and "Curative care." In 2011, Niger joined the SUN Movement, and, in 2012, the government implemented a multi-sectoral initiative designed to provide a central coordinating body for nutrition planning and programming. As a result, Niger's total expenditure for nutrition increased from 8 million USD in 2011 to 21 million USD in 2013, and the NHA expenditure tracking included spending data for 7 additional lines.

Figure 24. Program costs by activity category for SUN costed national plans for 11 countries in sub-Saharan Africa, with nutrition-sensitive costs excluded



Source: SUN Movement CRF Planning Tool

indicated—and our desk research affirmed—that nutrition costing and expenditure tracking remains an incipient field, with a developing methodology that is still coalescing around standardized practices implemented at scale. Many of our informants noted that it is difficult to conduct a rigorous analysis of ASD costs when there is a profound lack of basic nutrition cost and spending data. Within the nutrition community, there is an ongoing effort to improve costing data and expenditure tracking, which we discuss further in the following section.

Our informants strongly held that ASD activities are essential for strong nutrition planning, which echoes advocacy at the global level. However, our informants also noted that members of the nutrition programming community think that reducing ASD inefficiencies may not be as mission-critical for nutrition as for other areas of programmatic spending. Informants expressed the opinion that nutrition was not as "top heavy" as other program areas—the field generally is under-resourced and lacks the developed architecture of HIV/AIDS and immunization programs—and, thus, the greatest efficiency gains that could be leveraged to improve service delivery likely are at the point of service delivery.

Many of our informants noted that the nutrition field suffers from gross under-investment at present; because the field receives limited funding, they think that it is possible that there are not substantial areas of waste above the point of service delivery. Our informants also observed that the lack of visible data may contribute to the perceived unimportance of nutrition-related ASD costs, and that it is possible that the share of program expenditures dedicated to ASD activities is underestimated and underreported.

One observation on the impact of nutrition ASD activities that emerged from both our informant interviews and our desk research is worth highlighting: given the multisectoral nature of nutrition programs, programs' accountability would improve and redundancies in their efforts would decrease if they were coordinated by a central office. Informants pointed to Ethiopia's nutrition programs, which are run through the Prime Minister's office, as an example of centralized programming under the leadership of a central authority. The SUN report on countries' experiences echoed this observation: "Countries that have clearly identified functions for coordination and management of nutrition appear to have been better positioned in identifying the required activities and costs" (SUN Secretariat, 2014).

What current, on-going, or planned efforts will improve the knowledge base and efficiency of nutrition ASD costs?

Efforts to increase knowledge about nutrition costing are in development; however, given the paucity of data about basic nutrition costing, we do not expect these efforts to focus on ASD costs, activities, and efficiency. A technical working group convened by Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING), the SUN Movement,

and R4D is working to harmonize methods for budget and expenditure analysis for nutrition. The growth of the WHO NHA repository grows should increase the data on public expenditures for nutrition that are available. Public Expenditure Reviews (PERs) for nutrition may also be forthcoming. In 2014, Tanzania became the first country to execute a PER for nutrition, opening the possibility for additional PERs for nutrition in the future.

What are the key gaps in the nutrition ASD knowledge base?

We found that researchers need reliable, comprehensive data to assess the unit costs of basic nutrition interventions. The lack of availability of these data limits policy makers' and advocates' abilities to make compelling arguments for continuing and increasing investment in nutrition.

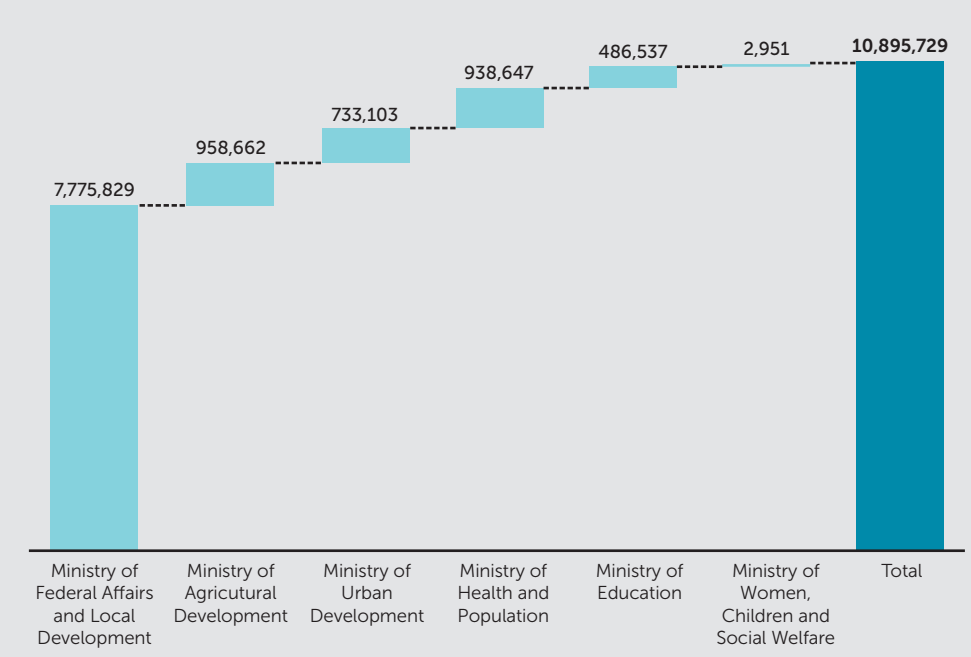
Although researchers and policy makers have considerable interest in the costs of ASD activities associated with nutrition programs, a priority within the field is understanding total nutrition expenditures. In some countries, nutrition activities are coordinated by ministries of health, agriculture, sanitation, environmental affairs, finance, food, land, social welfare, and infrastructure. In instances in which nutrition programs are spread amongst numerous ministries and sectors, researchers have difficulty obtaining comprehensive spending data. A recent nutrition budget analysis for FY 2014-15 for the government of Nepal, presented in Figure 25 below, indicated that on-budget allocations for nutrition spanned six ministries, highlighting the challenge faced by researchers in obtaining comprehensive data for domestic financing for nutrition.

Research studies on the economies of scale for nutrition interventions will aid health planners in estimating the impact, costs, and efficiencies of increasing the reach of nutrition interventions. In addition, as nutrition interventions reach a saturation point in certain areas, greater research will be needed on the impact and efficiency of efforts to expand coverage to hard-to-reach populations (so called "last mile" efforts).

We found in the literature review that high-cost commodities, especially those used to treat and manage acute malnutrition, are among the main cost drivers of nutrition programs. Within CMAM programs, ready-to-use therapeutic foods (RUTFs) often account for 25 to 40 percent of program costs (Puet et al., 2012; Wilford et al., 2010; Horton et al., 2010; Bachmann, 2009). We anticipate that additional research in improving the efficiency of the procurement and manufacture of common nutrition-related commodities will indicate ways to improve efficiencies and potentially lower the unit costs of nutrition interventions and unlock savings at the point of service delivery.

Overall, we found that a stronger empirical knowledge base of ASD and service delivery costs in nutrition alike is needed. Countries and donor organizations should expand expenditure tracking for nutrition, such

Figure 25. Budgeted nutrition allocations in Nepal span six ministries (NPR thousands, 2013-2014)



Source: SPRING, 2015

as through Public Expenditure Reviews or the WHO's NHA system. With expanded data, it may be possible for researchers to fill the more specific knowledge gaps of ASD activities. At present, if researchers consider ASD costs in nutrition cost analyses, they often either estimate or apportion costs by anecdotal experience. To the extent that a more detailed sense of ASD and service delivery expenditure split emerges, researchers will be able to advance more refined analyses of the costs, impact, and efficiency of ASD activities.

Family Planning

What data are publicly available for family planning ASD costs?

We found two major sources of ASD cost data for family planning (FP) programs that are publicly available. However, both of these sources provide the *incremental* costs of meeting specific coverage and/or outcomes targets, not the full cost to the health system. As such, these data are not easily comparable with the data in other program areas, and must be interpreted particularly carefully.

First, since 2012, USAID's Health Policy Project (HPP, 2015) and Futures Group (now Palladium Group) have helped 15 countries to produce Costed Implementation Plans (CIPs) to expand and improve FP services (Zlatunich & Reeves, 2015) guided by national targets tied to FP2020 (n.d.), a global partnership to promote universal access to contraceptives. The CIPs contain high-level breakdowns of costs for both service delivery and ASD activities, while the underlying costing models provide detailed ingredients-based costs for all activities.

As Table 6 indicates, 15 of the 16 plans are published online, while full costing models are currently available for only 4 countries: Ghana, Malawi, Uganda, and Zambia.

Second, through its *Adding It Up* series, the Guttmacher Institute[29] annually publishes global investment needs to achieve universal coverage of essential sexual and reproductive health services, including contraceptives (Singh et al., 2014). The Guttmacher Institute includes ASD activities in the estimates of "program and system costs," which we discuss in the next sub-section, but *AIU* reports them only at the global level.

We also searched the peer-reviewed literature and found minimal information about ASD costs or spending for FP programs. We found only two relevant studies published since 2010, neither of which retrospectively examined FP-related ASD costs or spending. One, a cost assessment of integrating sexual and reproductive health and HIV services in Kenya and Swaziland, focused exclusively on facility-level spending (Warren et al., 2012). The second, a facility-centric cost analysis of youth-friendly sexual and reproductive health services in Moldova, used a conventional ingredients-based approach to estimate service delivery costs, which then underpinned resource-needs estimates for scale-up (Kempers et al., 2014). The authors excluded the largest facility when they extrapolated scale-up needs because its budget included a number of system-level services. In other words, the study's authors deliberately sidestepped analyzing the costs of ASD activities.

Finally, we found no repositories of ASD spending data for FP. Researchers might be able to estimate such spending using National Health Accounts data. However, FP-related activities are not neatly categorized in the System of Health Accounts (OECD et al., 2011). Analysts would have to extract data pertaining to non–service delivery spending through multiple healthcare

Table 6. Availability of Costed Implementation Plans and underlying costing models

Country	Years covered by CIP	CIP available	Costing model available
Benin	2014–2018	X	
Cameroon	2015–2020	X	
Côte d'Ivoire	2015–2020	X	
Ethiopia	*Under government review*		
Ghana	2016–2020	X	X
Guinea	2014–2018	X	
Malawi	2016–2020	X	X
Mali	2014–2018	X	
Mauritania	2014–2018	X	
Myanmar	2014–2018	X	
Niger	2012–2020	X	
Nigeria	2014–2018	X	Forthcoming (2016)
Togo	2013–2017	X	
Uganda	2015–2020	X	X
Zambia	2013–2020	X	X

Sources: HPP (2015) and FP2020 (2015)

[29] Accessible at https://www.guttmacher.org/.

functions and providers, ranging from population-level public health activities, like demand creation for condoms, to FP counseling provided as part of routine primary care, to complex obstetric services provided in hospitals. The fact that FP services are often delivered together with general primary healthcare, as part of broader maternal and child health programs, or in conjunction with programs addressing HIV and other STIs, makes it difficult for analysts to allocate any ASD spending (or non-variable service delivery spending) specifically to FP. Additionally, we found no detailed data on the expenditures of donor-funded programs focused exclusively on FP interventions.

What are FP ASD activities and what share of program spending do they comprise?

There is no standard taxonomy of ASD activities for FP.

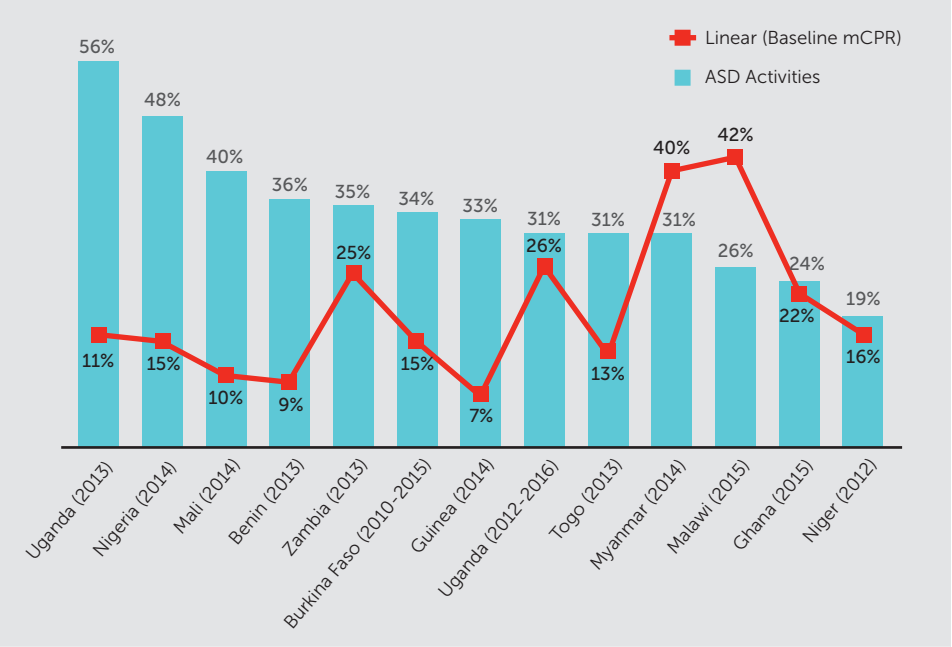
The FP CIPs all include slightly different activities based on the respective country's priorities and needs. Most include at least a subset of the following ASD cost categories:

- Demand creation
- Contraceptive security
- Policy and enabling environment
- Financing
- Health workforce
- Quality and safety
- Stewardship, management, and accountability

The CIPs also cost commodities and "service delivery and access." In some CIPs the latter includes both service delivery and ASD activities, but they are not easily disaggregated in the documents. For our descriptive analysis of the data below, we consider any costs labeled as "service delivery and access" to be service delivery-related costs.

Figure 26 below depicts the allocation of projected ASD and non-ASD (commodities and service delivery) needs for the 13 CIPs published online. On average the ASD share is 34 percent and varies considerably, ranging from 19 percent in Niger to 56 percent in Mauritania. We posit that the variation derives from numerous factors. First, each country approaches its planning from different initial coverage levels, different capacities and baseline spending at both service delivery and ASD levels, and with different goals and timelines.

Figure 26. Allocation of projected FP spending needs for ASD activities

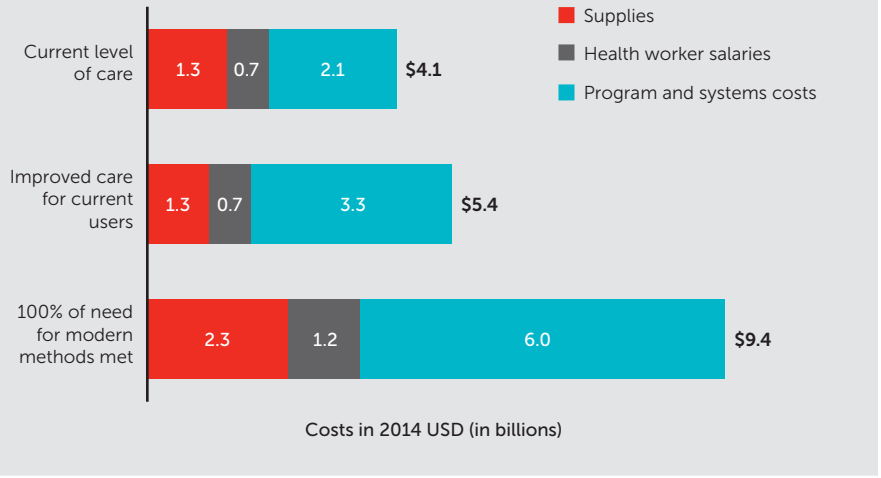


Source: R4D analysis using data from the 13 CIPs posted to the Health Policy Project and FP2020 websites

Second, although we might expect that ASD share for incremental investments needed in family planning is related to the current level of unmet need, we did not find a consistent relationship between ASD share and unmet need in the data. The relationship between modern contraceptive prevalence rate (mCPR) and ASD share is mildly negative,[30] which is consistent with our hypothesis that ASD costs might increase more slowly than service delivery costs as FP coverage expands (e.g., due to scale effects). The data fit for this

[30] Based on the overall pattern of these data, as baseline mCPR increases by three percentage points, ASD share decreases by one percentage point.

Figure 27. Costs of meeting demand for modern contraception under current coverage, improved care, and universal coverage scenarios



Source: Reproduction of Figure 2.3 in Singh et al., 2014

hypothesis is not strong, and we recognize that alternative explanations for the observed effect are possible.

Third, relative prices may vary from one country to another. For example, a month of work by an IT expert in Malawi (ASD) costs about 10,000 times what a single IUD costs (service delivery) (Government of Malawi, 2015). In Ghana, however, the ratio is around 4,000 to 1 (Government of Ghana, 2015). Given that these countries have similar ASD shares, such price differences could indicate that they are getting different amounts of ASD activities for their money. Fourth, some CIPs may rely more on external technical support than others, which typically is more expensive than domestic expertise.

Ultimately, to explain the observed variation, we would have to analyze intensively all 15 CIPs and their underlying cost models, most of which are not publicly available.

In contrast to the CIP cost taxonomy, *Adding It Up* disaggregates costs into *direct* and *indirect* costs, the latter of which includes a slew of "program and system costs" that fall into several categories (Weissman, 2013). Table 7 summarizes the subcategories of indirect costs.

Adding it Up reports global estimates only for indirect costs, not for individual program and system costs. Figure 27 above depicts the distribution of costs across contraceptive supplies, health worker salaries, and program and system costs under current coverage levels, *Adding it Up*'s estimates for improved care for those currently covered, and universal contraceptive coverage. The global cost of universal coverage is estimated at 9.4 billion USD, of which 6.0 billion USD (64 percent) covers program and system costs.

Unfortunately, we found it impossible to determine the ASD share without data on each of the activities listed in Table 7 below. We found it difficult to parse the methods underpinning *Adding it Up*'s estimates of indirect costs. *Adding it Up* relies on regional indirect cost ratios produced by the United Nations Population Fund (UNFPA, 2009), which in turn are based on adapted estimation techniques developed by the World Health Organization for maternal and child health (WHO, 2005). On what basis UNFPA determined the expected spending levels on program and system costs remains opaque even to *Adding it Up*'s authors; for instance, they may or may not derive from real data on the costs of program management and system investments. Even with greater transparency, the reliance on regional averages makes it unlikely that the cost estimates are precise at the country level.

Table 7. Categories of projected indirect costs for FP in Adding It Up

Program Costs	System Costs
Program management	Infrastructure
Supervision	Transport and communication
Health education	Human resources (pre- and in-service training)
Advocacy	Logistics and supply chain
Monitoring and evaluation	Health information systems
	Leadership and governance
	Health financing
	Research, data, and policy analysis

Source: Weissman, 2013

What is the relationship between ASD spending and overall program efficiency?

We found little research into the relationship between ASD spending and FP programs' efficiency. We found a few studies on the effectiveness of specific non-service delivery interventions like social and behavioral change campaigns, but neither the literature nor interviewees pointed toward any data that enable researchers to estimate how much countries *should* be spending on various ASD activities or on what the marginal impact of increasing or decreasing expenditure would be. Instead, there is some sense among experts that service quality lacks in part because of severe underinvestment in ASD activities like supervision and M&E. If donors/programs work to track ASD spending in FP programs, these data likely will validate or correct this perception.

What current, on-going, or planned efforts will improve the knowledge base of ASD costs and their efficiency?

Along with country-level CIPs, HPP and FP2020 have developed a CIP resource kit[31] that includes tools and resources for a rigorous three-phase approach to planning, developing, and executing CIPs. These entities are still developing a tool to monitor the performance of CIPs for results and to better track financing[32] and outcomes. We recommend that such a tool include ASD activities in its taxonomy for expenditure tracking.

What investments in research and development should be prioritized to expand knowledge of ASD costs and improve the efficiency of ASD activities?

We found that there are several promising avenues for FP-related investments. First, FP experts agreed that more and better data on how much money is spent on FP—at all levels of the health system—will improve experts' decision-making and research. In general, they argued that the near-term priority should be to address the paucity of cost and expenditure data at the service delivery level rather than ASD. However, they recognized that researchers could design studies to collect both types of data concurrently. At the very least, we recommend that any existing cost models should be published if possible, including those underpinning all of the CIPs. Retrofitting those models for easier cross-country comparability would also be valuable.

Second, FP lacks a broadly accepted taxonomy for program costs. Unless leading institutions in FP costing adopt a uniform taxonomy, data collection and analysis will remain unstandardized and researchers will have difficulty comparing results across settings and over time. Consequently, organizations such as FP2020 and the Guttmacher Institute should initiate an effort to develop and disseminate a widely applicable taxonomy that clearly defines cost categories, and is aligned with similar efforts in other program areas.

Third, researchers estimating ASD resource needs for FP have focused mainly on scale-up costs rather than recurrent costs. In fact, longer-term projections may underestimate how much money will be required to sustain ASD activities after basic capacity is built. Consequently, we anticipate that costing studies in countries that have more advanced FP programs could better calibrate long-term resource planning and advocacy globally.

Finally, given the substantial unmet service delivery needs in FP in many countries (Singh et al., 2014), experts felt that while additional data collection and research are valuable, such efforts do not merit diverting significant resources away from service provision. Rather, experts prefer to see smaller investments that yield decent data and insights into ASD spending and its impact, rather than those to that result in a perfect accounting of FP spending at the ASD level.

[31] Accessible at http://www.familyplanning2020.org/microsite/cip.

[32] USAID's DELIVER Project already offers a tool to track contraceptive financing: http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/EnhaCSFin.pdf.

Cross-Program Focus Topics in Above Service Delivery Costs

In this section, we discuss two cross-program topics: Supply chain and procurement, and Laboratory operations. The topics are of particular interest due to their substantial cost, the emphasis placed upon them by major donor organizations, the tangibility of their performance metrics, clear logical connection with quality of care, and demonstrated methods for improvement. In our interviews with stakeholders, interviewees regularly raised these topics as the most relevant activities above the point of service delivery to evaluate for potential performance improvement and cross-program learning.

Supply chain and procurement

What data on ASD costs in supply chain and procurement are publicly available?

We found that it is challenging for researchers to develop complete and accurate costs of pharmaceutical procurement and supply chain management activities due to the large scale and complex nature of most of these systems. Pharmaceutical procurement is defined as the country-level process of ordering drugs and/or commodities. Costs related to procurement include both (a) the costs of goods procured (e.g., drugs, supplies, and equipment), which are often consumed at the point of service delivery, and (b) the costs of procuring those goods (e.g., needs assessments, product selection, issuing tenders, quality assurance, and monitoring the procurement process), which are typically incurred at a level above the point of service delivery. Supply chain management (SCM) is the mechanism by which these products are delivered to healthcare facilities. Costs for supply chain include (a) transportation (including amortization for vehicles, fuel) (b) storage (including warehousing/storage and amortization for storage equipment, inventory management, maintenance, energy costs and (c) labor (including per diem and labor costs) (Portney et al., 2015). Both processes move essential drugs and supplies from manufacturers to patients. To disaggregate the costs of procurement and SCM activities incurred at the facility from those above the point of service creates an additional layer of complexity, especially given the heterogeneity of categorization in cost data.

We found, overall, that there is extensive literature documenting actual health supply chain costs (Mvundura et al., 2015; Shretta et al., 2015), as well as modeled costs (Portney et al., 2015) in a variety of settings. However, the level of publicly available SCM data that are disaggregated by above and below site costs is low. A substantial amount of procurement cost data is available, primarily because a large share of procurement is the cost of commodities (generally categorized as facility level costs), which are often known and public. Data on individual procurement costs are available through the Global Fund's price and quality reporting system and voluntary pooled procurement system, the PAHO Revolving Fund, and from UNICEF Supplies and Logistics.

Ultimately, we conclude that an accurate idea of ASD-SCM and procurement costs requires national cost data disaggregated by service delivery level and activity, and a clear understanding of when costs for these two mechanisms are disaggregated from each other or combined. We found four platforms that report data of this nature, each of which has advantages and limitations: (1) System of Health Accounts (SHA); (2) peer-reviewed costing studies; (3) published reports of donor projects; and (4) modeled data. We discuss the four platforms in turn below.

National data sets

We have described National Health Accounts data in other chapters of this report in reference to the sub-accounts for different health program areas. An additional feature of the System of Health Accounts 2011 (OECD et al., 2011) methodology is relevant to SCM costs: the categorization of expenditures by *financing agent*, the entities that manage and

channel funds provided by financing sources and use those funds to pay healthcare providers or purchase healthcare activities.

NHAs using the SHA 2011 methodology provide information on the financing source and amount allocated to supply chain financing agents, for example, the Pharmaceuticals Fund and Supply Agency (PFSA) in Ethiopia. The PFSA was formed specifically to address timely procurement and distribution of pharmaceuticals to health facilities in Ethiopia. NHA data provide information on total financial flows to agents such as the PFSA, and indicate the direction of expenditures to providers and functions. In this sense, NHA data offer a relevant starting point to calculate ASD costs. However, these expenditures are often tracked as aggregated disbursements to government administrations of health providers for general administrative activities. There is not sufficient granularity within the provider categories to enable researchers to disaggregate data by service delivery level, or within the function categories to disaggregate supply chain-specific activities from general health administration activities. The data are often insufficient for researchers to determine specific ASD-supply chain expenditures. Lastly, actual expenditures like the SHA 2011 are crucial to understand resources within a country; however, costed projections are critical to understand the gap between actual resources and the ideal needs/demands of a fully functional system.

Costing studies published in peer reviewed journals

We found recent literature on costs of SCM for HIV, contraception, and immunization (among others), but these studies generally did not disaggregate by ASD and facility level costs. A 2014 systematic review by Siapka et al., examined published and grey literature from 1990 to 2013 on costing and efficiency data for the six basic programs of the UNAIDS Strategic Investment Framework. The review showed that among 82 included studies, degree of reporting of ASD costs varied and was always only partial. Most studies included costs for training and supervision, but they rarely included typical ASD costs such as the maintenance of the drug supply chain, transportation, and technical support (Siapka et al., 2014).

The EPI Costing and Financing studies (EPIC) published in 2015 exemplify high quality publicly available data on ASD costs. We describe the results from the EPIC studies concerning SCM in greater detail below.

Costing studies published in donor reports

We found that another rich source of supply chain costing data is published donor reports, such as the USAID-Deliver project and its costing of the contraceptive logistic management system (CLMS) in Nigeria. In Table 8 below we present deliver-project supply chain costs, by tier, in Nigeria. The study

Total estimates of supply chain costs, by tier, for Nigerian contraceptives logistics management system (USD)

Function	Central	State	Local government area	Service delivery point	Total
Procurement	67,952	940	23,578	102,241	194,710
Storage	47,999	60,972	118,188	863,490	1,090,649
Transportation	--	46,314	494,865	311,464	852,643
Management	2,057	81,317	343,562	350,315	777,251
Total systems costs	118,008	189,543	980,192	1,627,511	2,915,254

Source: Hasselback et al., 2012

included the following indicators (Hasselback et al, 2012):

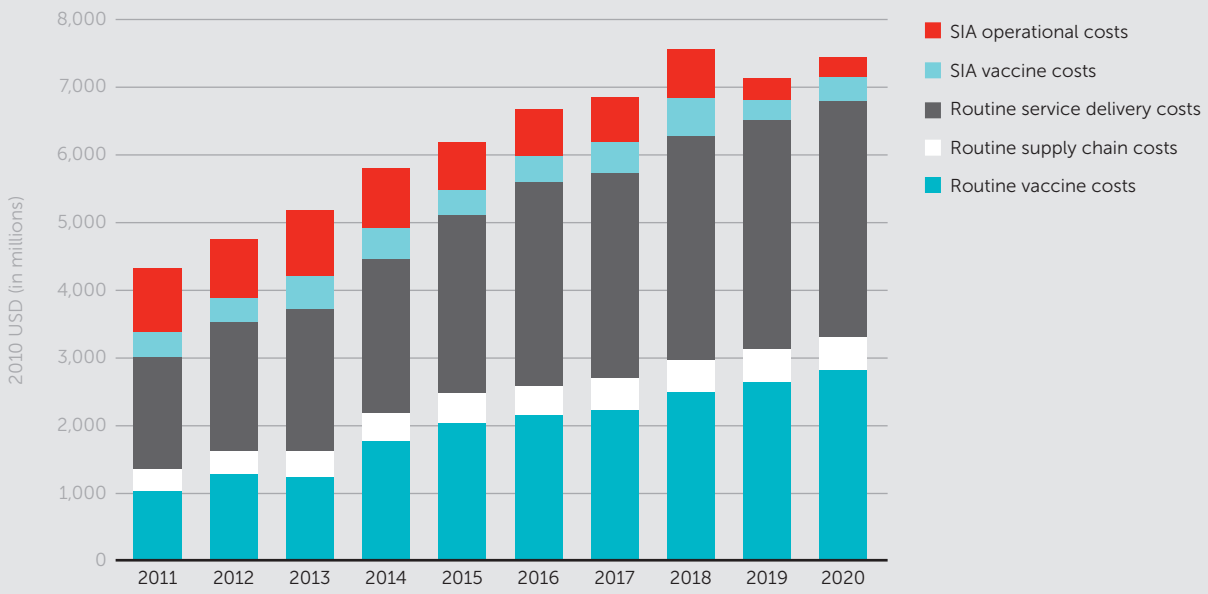
- Supply chain costs as a percentage of the total value of commodities
- Supply chain costs per USD value, volume, or weight of commodities
- Costs by tiers and functions

We found that one limitation of these donor sponsored costing studies is their vertical nature. Outside of national data surveys like the SHA 2011, supply chain activities and their financial analyses often tracked are via parallel systems depending on the commodity (vaccines, HIV-drugs, family planning etc.) and the funder (donor, government, etc). Some amount of segmentation may be necessary based on differences in demand variability, criticality to patients, costs, etc., of different products, which influences forecasting, inventory management, and logistics for the different chains. However, to get an accurate picture of total ASD-costs for procurement and supply chain, researchers must aggregate data from each supply chain with all costs for national procurement and distribution systems, such as electronic logistic management information systems (eLMIS). To date, researchers have not completed an analysis of this nature.

Modeled savings

We found that research on modeled savings on supply chain costs can support analyses of potential future costs when actual data are not available. However, in line with other published literature on the topic, we found that many cost modeling studies do not disaggregate ASD from facility level costs. A 2015 study by Dutta et al. that modeled the financial gap resulting from scaling up ARV therapy in 97 countries from 2015 to 2020 excluded programs' ASD costs, but cited the exclusion as one of the main limitations of the study. Furthermore, the authors defined the price of ARVs as "ex works" prices that did not account for the costs of transportation or storage in country (Dutta et al., 2015). Another large modeling study by Portney et al., 2015 modeled the costs of vaccine programs across 94 low- and middle-income countries. The study examined both procurement (including vaccine costs) and supply chain as discrete cost categories, and generated country specific cost models for current and projected vaccine regimens using HERMES (Highly Extensible Resource for Modeling Supply-chains) for four reference countries (Benin, Niger, Mozambique (Gaza Province), and India (State of Bihar)). The authors then used data from the four

Figure 28. Total immunization program costs by component and by routine vs. SIA (2011-2020)



Source: Portney et al., 2015

reference countries to extrapolate results to the remaining 90 countries in the analysis. Figure 28 above provides the results on costs for components for all 94 countries. The study differentiated between service delivery costs and SCM, but did not explicitly categorize costs by service delivery level. The information provided is an appropriate starting place to estimate ASD-SCM costs, but is not sufficient in-and-of itself.

What are procurement and SCM ASD activities and what share of program spending do they comprise?

Activities

Supply chain activities include all activities needed to ensure products are delivered to healthcare facilities. By their very nature, the majority of SCM activities occur above the point of service. While the level at which healthcare programs allocate costs for these activities is context specific and depends on the organization of the health system, the EPIC study identified drug collection, distribution, and storage as ASD cost drivers at the regional and central level (Le Gargasson et al., 2014). Procurement activities can be more difficult to identify: researchers and officials often bundle procurement commodity costs into the unit cost of commodities at the facility level, and other ASD procurement activities are not well defined.

Proportion of program spending

Regarding supply chain management, the USAID-Deliver analysis in Nigeria cited storage and transportation as supply chain system drivers at 37 percent and 29 percent of total supply chain costs respectively (Hasselback et al., 2012). As a whole, the EPIC initiative showed that facility level costs for service delivery, specifically labor and vaccine costs, and not ASD supply chain or procurement costs, were the cost drivers of routine immunization programs across six countries. On average, 85 percent of costs were accounted for at the facility level, with 15 percent of costs incurred above the point of service delivery (ranging from 6 percent in Benin to 26 percent in Zambia). Moldova, which had the highest immunization coverage, had ASD costs of 18 percent. (Brenzel et al., 2015). We provide country specific data for the following proportions in Table 9 below:

- The percentage of activity costs that are incurred above the point of service (percent of ASD activity cost incurred);
- The proportion of total ASD costs accounted for by each activity (ASD activity cost as percent of all ASD program costs);
- The proportion of all costs (facility and ASD) accounted for by each activity (ASD activity cost as percent of all program costs).

The data in Table 9 illustrate that, on average (using EPIC data from Benin, Ghana, Uganda, and Zambia), 21 percent of vaccine collection, distribution, and storage costs and 17 percent of cold chain maintenance occurred above the facility. Furthermore, the cost of vaccine collection,

Table 9. EPIC study data for four sub-Saharan African countries for cold chain maintenance and vaccine collection, distribution, and storage

	Vaccine Collection, Distribution, and Storage				Cold Chain Maintenance			
	Benin	Ghana	Uganda	Zambia	Benin	Ghana	Uganda	Zambia
% of activity cost incurred ASD	19%	29%	7%	30%	19%	16%	13%	21%
Activity ASD cost as % of all ASD costs	36.6%	10.1%	10.6%	10.4	1.4%	2.5%	8.3%	3.1%
Activity ASD cost as % of all program costs	11%	8%	7%	9%	0%	2%	5%	3%

Source: EPIC studies

distribution, and storage contributed more to both ASD and total costs than cold chain maintenance. Neither activity, however, accounts for a large proportion of total program costs.

What is known about the impact/efficiency of supply chain ASD activities?

Given the scale of procurement and supply chain costs (including commodities, 5 billion USD in anticipated investments by the Global Fund alone over the next three years) even minor efficiency gains could lead to huge savings. We found in the literature that SCM and procurement are perceived overall as potential areas in which programs can improve their efficiency and incur cost savings. A 2014 systematic review by Hinrichs et al. examined 72 studies on efficiency savings in procurement and supply chain management approaches for clinical and non-clinical goods. The review found that collective approaches to purchasing, improving relationships with suppliers, building capabilities and skills for purchasing decisions, and using technology for data and materials management may lead to more efficient procurement and potentially save costs. However, the study's results showed that empirical evidence demonstrating gains from these approaches was scarce and, when available, tended to be weak in design and execution.

We found extensive grey literature on strategies to increase operational efficiency in the supply chain. For example, level jumping, the process of eliminating mid-level/district storage facilities and instituting direct delivery to facilities to increase efficiency, has shown promising results for cost effectiveness and efficiency in Mozambique. The intervention used in Mozambique, called dedicated logistics system (DLS), combined level jumping, task-shifting, data use, optimized transport loops, and supportive supervision. After 4 years, results from an impact evaluation showed a 27 percent increase in the diphtheria, pertussis, tetanus (DPT)-hepatitis B3 vaccine coverage rate and a decrease in the percentage of health centers reporting a stockout—from 80 percent to 1 percent (Hasselback et al., 2012). Similarly, vendor managed inventory, the process by which the vendor takes full responsibility for the agreed inventory, showed savings of 6.6 million USD per year in Thailand due to reduction of un-opened vaccine wastage (Rievpaiboon et al., 2015). Lastly, informed push systems in Zimbabwe showed significant improvements in performance, including reducing stock out rates from 20 percent to 2 percent (Sarley et al., 2010). Informed push adapts the principles used in commercial sector distribution by utilizing teams of trained staff to visit health facilities, review inventory, and restock shelves from trucks.

Metrics for Procurement and SCM

To identify and implement efficiency gains in procurement and SMC, decision-makers must understand how a better supply chain would result in such gains. To do this, programs must establish metrics to monitor performance across the spectrum of activities. A 2010 report by the John Snow Institute (JSI) outlined key performance indicators (KPI) for supply chain groups, including quality, response time, cost/financial, and productivity across the following five categories (Aronovich et al., 2010):

1. Product selection, forecasting, and procurement;
2. Supplier/sourcing;
3. Warehousing/storage;
4. Inventory management/LMIS/Customer response; and,
5. Distribution/Transport.

Similarly, JSI outlined performance indicators for procurement cost, quality, timeliness, systems productivity, and integrity. Costs and productivity indicators included the following:

1. Product Price Variance: Percentage price variance between contract unit price and international unit price for focus products;
2. Effective Contract Utilization: Percentage by value of purchases made under simple purchase orders, annual contracts, and multiyear contracts;
3. Emergency Procurement: Percentage, by value and number, of purchase orders or contracts issued as emergency orders;
4. Procurement Cost: Ratio of annual procurement unit cost-to-value of annual purchases; and,
5. Staff Training: Key training program components are in place and the percentage of staff who receive training annually.

We found that effective performance measurement for SCM is complicated by a lack of focus on driver metrics (Ebel et al., 2013) and impact indictors as opposed to output indicators. We found that program staff do not systematically measure or manage structural drivers including responsiveness (e.g., replenishment lead time), manufacturing frequency, supply reliability (e.g., schedule adherence), and stability (share of rush orders, planning accuracy). Researchers also face a lack of available central data and "apple to apple" benchmarks that would enable meaningful targets based on these performance indicators (Ebel et al., 2013).

What current, on-going, or planned efforts will improve the knowledge base of ASD costs and their efficiency?

We found that the following efforts are underway to improve the knowledge base of ASD costs and develop standardized costing tools for supply chain and procurement:

1. Supply Chain Costing Tool (SCCT), an activity-based approach developed by the USAID/DELIVER PROJECT to standardize measurement and analyze costs. The SCCT captures and organizes supply chain costs into four functions (procurement, storage, transportation, and management) by organization, and by each level or tier (central, regional, facility level, etc.) of the supply chain.
2. HERMES (Highly Extensible Resource for Modeling Supply-chains), a computational framework for modeling and optimizing supply chains.
3. Guide to Public Health Supply Chain Costing: A Basic Methodology. Arlington, Va.: USAID/ DELIVER PROJECT, Task Order 4.

We conclude that more work needs to be done to ensure that these tools include standardized methodologies to disaggregate ASD activities as discrete categories.

Gaps in knowledge and recommendations to improve procurement and supply chain

In general, we found that the procurement and supply chain topic has been a more tractable area of investigation for researchers, in part because of efforts such as the partnership for supply chain management, the USAID/Deliver project, and research efforts funded by BMGF. As such, this is an area in which researchers have identified strong approaches for improvement that can be applied in appropriate country settings, such as level jumping, optimized transportation loops, informed push systems, vendor managed inventory, and eLMIS systems. In procurement, strides have been made at the Global Fund and elsewhere to bring private sector procurement principles into public sector bodies, which has reduced the costs of drugs, by using principles that are transferable to other settings. We conclude that by applying these techniques in the right settings, programs could experience immediate benefits. Moreover, if policy-makers accompany efforts with appropriate research design, the results will bolster the peer-reviewed knowledge base in this space and supplement the extant grey literature.

In addition to the actions described above, experts who we interviewed mentioned the following remaining gaps in knowledge that could be addressed by further research:

1. Wastage rates and the associated cost;
2. The total 'true' cost of transporting products in country—very little transparency exists in these costs, but knowing this could allow more effective negotiations by governments, donors, and implementing partners; and,
3. The value received from spending on technical assistance.

Lab operations

What data on ASD costs and expenditures are publicly available?

We found few repositories of spending estimates for lab operations at the global or country level, despite the fact that laboratory operations are a prominent and critical component of above service delivery activities, particularly for HIV/AIDS, malaria, and tuberculosis. We found limited unit cost data, and those we found did not provide a comprehensive cost repository for lab operations in full.

Laboratory operations are a critical activity within HIV/AIDS programs. Recently, PEPFAR identified strengthening laboratory systems as an investment priority. In PEPFAR's 2014 expenditure analyses, lab-related expenditures accounted for 285 million USD out of the total 3.5 billion USD that it invested in country programs, making lab-related expenditures the third largest overall category of spending, behind facility-based care, treatment, and support (FBCTS), and activities for the prevention of mother-to-child transmission (PMTCT) of HIV.

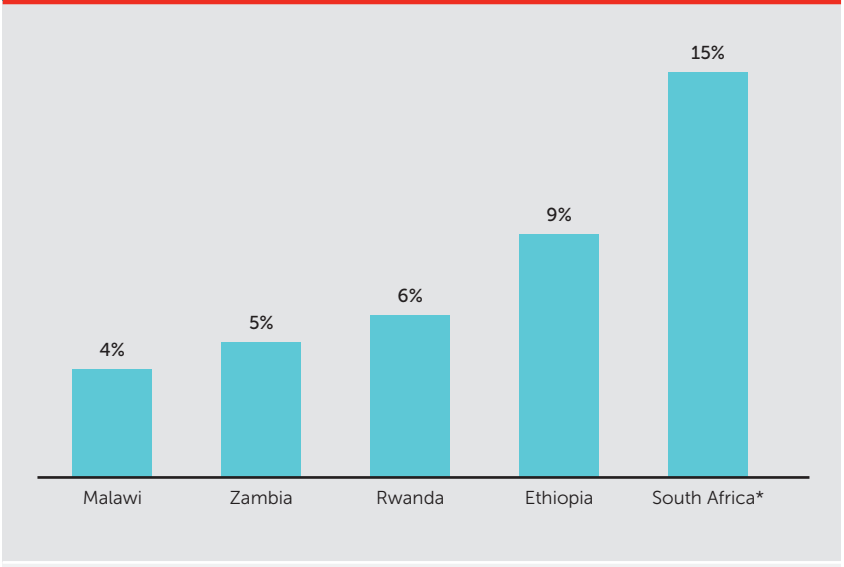
Countries' National AIDS Spending Assessments (NASAs) report domestic spending on laboratory operations within HIV programs, although these data are less consistent and tend to be captured across different activity lines. In the NASAs of Kenya, Malawi, Ethiopia, Zambia, Nigeria, and Swaziland, HIV-specific laboratory monitoring typically comprises 5 to 20 percent of Treatment and Care costs. Countries may include spending to upgrade laboratory infrastructure and equipment under the infrastructure component of program management when they report their expenditures.

The Multi-Country Analysis of Treatment Costs for HIV (MATCH) study, conducted in 2011 by CHAI in partnership with the Center for Global Development and the governments of Ethiopia, Malawi, Rwanda, South Africa, and Zambia reported additional data on laboratory spending. The MATCH study gathered data between 2009 and 2011 and then analyzed expenditures from 161 antiretroviral therapy facilities. The expenditure data were disaggregated across four cost categories: personnel, ARVs, laboratory operations, and other expenses.

The MATCH study found that lab costs generally accounted for less than 10 percent of ART facility costs, as illustrated in Figure 29 below. In South Africa, lab costs appear significantly higher. However, this is likely explained by the fact that the data from South Africa are more comprehensive than those from Ethiopia, Malawi, Rwanda, and Zambia, in which laboratory spending only includes consumable commodities (e.g., spending for test cartridges, reagents, etc.); for South Africa, the data additionally include personnel and equipment costs. In all countries, the category of laboratory costs includes costs from primary, secondary and tertiary lab facilities, but lab sample transportation costs and supply chain costs were not included in the study (Tagar et al., 2014).

CHAI has conducted analytical work to estimate the size of large laboratory commodity costs, depending on the size of a country's ARV program, based on price data reported in CHAI's ARV Market Report. Based on the assumption that patients receive all tests recommended for clinical care and diagnosis, CHAI expects lab commodities to account for 13 percent of ARV commodity costs. This estimate does

Figure 29. Laboratory spending as a share of total facility-level expenditure across the five MATCH study countries

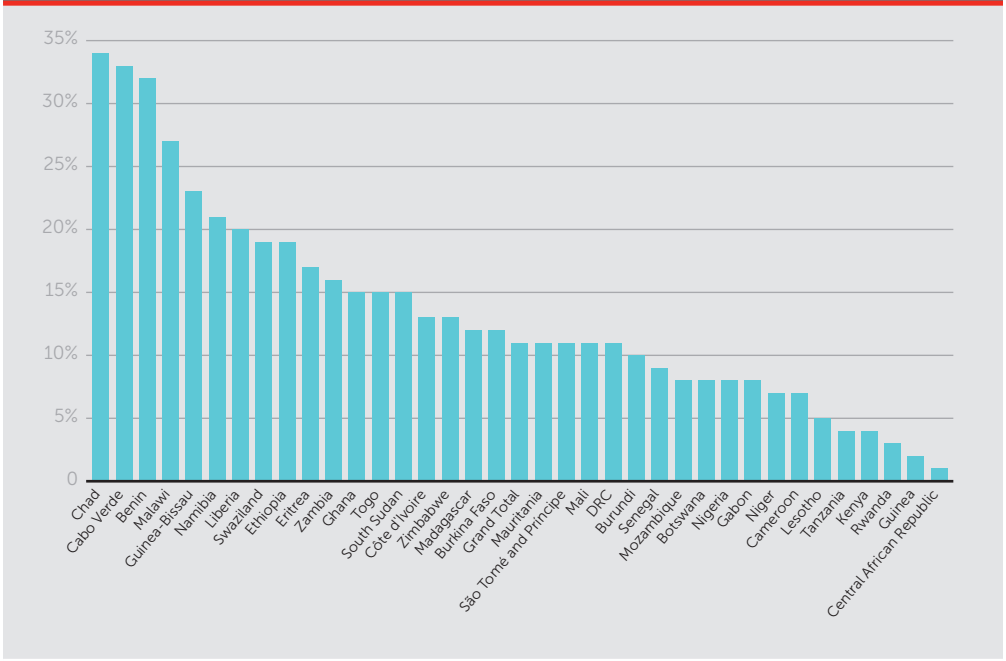


Source: MATCH study. Lab costs only include consumables, except in the case of South Africa, where lab commodities, personnel, and equipment were combined.

not include the costs of maintaining buffer stock or of service delivery (e.g., equipment, maintenance, personnel, training, infrastructure, etc.), which could substantially contribute to the full cost of a laboratory system.

The Global Fund currently tracks budget data across its program grant agreements within its malaria programs. The Global Fund disaggregates these budget data by expenditure category; however, there is no unique category for laboratory operations or for diagnosis-related costs. It is possible that the Global Fund captures these costs under "Infrastructure and other equipment," although the definition of this cost category is not clearly established. Similarly, data from the President's Malaria Initiative (PMI) are not granular enough for researchers to identity global or country laboratory spending for malaria.

Figure 30. WHO TB expenditure for laboratory services in thirty-seven sub-Saharan countries (2010-2015), as a percentage of total country TB expenditure



Source: WHO

With respect to TB programming, the WHO's annual country surveys on TB expenditure record data on budget requirements and expected funding for "Laboratory infrastructure, equipment and supplies." These data are available upon request, but the WHO does not publish them.

As illustrated in Figure 30 above, the data available from the WHO expenditure tracking database for TB laboratory spending indicate a wide variance in spending levels amongst countries, between 2010 and 2014. Averaged across all data available from 2010 to 2014, countries reported spending approximately 12 percent of total TB expenditures on laboratory services. However, lab expenditure data are not available for numerous countries (36 of the 47 countries for which TB expenditure data were obtained did not report lab expenditures in at least one of the years 2010-2014, inclusive, and 10 countries did not report any lab expenditure data across all five years), which limit our ability to perform a comprehensive analysis of this database.

Current efforts by researchers to study TB lab costing data have focused on the introduction of Xpert MTB/RIF testing in labs. This new test provides a cartridge-based automated nucleic acid implication test for TB, which provides a far more sensitive and rapid results than the conventional sputum smear microcopy test, and additionally enables labs to test for resistance to rifampicin, one of the common first-line antibiotics used to treat TB. The Xpert assay is substantially more expensive than smear microscopy testing, but modeling studies and experts argue that the cost is offset by the test's higher sensitivity in detecting cases of TB and enabling healthcare providers to use rifampicin and other anti-tubercular drugs more appropriately and effectively.

What is known about the impact and efficiency of lab operations?

Improving the quality and efficiency of laboratory operations to enable healthcare workers to accurately detect cases and perform infectious disease surveillance is a key priority of donor organizations and a critical part of providing diagnosis and treatment in line with international guidelines (Petti et al., 2005).

As of 2013, PEPFAR has invested roughly 3 billion USD to create and strengthen laboratory networks (including commodity and training spending), with the goal of creating a lab infrastructure to support treatment of HIV and other major health challenges.

Healthcare providers who do not have access to adequate laboratory services often misdiagnose diseases by relying solely of clinical diagnosis. Clinical diagnosis, based on signs and symptoms of illness rather than laboratory tests, requires no additional cost or specialized equipment, but can be error-prone. Healthcare providers risk both underdiagnosis—where the presence of a critical infection is not diagnosed—and over-diagnosis—where, for instance, fever-like symptoms are classified as an endemic illness (e.g., malaria), when, in fact the cause is from a different source. In Tanzania, a study of 4,670 patients admitted to hospitals with clinical diagnoses of severe malaria found that less than half of the patients had blood smear results that confirmed the presence of *Plasmodium falciparum* (Reyburn et al., 2004). These patients, further, tended to have better outcomes as a results of treatment than those patients whose test results did not indicate a malarial infection, suggesting that many patients were misdiagnosed and did not receive appropriate treatment.

More sophisticated laboratory operations may enable health systems to conduct drug resistance tests, which can enable healthcare providers to prescribe targeted first and second line drugs, potentially improving both the impact and efficiency of treatment. In the case of HIV, genotypic and phenotypic assays can test viral drug resistance to ensure the appropriate use of second line ARVs, thus reducing ineffective treatment and associated waste. Accurately targeting therapies will be of increasing relevance as HIV care continues to shift from a paradigm of acute treatment to chronic disease management. New Xpert assays also are able to detect whether sample strains of the tuberculosis bacillus will respond to rifampicin, which ensures that patients are not initiated on therapies to which the bacillus is resistant.

Countries and donors must consider efficiency and cost-effectiveness when they are deciding whether to adopt new diagnostic or treatment guidelines. As new diagnostic tests become available, the country, donor, and program must weigh the effectiveness of the new approach against the cost of upgrading laboratory equipment or retraining laboratory staff. Next-generation diagnostic tests, such as the Xpert assay, may be more expensive than existing diagnostics, requiring a program to make large initial investment in equipment costs; this, however, may actually result in efficiency gains through more automated, sensitive, and reliable test results, which will increase the likelihood that patients will a) receive accurate diagnoses, b) receive the most appropriate drug regimens, and c) not be lost to follow-up and be retained in care.

Importance of standardization

Many of the current global efforts to strengthen and improve laboratories have focused recently on the *standardization* of laboratory operations (USAID, 2010). As parallel public health programs to manage HIV/AIDS, malaria, and TB have been developed over the past decades, demand for testing services has increased. In response to the demand for testing for disease specific programs, laboratory services began to decentralize such that testing could occur at peripheral laboratories, resulting in the growth of laboratory services at the local and district levels.

In 2008, the WHO convened a consensus meeting on Clinical Laboratory Testing Harmonization and Standardization in Maputo, Mozambique. The main product of the meeting—the Maputo Declaration on Strengthening of Laboratory Systems—urged countries to create integrated, tiered laboratory networks. In addition, the Declaration emphasized that countries must standardize laboratory equipment and protocols to strengthen laboratory systems.

From an efficiency perspective, standardizing operations across lab facilities enables peripheral laboratories to use the same machines and reagents, resulting in economies of scale. These benefits may extend to the supply chain, to improve and make more efficient systems to procure and distribute (or redistribute) equipment to prevent expiration and stockouts. Creating and imposing standards with respect to testing procures also enables programs and researchers to collect more rigorous and comparable incidence and prevalence data, which critically inform public health planning for communicable disease management and prevention.

What are the key challenges that impede the efficiency and strengthening of laboratory operations?

The strength and efficiency of laboratory systems depend on a number of distinct elements, which may vary significantly across different country settings. According to Petti et al., the following critical variables within and across laboratory systems affect their strength and efficiency:

- Quality of laboratory facilities;
- Access to utilities (e.g., piped water and constant power supply);
- Availability of laboratory equipment and supplies (e.g., incubator, refrigerator, freezer, microscope, and staining reagents);
- Implementation of standard written operating procedures (including quality-control procedures); and,
- Knowledge or skill of supervisors and technical personnel.

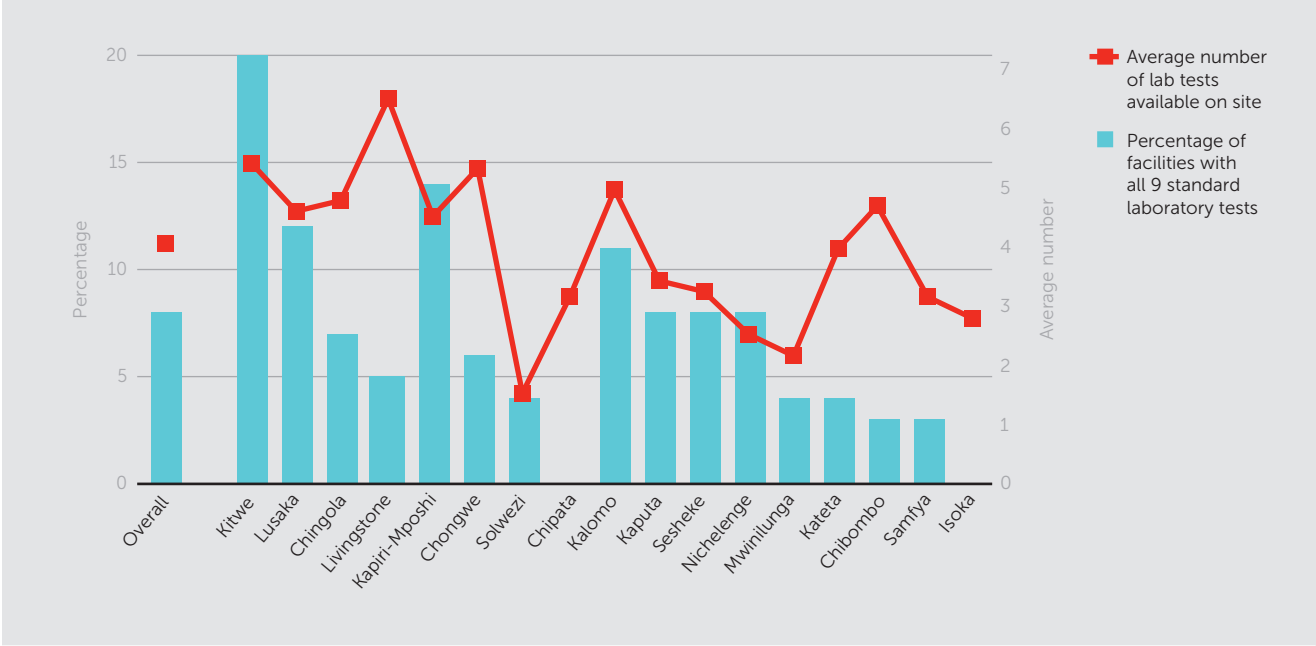
As Petti et al. explain, strong laboratory systems require quality assurance mechanisms by which health systems can monitor performance and ensure adherence to clinical and technical guidelines. Recent PEPFAR-supported work from Nigeria indicates that "close monitoring and continuous adherence to policies are vital" to quality assurance and capacity building (Abimiku et al., 2010).

Underfunding of laboratory facilities

Our review of the literature found that in certain settings, laboratory facilities are heavily underfunded and under-resourced within the context of the broader health program.

In Zambia, for example, the WHO conducted a Service Availability and Readiness Assessment (SARA) in 2010, a component of which assessed how many healthcare facilities had access to 9 core laboratory tests: hemoglobin, blood glucose, HIV rapid diagnostic test (RDT), syphilis RDT, malaria RDT or a smear test, TB microscopy, general microscopy, urine pregnancy test, and urine dipsticks. The SARA analysis found that only 8 percent of healthcare facilities across 17 districts had all 9 core laboratory tests, as displayed in Figure 31. On average, facilities were able to conduct less than half of the 9 laboratory tests on site; in the peri-urban Solwezi district, facilities had access to only 1 or 2 core tests, on average.

Figure 31. SARA 2010 results regarding the availability of standard laboratory tests, per district, among 17 districts in Zambia



Source: SARA results for Zambia (2010). Nine core laboratory tests are hemoglobin, blood glucose, HIV RDT, syphilis RDT, malaria RDT or smear, TB microscopy, general microscopy, urine pregnancy test, and urine dipstick.

Importance of strong referral and distribution systems

Proper diagnosis of disease does not depend solely on well-equipped and well-functioning laboratory facilities; issues of supply chain and transportation logistics are also critical in ensuring that specimens are delivered to testing centers, and that the results of tests are returned to clinicians and patients. As global health programs pursue higher rates of coverage, improving access among rural and other hard-to-reach populations, laboratory systems increasingly depend on reliable referral and distribution systems.

Referral and distribution systems will also be increasingly important as high cost/high impact assays like Xpert are rolled out within countries. Because the cost of providing each facility with new diagnostic machines is prohibitive, countries may adopt a more efficient system that relies on sample and test result delivery between the facility and district or regional level lab facilities. As one of our informants noted, there is no need for expensive laboratory equipment at every facility if the health system has an efficient transportation component to support the network of national laboratories. Conversely, our informants noted that in situations in which distribution systems are poor, specimens and test results may be lost en route. As a result, tests need to be re-run because samples and results are lost in transit. Informants suggests that these inefficiencies that could be greatly reduced if countries improve the monitoring and management of lab information.

Researchers have noted that these and other considerations raise concerns that patients regularly fail to receive their test results under heavily centralized lab systems. Studies from Kenya, Tanzania, and Mozambique indicate that the results of 40 to 45 percent of early infant diagnostic tests for HIV are never received by the patient/guardians (Dube et al., 2012; Hassan et al., 2011; Nuwagaba-Biribonwcha et al., 2010), leading to wasted consumables, unnecessary repeat testing, and infants lost to follow-up.

Some of our informants noted that point-of-care (POC) laboratory testing increasingly is becoming an attractive alternative in certain facilities, in which volume is sufficiently high to justify the additional capital expense of investing in POC testing equipment and training local lab staff. POC testing, our informants indicated, is more expensive than centralized laboratory tests, due to the higher costs for equipment and consumables; however, our informants argued, when the costs of the transportation of samples and the rate of waste/loss incurred by centralized systems are taken into account, the cost per result returned is similar for POC and centralized laboratory testing. Meanwhile, recent research in lab system optimization indicates that POC investments may generate stronger operational improvements for diagnostic efficiency than centralizing investments in transportation and laboratory capacity (Deo & Sohoni 2015).

Need for further progress in laboratory integration and accreditation

Our informants observed that the integration of laboratory services remains an unfinished objective of the 2008 Maputo Declaration. Although countries have made significant strides in ensuring access to laboratory facilities across programmatic areas, inefficiencies remain that could be remedied by leveraging new technologies and equipment to generate areas of cross-disease program synergy. For example, cartridge-based Xpert test machines have the capability to conduct molecular diagnosis of both HIV and TB infections. While these machines may be financed as part of a national HIV or TB program, both types of programs could benefit from underutilized capacity. Our informants noted that political barriers might impede programs' abilities to capture and realize these efficiencies due to the siloed nature of certain vertical disease programs and the program managers' potential territoriality. If countries (and, where relevant, donors) work to establish ways to fairly distribute the high cost of Xpert equipment, maintenance, and training across disease programs, programs will utilize these diagnostic tools more effectively and efficiently.

Finally, our informants noted that the accreditation of laboratory facilities in developing countries is still nascent. In 2008, the WHO Regional Office for Africa and other stakeholders developed a training program in laboratory management and quality assurance systems: the Strengthening Laboratory Management Towards Accreditation (SLMTA). In 2011, the Regional Office developed a tiered accreditation scheme, the Stepwise Laboratory Improvement Process Towards Accreditation (SLIPTA). Both SLMTA and SLIPTA have

been hailed as key accomplishments in enhancing laboratory systems in sub-Saharan Africa (Alemnji et al., 2014). Early reports from Tanzania's experience with SLMTA indicate that the programs has enabled progress and diminished potential barriers to improvement (Andiric & Massambu, 2015); however, researchers have not assessed the extent to which these efforts have had an impact on patient care.

What current, on-going, or planned efforts will improve the knowledge base of lab operation costs and their efficiency?

Our informants identified two specific analyses that programs are conducting to expand the knowledge base of lab operation costs and planning. TB-MAC currently is conducting an analysis of the scale up costs associated with the roll out of Xpert test assays to replace/supplement conventional swab testing. Within HIV, PEPFAR currently is examining international standards for laboratory support, specifically in the context of managing HIV as a chronic disease. The results of these efforts, however, are not yet available.

Gaps in knowledge and recommendations to improve lab operations

We found that disease programs do not consistently or comprehensively capture laboratory costs and expenditures. We perceive that there is a need for additional costing studies to provide data on the full systemic costs of laboratory testing, which should capture the impact of waste and the costs of equipment maintenance, staff training, and lab supervision.

Many of our informants noted that laboratory systems are routinely underfunded, in part because budgets fail to capture essential activities within the system. Budgets for laboratory systems—and donors' financial support for laboratory systems—often focus on the capital expenditures associated with laboratory equipment and reagents; however, budgets may not adequately cover costs associated with maintaining equipment, or training and supervising laboratory technicians. Without these activities, laboratory equipment falls into disrepair or disuse, and reduces the overall efficiency of the system. In some settings, ensuring adequate funding and support for laboratories will require some financial and political reorganization, e.g., separating laboratory budgets from hospital and other facility budgets, and placing the laboratory system as a whole under the supervision of a high-ranking health official. This would provide centralized accountability and insulate fiscal space for laboratory operations from hospital budgets.

Based on our review, we recommend that countries' ministries of health implement the integration of laboratories across vertical disease programs and pursue synergies in the molecular assay testing of HIV and TB, such that laboratory facilities operating below capacity relieve some of the testing burden of high volume labs. This integration will require collaboration by disease programs within ministries of health to ensure adequate financing, implementation, and oversight.

We also recommend that as laboratory systems become more developed, laboratory managers consider implementing cost effectiveness analyses for point-of-care and external laboratory testing at various high volume facilities, in order to appropriately prioritize sites for point-of-care testing. Within certain facilities, the high volume of testing may justify the higher capital expenditure for new POC equipment; however, these determinations must be done strategically, in order to selectively distribute POC diagnostics to areas in which they would be most effective.

Finally, as accreditation and training programs such as SLMTA and SLIPTA mature, country case studies and patient impact studies will provide additional information on the impact of lab standardization and professionalization on patient care. Country audits of accreditation and training programs will provide useful feedback on the uptake and retention of laboratory quality improvements, indicating where challenges may arise in promoting high laboratory standards and what strategies may be best utilized to overcome them.

Above Service Delivery Costs Related to Aid Architecture

While Aid Architecture as a whole is a much larger topic than we can address in this report, in this chapter we lay out some of the ways in which aid architecture affects activities and costs above the point of service delivery.

Overview of aid architecture

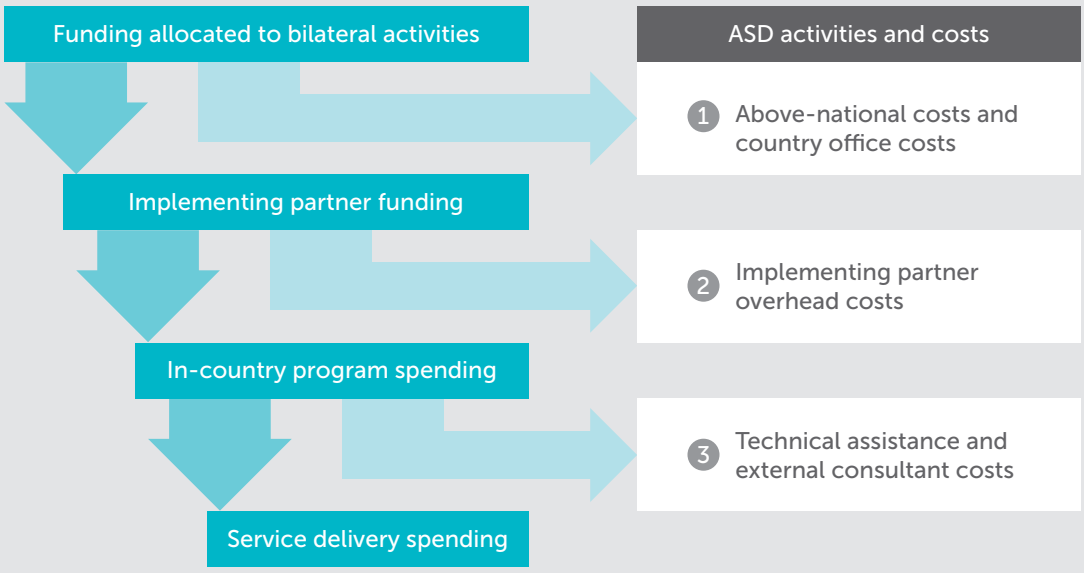
Aid architecture, in its broadest definition, refers to the mechanisms of delivery, implementation, and management of the international aid system (UN World Economic and Social Survey 2010). These mechanisms facilitate the economic management and disbursement of billions of dollars of official development assistance (ODA), which provides vital support for a variety of health programs around the world and has had an impressive global impact.

However, these mechanisms, and the structures through which bilateral funding is channeled, carry significant costs. At each level of the international aid system, activities designed to ensure successful program implementation absorb a portion of the funding, reducing the overall amount of funds that reach the point of service delivery. By definition, all of these elements are ASD.

This chapter considers aid architecture costs from the vantage of the following three levels, depicted in Figure 32 below:

- Above-national costs, or those costs incurred by the Development Partners' (DPs) headquarters outside of the country
- Costs incurred by in-country implementing partners (IP) in delivering the services, especially when IPs are not local organizations within the country of service delivery
- In-country aid delivered through technical support and expatriate labor

Figure 32. Conceptual model for understanding ASD activities associated with Aid Architecture



Above-national costs and country office costs of international aid organizations

Above-national costs

In interviews, a number of experts noted that a portion of international funding is allocated to above-national expenses incurred at the headquarters of coordinating bodies and other agencies. These central-level costs are separate from the personnel costs of donor organization staff who monitor grants and programs in-country, and reflect the central oversight and international management of programming within the headquarters of the donor agency.

We were not able to easily access central costs for all relevant aid organizations, but we found that some public data are available from the U.S. government's PEPFAR and PMI programs. Central costs of these programs appear to constitute between three and nine percent of total program funding per year.

For PEPFAR, funding to cover central and coordination costs are provided by Technical Oversight and Management (TOM) funds. This funding is disbursed across various agencies and expenses, as shown in Table 10 below.

Across these different agencies, funding amounted to 142 million to 174 million USD in FY2012 to FY2014, as shown in Table 11 below. As a general practice, these Technical Oversight and Management costs have accounted for approximately three percent of total funding from USAID Global Health Programs (GHP)–State Department.

In addition to these technical oversight and management funds, the following two additional categories of above-national expenditures are included in PEPFAR's "headquarters" budget:

- Technical Support, Strategic Information, and Evaluation,
- Additional funding for country programs at the HQ level.

Including these activities, in FY 2013, PEPFAR's combined "headquarters" funding comprised 8.4 percent of the total bilateral GHP-State PEPFAR account, excluding contributions to the Global Fund and UNAIDS. This funding level indicates that a substantial share of PEPFAR's funding is retained for above-national activities. (Office of the United States Global AIDS Coordinator, 2013.)

Table 10. USG agencies receiving PEPFAR Technical Oversight and Management (TOM) funds

USG agency	Expenses supported by PEPFAR TOM funding	Associated sub-agencies and centers
Department of State	Direct expenses, including salary, benefits, and travel	Office of the U.S. Global AIDS Coordinator and Health Diplomacy (S/GAC)
		Bureau of Intelligence and Research (INR)
USAID	Direct and indirect expenses including salary, benefits, travel, supplies, professional services, and equipment	
Department of Health and Human Services	Direct and indirect expenses including salary, benefits, and travel, overhead, operation and maintenance of facilities, and advisory and assistance services)	Centers for Disease Control and Prevent
		Health Resources and Services Administration
		National Institutes of Health
		Food and Drug Administration
		Substance Abuse and Mental Health Services Administration
Peace Corps	Direct and indirect expenses including salary, benefits, travel, supplies, professional services, and equipment	
Department of Defense	Direct and indirect expenses including personnel, equipment, supplies, services, professional development, travel and transportation	

Source: Office of the United State Global AIDS Coordinator, 2015

For the Presidential Malaria Initiative, a similar pattern emerges, with between five and nine percent of total funding shown to have been allocated to PMI's activities at the headquarters level between FY 2006 and FY 2014, as shown in Figure 33 and Table 12 below (PMI, 2014).

Country office costs

The managing agencies for large development partners usually have offices in-country that incur operational costs, and that allow for the management, coordination and oversight of all their grant activities. For example, the PEPFAR funding flows through organizations such as USAID and CDC, which typically operate offices in every major recipient country.

The data on these expenses for most donors is not publicly available. For example, the PEFPAR EA country data, when collected, is disaggregated between national and regional levels, but this disaggregation is not available on the website.

Table 11. Percent of PEPFAR funding by fiscal year approved for Technical Oversight and Management

Funding, in $'000	FY 2012	FY 2013	FY 2014	FY 2015 (estimate)	FY 2016 (requested)
GHP-State funding (estimates)	$5,542,860	$5,439,829	$5,670,000	$5,670,000	$5,426,000
Approved Technical Oversight and Management funds for S/GAC Oversight/Management	$174,096	$154,961	$142,500	$161,628	$162,000
% of GHP-State funding	3.14%	2.85%	2.51%	2.85%	2.99%

Source: Office of the United State Global AIDS Coordinator, 2015

Figure 33. PMI funding by fiscal year (USD, FY 2006-2014)

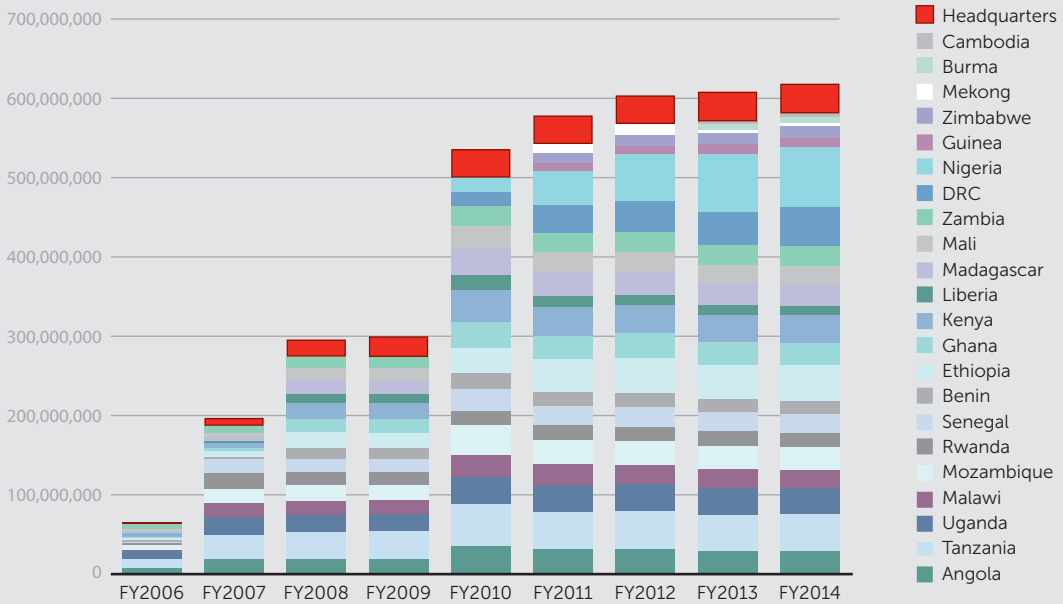


Table 12. Share of PMI funding by fiscal year allocated to Headquarters

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	Average
% Headquarters	5%	6%	7%	9%	7%	6%	6%	6%	6%	7%

Source: PMI

Note: Allocations to Headquarters spending are highlighted in red

In South Africa, the expenditure tracking exercise undertaken for the HIV Investment Case found that PEFPAR spent 20.1 percent of all spending at national level and 3 percent at the above-national level. Some of these national level overhead costs, especially personnel, are 'attributed' to the management of specific programs, as they are considered essential costs to ensure optimal program performance.

Overhead costs of implementing partners

We found limited publicly available data on how implementing partner organizations use the funds that they receive from donor agencies. In many cases, these are international organizations that may have substantial expenses at the above-national level, both in terms of organizational overhead and in terms of technical support activities being coordinated from the organization's headquarters. In interviews, some experts expressed concern that large sums of funding are being retained in donor countries, particularly the United States, and that the use of these funds is not at all transparent. That is not to say that these funds are not justified. Some amount of coordination/administration is necessary, and program support provided internationally by staff in the organization headquarters may be of direct and high value to teams working on the ground. The lack of transparency, however, makes it impossible for researchers and donors to verify that these funds are being allocated effectively.

A recent Center for Global Development paper analyzed the financial flows of PEPFAR's funding for implementing organizations, and found that the majority of PEPFAR's most highly funded implementing organizations were U.S.-based agencies, NGOs, and universities; by comparison, a small percentage of contract dollars were awarded to prime recipients in the developing world (Fan et al., 2013). Researchers noted concern that a significant portion of PEPFAR funding likely is retained in the U.S. (e.g., in overhead payments of U.S.-based organizations), and that this may not be the most effective use of the scarce resources available. Global health commentators and NGOs have taken up this issue over the years. In 2008 Laurie Garrett of the Council of Foreign Relations noted: "Contractors, universities, NGOs and FBOs take significant overhead off the top of federal grants, fund activities executed by Americans on the ground, and buy American-made goods even when less expensive products are regionally available" (Garrett, 2008). This concern still resonates to some extent with many of our informants.

More recently, Vijaya Ramachandran and colleagues at the Center for Global Development voiced a related concern in a study of US spending in Haiti in the aftermath of the 2010 earthquake; a lack of transparency regarding subcontractor disbursements activities. Though disbursements of USAID funding to Haiti are reported for primary contractors, subcontractor disbursement data are often not made public, making it difficult for researchers to determine how funds are being spent and what the funding has achieved (Ramachandran and Wlaz, 2013).

PEPFAR's ongoing efforts on local capacity-building and drive towards country ownership should lead to some increase in the percentage of resources reaching the ground and should be commended; several informants suggested that greater transparency in how PEPFAR funds are used by U.S.-based implementing partners would complement PEPFAR's larger data dissemination efforts, and enable researchers to sharpen analyses of value for money for PEPFAR expenditures.

In-country expenses: Expatriate labor and external consultants

We found that within in-country spending, two additional phenomena may contribute to high spending on activities above the point of service delivery: the employment of expatriate labor rather than local labor, and the use of external (often international) consultants to provide technical assistance.

As alluded to in the previous section, U.S. agency-funded programs often employ Americans in-country to coordinate and execute program activities. We were unable to determine the extent to which this occurs—and the proportion of total funding that goes towards the salaries of expatriate—based on public data sources. One recent study (Marseille et al., 2012), found that expatriate labor accounted for nearly a quarter of the personnel costs in Zambia's HIV response; but these types of data are not available across multiple countries.

In general, salaries of expatriates are significantly higher than local wages, and the substitution of local

for expatriate labor has the potential to realize non-trivial gains in efficiency. In interviews, experts noted that the predominant use of expatriate labor may have been justified in the early days of programs, when programs were being set up and implemented as quickly as possible to get vital services in place. Interviewees said that plans to build local capacity and transfer ownership of programs to local organizations have not always been executed.

In addition to the use of expatriate program staff, interviewees state that costs incurred by external consultants providing technical assistance are substantial. Programs engage external consultants to provide technical assistance on various activities, including grant proposals, concept notes, and investment case preparation, to improve the efficiency of procurement and supply chain management, and advise on the development of quality assurance mechanisms. Informants indicated in interviews that salary and travel expenses of consultants, and other international organizations providing technical assistance, substantially contributed to ASD spending, particular in situations in which local technical expertise is scarce or in high demand.

We found that limited data are available on the costs incurred through the use of international technical assistance. The best data available are the PEPFAR expenditure analyses, which capture as a line item the expenses accounted for by "external consultants" within the country operational plans. These expenses may include those of both international consultants and local consultants (and locally incorporated offshoots of international consultants).

Examining a subset of countries, PEPFAR data indicate that external consultants constitute a median of 2 percent of PEPFAR program expenditures, as show in Table 13 below. Although the external consultants line in Table 13 is not defined to be above the point of service delivery, the vast majority of external consultant spending is allocated to the large ASD cost categories of Health System Strengthening, Strategic Information, and Program Management.

While the costs of external consultants are not trivial, several experts raised questions about the impact and efficiency of spending on external consultants, particularly international consultants. The value of international TA has not been well established in studies (either in its own right, or in contrast to locally available services), and interviewees expressed some concern that countries continue to rely on international TA on a recurring basis rather than for occasional specialist assistance. On a slightly different angle, some informants also considered that international TA could be counter-productive when used intermittently, as consultants flying in for short-term work may not have the proper contextual knowledge to provide effective assistance.

Several experts believed that moving from international consultants to local consultants could lead to large cost savings due to lower fees, but this has not always been easy to achieve in practice. For example, PEPFAR stakeholders report that fee differences between international and local TA have been less significant than expected, and speculate that this may reflect distortions in the local labor market after years of paying high prices to international organizations working in these markets.

Table 13. Share of spending identified by PEPFAR expenditure analysis for external consultants

	Percent of spending for external consultants
Ethiopia	1.67%
Kenya	1.72%
Malawi	3.40%
Nigeria	2.29%
Swaziland[33]	9.35%
Zambia	0.92%

Source: PEPFAR

In order to make optimal use of program funding, we recommend increasing research into the impact and value-for-money of consultants (and particularly, international consultants) to provide helpful information for countries and donor programs. In addition, we recommend that researchers and donors include consultant fees and in-country expatriate labor as standard line items in comprehensive costing studies.

[33] The percent share of PEPFAR spending for external consultants in Swaziland is particularly high due, in part, to the fact that the government of Swaziland currently funds 100 percent of the country's ARV drugs. This spending results in a 0 percent allocation for ARVs under the country's PEPFAR budget, which increases the percent share of other costs.

Priorities and Opportunities for Future Research and Programming: Recommendations

We have summarized a series of recommendations, based on the analysis presented above and the recommendations of the experts and stakeholders that we consulted. Up until now, it is understandable that the greatest level of attention and scrutiny has been paid to service delivery activities and costs rather than those above the point of service delivery: service delivery activities have the most directly observable impact on patients; facility-level costs can be more easily defined, measured, and compared than those outside the facility setting; and there has been significant room to lower the costs of service delivery by focusing on making facility-level activities more efficient and through global efforts to bring down the price of critical commodities. However, as donor aid budgets tighten and countries take on increasing levels of ownership for their HIV response within their national health systems—and as the scope for further efficiency gains at service delivery level diminishes—countries, donors, and the broader global health community must begin to take on the challenge of improving health program performance above the point of service delivery. Our recommendations cut across two categories: those that relate to future data gathering, research, and harmonization; and those that relate to future programming.

Recommendations regarding future research, data gathering, and harmonization

Improved cost and expenditure data are a prerequisite to optimize ASD activities

As discussed throughout the report, the general lack of publicly available, high quality, and readily comparable data on costs (or expenditures) for activities above the point of service delivery hampers researchers' efforts to analyze ASD activities, evaluate their efficiency, or benchmark results across country, provincial, or program settings. Generating the most useful data will require significant up-front coordination between stakeholders, and an ongoing commitment of resources from governments and donors, but improved cost and expenditure data could lay the groundwork for significant gains in efficiency and value for money in major health programs. We believe that the benefits of better cost and expenditure data justify the additional investments needed to generate them.

We have identified the following priority areas for improvement:

1.1 **Comprehensive costing of programmatic activities**, to better understand true costs, enable benchmarking of 'reasonable' activity costs, and enable countries to consider strategies for cost reduction above facility level, such as task-shifting from more expensive labor to less expensive labor. Comprehensive costing—collecting cost data both *at* and *above* the point of service delivery, rather than focusing on one or the other— is the best way of ensuring that no relevant costs are overlooked.

1.2 Creation, validation, and adoption of a **standardized taxonomy for ASD cost components** to bolster cross-program comparison of ASD spending, a critical tool for health system policymakers.[34]

1.3 **Standardized costing approaches for evaluating investments in shared resources** (e.g., labs, blood safety, health information systems), and attributing the costs of these shared resources to specific programs where relevant.

1.4 Collection of **high quality sub-national cost and expenditure data**.

1.5 Where costing is more robust and data collection has been standardized across a number of countries, expand the exercise to include **additional sample countries** and **longitudinal data collection** to facilitate more useful benchmarking and trend analysis to inform country decision-makers (e.g., in immunization: the EPIC studies provide a solid starting point with a standard methodology and baseline data for six countries).

[34] Figure 1 of this report provides a starting point for this exercise.

1.6 For supply chain efficiency and cost, greater data are needed to better understand **wastage rates** (and the impact of waste on cost) and **the total 'true' cost of transporting products in country**. Very little transparency exists with respect to these costs, but knowing this information could enable governments, donors, and implementing partners to engage in more effective negotiations.

Impact and performance measurement and analysis would inform ASD activity optimization and strengthen program planning

As discussed at various points in the report, we found that little has been done to connect ASD activities to their impact on service delivery, making it challenging for researchers to discern whether resources are being allocated optimally across ASD activities, and to what degree countries should continue to finance these activities if they transition away from donor support. We have identified the following key priorities:

2.1 Create good, **standardized intermediate outcome metrics for ASD activities** (in a similar vein to those used in procurement/supply chain) to help better understand performance and enable improvements.

2.2 Additional research and analysis is needed to understand the cost and impact of some specific activities. Experts and stakeholders expressed particular interest in understanding the returns on different levels of **demand generation activities** (particularly, mass media), **monitoring and evaluation**, and the use of **expatriate labor and external consultants**.

2.3 In programs striving to maximize and extend coverage in difficult-to-reach areas and populations, greater research is needed to understand the **impact of last-mile efforts on above service delivery costs.**

2.4 Initial attempts should be made to **link spending data to high quality outcome measures**, wherever available. For example, TB treatment outcome indicators, which are well-established, collected in a wide range of countries, and tracked over time by WHO, may provide a promising place to start this type of analysis.

Donors and partner organizations can take immediate steps to enhance transparency regarding ASD expenditures and activities

In addition to the overarching recommendations above, specific donor and development partner organizations can play a major role in improving the knowledge base on ASD costs and expenditures by sharing their existing data or creating new knowledge. In so doing, they can provide the foundation for the analyses of ASD activities that are critical to improve decision-making and increase value-for-money in major global health programs. Organization-specific recommendations are as follows:

3.1 PEPFAR

- 3.1.1 PEPFAR's publicly disseminated expenditure data represent the current high water mark in donor spending transparency and accountability. **PEPFAR should continue with their efforts to provide timely and comprehensive expenditure data**.
- 3.1.2 PEPFAR could facilitate more robust analyses of ASD expenditures by **adding dimensions to the public data that disaggregate by geography and level incurred** (e.g., national, provincial, district, local) where available. This would enable both a clearer accounting of the spending structures, and within-country comparisons/benchmarking of ASD spending.
- 3.1.3 PEPFAR should extend its transparency agenda by **more clearly disclosing the extent of PEPFAR spending on PEPFAR operations in Washington, DC and country program offices**. This would be complementary to PEPFAR's continuing efforts to promote country ownership of the HIV response, and would help identify opportunities for further efficiency gains.
- 3.1.3 In the same vein, for PEPFAR expenditures supporting implementing partners and technical assistance, PEPFAR should **more clearly disclose the proportion of funding that is retained in the United States** (or other donor countries), whether through direct funding or indirectly through partner overheads.

3.2 Global Fund

3.2.1 The Global Fund should increase the functional transparency of its grant budget data. While these data currently are made available on the Global Fund website through scanned program grant agreements, the Global Fund should **publish past and current grant budget data via a repository or a machine readable format** to facilitate analyses across countries and over time.

3.2.2 In the future, for large grants, the **Global Fund should require that principal recipients report their expenditures by the organizational level** at which the spending occurred. The Global Fund should do the same for smaller grants, except where this would create an undue reporting burden.

3.2.3 The Global Fund should **sponsor additional analysis of ASD spending within countries to whom they provide significant support** across all three focus disease programs.

3.3 WHO

3.3.1 WHO should continue to **refine and strengthen the National Health Accounts** and disaggregate, where feasible, the share of expenditures spent at different organizational levels.

3.3.2 WHO should **publish validated, self-reported national expenditure data for TB and malaria programming via a repository and/or a machine readable format.** (Raw forms of these data are currently available by request from WHO.)

3.3.3 WHO should lead efforts to **standardize expenditure questionnaires** across disease programs (e.g., malaria, TB), to the extent feasible.

In addition to the major donors and partners above, we recommend that other organizations take part in advancing understanding of ASD costs and expenditures.

3.4 Global Health Costing Consortium *(inception phase underway)*

3.4.1 In collaboration with donors and other development partners, we recommend that the Consortium **develop standardized methodologies to collect HIV and TB ASD costs**.

3.4.2 The Consortium should engage with PEPFAR, the Global Fund, WHO and others to standardize **ASD costing and analyze potential efficiency gains** to be made through ASD activities.

3.4.3 The Consortium should generate, to the greatest extent possible, **standardized cost estimates for ASD activities in HIV and TB**, and channel the findings related to ASD costs into advocacy and data visualization tools/websites for broader dissemination.

3.4.4 To the extent feasible, the Consortium should engage with experts in fields outside of its core focus area of HIV/TB, and **explore how the ASD costing standards for HIV/TB can be applied usefully in other global health programs**.

Recommendations regarding future programming

As HIV efforts transition from emergency response to chronic management, structural reforms aimed at efficiency and sustainability should continue

In the first phase of the global response to HIV, donor agencies and development partners prioritized the rapid creation of treatment and prevention programs to bring much-needed services to patients as quickly as possible, without delaying to wait for local systems and capacity to be in place, and with less focus on long-term efficiency. As programs increasingly focus on sustainability, we recommend that programs continue to implement, if not accelerate, necessary structural reforms that will rationalize or refocus spending above the point of service delivery. Our recommendations are applicable to multiple health programs, but address issues that were highlighted in our conversations with experts and stakeholders as particularly relevant for improving the sustainability of the HIV response.

4.1 **Duplication and redundancy of activities and systems should be minimized** where possible. In many countries, parallel systems were set up to ensure the delivery of HIV care—significantly increasing many costs above the point of service delivery—and the reintegration of these parallel systems into national health systems remains a work in progress. More broadly, WHO is in the process of piloting diagnostic tools to evaluate the extent of duplication within health systems; countries and donors should apply this type of diagnostic where relevant and continue the reform agenda. As a practical next step, the large donor agencies should consider collaborating with governments in a small number of pilot countries in an effort to reduce duplication across programs and rationalize ASD spending.

4.2 Efforts to **reduce reliance on expatriate labor and international consultants** must continue, including (where necessary) developing local capacity to assume the roles and responsibilities fulfilled by donor program staff or consultants from donor countries. Country ownership of the HIV response is acknowledged as critical for long-term sustainability, and efforts to transfer the necessary knowledge and skills should be prioritized. While reducing reliance on expatriate labor and international consultants should be a goal at every level of the health system where possible, the majority of these costs—and thus, the largest opportunities for efficiency gains—occur above the point of service delivery.

4.3 As the HIV response shifts towards managing HIV as a chronic disease, countries and donors must explore **novel or differentiated approaches to treatment**. For example, allowing adherent patients to check in with clinical staff at longer intervals and providing them with alternative means of receiving their drug supply can enable strong treatment outcomes while reducing the strain on front-line staff. Alternative models, remote monitoring, and novel distribution systems require shifts in policy and could imply new activities (and costs) above the point of service delivery in order to achieve improved outcomes or reduced costs at the point of service delivery.

4.4 As part of local capacity building, and in order to optimize local responses in an efficient way, donors should work with larger countries to **build sub-national capacity for program evaluation and optimization**, so that staff at provincial level or below can play an increased role in ensuring maximum impact from scarce health resources. This would initially represent an increased investment in new activities above the point of service delivery, but with the goal of improving overall performance and efficiency over time. This is particularly relevant in countries such as South Africa, where large parts of the HIV response are already decentralized to the provincial level and local adaptation may allow improved performance.

Procurement, supply chain, and laboratory operations are areas where immediate gains in overall program performance and efficiency may be possible

In addition to the broad cross-cutting efforts that we discuss above, we identify several specific systems as having potential for immediate gains. In particular, prior research and strengthening efforts in these areas have yielded performance metrics and concrete strategies for optimization, which experts believe can be applied to increasing numbers of countries and programs.

5.1 Where relevant, countries should **institute procurement consolidation for drugs** or consider **expanding procurement consolidation to a broader set of commodities** (such as diagnostic and clinical equipment). The latter approach has not been universally successful, and gains may vary depending on the capacity of central government and the nature of the relevant commodity market; an incremental approach to expansion in combination with tracking of simple performance metrics (e.g., unit prices paid for commodities) may be advisable.

5.2 Within supply chain management, programs should **conduct rapid assessments and apply established techniques for efficiency improvement** (such as level jumping, optimized transportation loops, informed push systems, vendor managed inventory, and eLMIS systems), potentially leading to both improved efficiency and performance. In addition to the potential for cost reductions in the supply chain itself, given the significant cost component that drugs/vaccines represent in several disease areas, reducing the number of commodities lost or wasted can in turn reduce overall program costs.

5.3 Relatedly, for laboratory operations, **optimized laboratory network design** should be implemented, which incorporates appropriate placement of more expensive laboratory equipment, strengthens referral, logistics and distribution systems, and, where relevant, appropriately balances deploying point-of-care diagnostics and referring samples to tertiary laboratories. Laboratory managers should continue to pursue the **integration of laboratory services across vertical disease programs**, capitalizing (for example) on cross-disease synergies in molecular assay testing of HIV and TB.

Appendices

Appendix 1: Experts and stakeholders interviewed

The authors would like to express their gratitude to the following experts and stakeholders who made themselves available to be interviewed for this project:

Carlos Avila	Abt Associates
Sergio Bautista-Arredondo	National Institute of Public Health (INSP, Mexico)
Michael Borowitz	Global Fund
Logan Brenzel	Bill and Melinda Gates Foundation
Win Brown	Bill and Melinda Gates Foundation
Rudolph Chandler	Avenir Health
Steve Cohen	Strategic Development Consultants, South Africa
Jacqueline Darroch	Guttmacher Institute
Chad Davenport	Partnership for Supply Chain Management
Charlotte Dolenz	Clinton Health Access Initiative
Christopher Game	Global Fund
Yvette Gerrans	Bill and Melinda Gates Foundation
Marelize Gorgens	World Bank
Kate Harris	Bill and Melinda Gates Foundation
Sue Horton	University of Waterloo
José-Antonio Izazola-Licea	UNAIDS
David Jamieson	Partnership for Supply Chain Management
Zachary Katz	Clinton Health Access Initiative
Andrew Kennedy	Global Fund
Nthabiseng Khoza	National Department of Health, South Africa
Carol Levin	University of Washington
Adri Mansvelder	Dept. of Health Kwazulu-Natal, South Africa
Elliot Marseille	University of California, San Francisco
Bruno Moonen	Bill and Melinda Gates Foundation
Nhlanhla Ndlovu	Centre for Economic Governance and AIDS in Africa
Regina Ombam	National AIDS Control Council (NACC), Kenya
Mead Over	Center for Global Development
Richard Owens	Partnership for Supply Chain Management
John Palen	PEPFAR, Office of Sustainability and Development
Linda Parsons	Centers for Disease Control and Prevention (formerly)
Edith Patouillard	World Health Organization
Ellen Piwoz	Bill and Melinda Gates Foundation
Carel Pretorius	Avenir Health
Raja Rao	Bill and Melinda Gates Foundation
Stephen Resch	Harvard T.H. Chan School of Public Health (HSPH)
Sydney Rosen	Boston University School of Public Health
Helen Saxenian	*Independent*
Andrew Siroka	World Health Organization
Karin Stenberg	World Health Organization
Todd Summers	*Independent*
Elya Tagar	Clinton Health Access Initiative
Anna Vassall	London School of Hygiene and Tropical Medicine
Damian Walker	Bill and Melinda Gates Foundation
Paul Wilson	Columbia University Mailman School of Public Health
Nichole Zlatunich	The Palladium Group

Appendix 2: Literature search protocol

R4D's research team conducted the following PubMed search for articles related to ASD costs on August 20, 2015:

This search returned 218 results. A high-level review of the returned results indicated additional terms potentially used to describe ASD costs ("operational costs," "off-site costs," "district costs," and "national costs"). A second PubMed search was conducted on August 20, 2015 using these additional search terms; the second search yielded 49 results not previously identified in the initial PubMed search.

The program associate reviewed the title and abstracts of the combined 267 search results for relevance to the project scope, both in terms of focus and geographic location (i.e. developing countries). In total, 197 articles were excluded, with the remaining 70 articles retained for additional review by the program associate and the senior program officer.

In addition, the research team conducted targeted searches for articles related to "laboratory strengthening," "laboratory service," and "aid architecture" to supplement materials for fourth chapter of this report.

Additional articles identified by informants were screened by the research team for relevancy and further review.

Terms	Located	Boolean Operator
Tuberculosis OR HIV OR Malaria OR Immunization OR "Immunization programs" OR Vaccination OR Vaccine OR "Family Planning"	Title/Abstract	AND
Cost* OR Costs OR Costing	Title	AND
"above service" OR "above delivery" OR "above service delivery" or "above facility" or "above the facility" OR "above the point of service" OR "program level cost*" OR "programme level cost*" OR "program cost" OR "programme cost" OR "above site cost*" OR "above the site" OR "high level cost*" OR "programme management cost*" OR "program management cost*" OR "overhead cost*" OR "central support cost*" OR "administrative cost*" OR "supply chain"	All Fields	AND
"English"	Filter	AND
"published last 5 years"	Filter	

Appendix 3: Challenges with using historic National Health Account data

National Health Account data is collected via a standardized process in countries and aims to capture all healthcare spending in a country in a systematic way, including breakdowns across different activities. These activities vary slightly depending on the year the data were collected, but include broad categories such as inpatient curative care, outpatient curative care, preventive care, and governance and health system and financing administration. Over time, some countries have also reported details on health sub-accounts for specific programs, such as HIV/AIDS, TB, malaria, and reproductive health.

Although the data do not break out activities by location (e.g., facility-level vs district-level or national-level), in theory these data could provide some helpful high-level comparisons across countries and across programs within countries. However, an initial examination of select countries raised questions about the data comparability in the health sub-accounts.

Table 14 below illustrates some consolidated data from the health sub-accounts of 7 sub-Saharan African countries. Given the categories provided in the sub-accounts, we initially focused on extracting information on governance and administration costs, for which the majority of costs would be expected to take place above the point of service delivery. The relative share of these governance and administration costs across countries and sub-accounts is shown in the table.

Table 14. Consolidated data from the health sub-accounts of 7 sub-Saharan African countries

% share of spending on governance and administration	Kenya (2012-13)	Tanzania (2009-2010)	Malawi (2011-2012)	Burkina Faso (2013)	Ghana (2012)	Niger (2013)	DRC (2013)
HIV/AIDS	17%	2%	13%				
Malaria	16%	1%	13%	19%	0%	30%	5%
TB	18%			32%	0%	60%	12%
Reproductive Health	21%	0%	16%				
Nutritional deficiencies	22%						
Vaccine-preventable diseases	48%						

Several cells are highlighted here to illustrate some of our data concerns:

- All spending values for Tanzania and Ghana appear to be implausibly low
- Within Niger's NHA data, spending for TB appears to be implausibly high
- Kenya's NHA spending amount for vaccine-preventable diseases appears implausibly out of step with other disease areas, as well as being contrary to the findings of the carefully collected EPIC study data

Our initial examination of these data suggested that there are issues of data comparability across and within countries in the historic NHA sub-accounts, and the expenditure categories are, at best, only partially informative about program expenditures above the point of service delivery. For this reason, we did not pursue analysis of these data further; future Systems of Health Accounts data are likely to be more comparable, and therefore more useful for understanding ASD costs.

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