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## Importance of Public-Private Partnerships: Strengthening Laboratory Medicine Systems and Clinical Practice in Africa

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### Abstract

After the launch of the US President's Emergency Plan for AIDS Relief in 2003, it became evident that inadequate laboratory systems and services would severely limit the scale-up of human immunodeficiency virus infection prevention, care, and treatment programs. Thus, the Office of Global AIDS Coordinator, Centers for Disease Control and Prevention, and Becton, Dickinson, and Company developed a public-private partnership (PPP). Between October 2007 and July 2012, the PPP combined the competencies of the public and private sector to boost sustainable laboratory systems and develop workforce skills in 4 African countries. Key accomplishments of the initiative include measurable and scalable outcomes to strengthen national capacities to build technical skills, develop sample referral networks, map disease prevalence, support evidence-based health programming, and drive continuous quality improvement in laboratories. This report details lessons learned from our experience and a series of recommendations on how to achieve successful PPPs.

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## Keywords

HIV; AIDS; PEPFAR; laboratory systems; public-private partnership; Africa; Becton, Dickinson and Company; private sector

Since the early 2000s, global collective action has expanded access to antiretroviral therapy for people living with human immunodeficiency virus (HIV), with or without AIDS (HIV/AIDS), in developing countries [1]. As part of the global response, government agencies and nongovernmental organizations—including the US President’s Emergency Plan for AIDS Relief (PEPFAR) and the Global Fund to Fight AIDS, Tuberculosis, and Malaria—developed new and innovative funding mechanisms to support access to medicines [2]. Although many programs addressed the urgent need for antiretroviral therapy in sub-Saharan Africa [3, 4], as of 2005 none addressed the weak laboratory systems that hamper health professionals’ ability to track diseases and deliver the most appropriate treatment to their patients [5–7]. As care and treatment efforts expanded, the gaps and shortcomings in laboratory systems became abundantly clear and were seen as an issue that could not be solved by either the public or private sector alone [8–10].

Funding from PEPFAR and the Global Fund to Fight AIDS, Tuberculosis, and Malaria created unprecedented opportunities to improve laboratory systems, and public-private partnerships (PPPs) are an innovative approach for building sustainable laboratory systems in resource-limited countries [6, 11]. Despite the enormous progress made in the HIV/AIDS arena, the global recession precipitated a funding crisis that now threatens to undermine these hard-fought gains [1, 8, 12, 13]. New and sustainable approaches should be assessed to optimize methods for improving laboratory systems.

The combination of the individual strengths of the private and public sectors is one way to establish a strong foundation for sustainable change and success [14–16]. Private sector engagement and PPPs play a critical role for PEPFAR by sharing responsibility for achieving an AIDS-free generation and meeting the sustainable development goals [10, 17–19]. Although there are several examples of PPPs improving health services globally [20–23], few address laboratory networks [24, 25]. PPPs are, therefore, needed in this area to act collectively to expand and enhance existing laboratory networks to improve patient care and treatment services [11].

This supplement reports the overall impact of the PPP between Becton, Dickinson, and Company (BD) and PEPFAR on HIV/AIDS and tuberculosis programming through laboratory-strengthening activities in Uganda, Ethiopia, Mozambique, and South Africa. The PPP contributed to national capacity development in the areas of building technical skills, developing guidelines, planning sample referral networks, mapping disease prevalence, implementing evidence-based health programming, and continuous quality improvement in laboratories, all of which are goals shared by these countries and PEPFAR.

## A RAPID RESPONSE TO A COMPLEX PROBLEM: THE BD-PEPFAR PPP

In 2007, the Office of the US Global AIDS Coordinator of the US Department of State, the Centers for Disease Control and Prevention (CDC), and the global medical technology company BD signed a memorandum of understanding. This memorandum promoted sharing each organization's respective strengths, experiences, methods, and competencies to pursue a public-private partnership focused on supporting specific laboratory-system-strengthening projects relevant to the goals of ministries of health (MOHs) and PEPFAR for prevention and treatment of HIV/AIDS. PEPFAR defines PPPs as collaborative endeavors that combine resources from the public sector with resources from the private sector to accomplish HIV/AIDS prevention, care, and treatment goals [26]. The key aspect of a PPP is that the private sector partner must be contributing a 1:1 ratio of financial contributions, in-kind contributions, or intellectual property. The BD-PEPFAR PPP was implemented at an estimated shared cost of \$18 million, which represents dollars spent and products provided, as well as donated time and services.

Ethiopia, Kenya, Mozambique, South Africa, and Uganda were chosen on the basis of their political support and readiness to provide leadership in the PPP. In-country projects were identified on the basis of the priorities that each country's MOH highlighted in its national laboratory strategic plan.

As the lead governmental partner in the BD-PEPFAR PPP, the CDC contributed its expertise in disease prevention and detection, patient monitoring, and surveillance. Laboratory-strengthening PPPs are under the purview of CDC laboratory directors in country offices. Acting in its role as the implementing agency, the International Laboratory Branch (ILB) within the Division of Global HIV/AIDS (the addition of "Tuberculosis" to the end of the division name is under proposal) in the Center for Global Health of the CDC drew on its staff to provide technical assistance and guidance in cutting-edge technologies and laboratory-system strengthening. Experts from the head-quarters of BD and the International Laboratory Branch met twice yearly for strategic planning, intercountry coordination, and technical assistance. Both BD and the CDC deployed dedicated staff who tapped into their home organizations for additional support, as well as the expertise of staff in the field.

The in-country CDC laboratory director supported BD staff in introducing the PPP to MOH officials. These introductions facilitated development of work plans for priority topics. These work plans were used by BD to identify competent BD Global Health Fellows from its worldwide workforce of experts, to assist local staff. Between 2009 and 2012, 75 fellows were deployed in the field for short-term assignments, observing, assessing, training, and mentoring laboratory personnel. A job description and rigorous interview process for selecting staff were developed by BD. Fellows were required to have 1 or more years of service with BD and were matched by their area of expertise to country-specific needs. Staff were drawn from a wide selection of competencies and included logistics coordinators, medical technicians, microbiologists, phlebotomists, and quality consultants. The fellows' orientation focused on all aspects of the project, ranging from country-specific cultural sensitivities to clarifying roles and responsibilities for the assignment.

The in-depth methods and programmatic results of this PPP are reported in the accompanying reports in this supplement. This report summarizes the results from a management perspective and focuses mainly on identifying the practices integral to the success of the PPP. Recommendations are also provided to benefit multinational healthcare companies and local decision makers aspiring to form their own PPPs.

## **THE IMPACT OF THE PPP**

BD and PEPFAR have successfully applied the established practice of PPP for the first time to the world of laboratory medicine. This PPP demonstrates a measurable, scalable, evidence-based model to multiply the individual strengths and competencies of the public and private sectors to fortify the lagging world of laboratory medicine in resource-limited settings.

## **CHALLENGES AND LESSONS LEARNED FOR COUNTRIES AND PRIVATE ENTITIES ASPIRING TO ENGAGE IN A PPP**

An independent third-party evaluation documented the challenges and lessons learned during the 5 years of coordinating and managing the BD-PEPFAR PPP (focusing on 2007–2012) [27]. This information was presented at a conference in Pretoria, South Africa, which was attended by participants from the Office of the US Global AIDS Coordinator, the CDC, BD, and leadership from all the countries involved in the PPP. We hope that the following lessons will benefit countries, international agencies and private entities who are either already engaged in a PPP or intend to engage in one in the future.

### **Maintain Strong Channels of Communication**

Given several organizations involved in the execution and implementation of country-specific work plans, there was a strong need to explicitly define the roles and responsibilities of each of the partners, and communication between partners was a key to the success of the PPP. Long distances and physical boundaries should not deter collaboration; partners must come together regularly to operate as virtual teams at predefined intervals throughout the project.

### **Define Formal Monitoring and Evaluation Arrangements**

All countries and private companies preparing to embark on a PPP should ensure that stakeholders formally define and agree on monitoring and evaluation metrics before starting the intervention. This will ensure that baseline data are collected prior to the PPP's contribution, helping attribute success to the respective partners after the intervention. These arrangements include but are not limited to data collection, management, analysis, interpretation, and dissemination.

### **Establish Mechanisms to Capture Matching Funds**

Stakeholders must agree on the mechanism to capture the allocation of matching funds for the PPP before starting the project.

### **Form In-country PPP Coordination Units**

The CDC laboratory directors stationed in countries recommended that all parties form an in-country coordination unit/ steering committee or its equivalent to efficiently manage and provide oversight and guidance for the PPP.

### **Build Sustainability Through Continuous Technical Support**

The PPP was designed to operate through a series of short-term interventions. The BD clinical staff provided technical assistance in the field for a maximum duration of 3 weeks; however, teams returned multiple times until the project was completed. Some in-country staff preferred longer visits to ensure sustainability and gain greater understanding of the local context. Several measures were taken by the partners to address these issues, such as strengthening orientation by partner organizations, setting up a unique dedicated email box for ongoing mentorship, and undertaking a thorough transfer of knowledge between the PPP fellows and in-country laboratory staff.

### **Take Local Considerations Into Account**

Understanding the local context is key to effective country engagement, facilitation, and transferring knowledge and skills. If this local understanding is not present, barriers can arise, as was seen in Ethiopia, where the local experts recommended that trainings be offered in a local official language, including a local trainer as part of the team, to mitigate language barriers. Notably, in Mozambique, the BD trainers working with the MOH and other key stakeholders were required to be fluent in Portuguese, which contributed significantly to the success of the program. The global nature of BD's workforce was leveraged by deploying staff from the BD Brazil sites to work in Mozambique.

### **Joint Review of Accomplishments**

The country teams recommended that, to ensure sustained success, all stakeholders and decision makers should jointly review accomplishments and lessons learned. This review should occur annually at a minimum.

## **FACTORS NEEDED FOR A SUCCESSFUL PPP**

Having little to rely on for precedent, the BD-PEPFAR PPP has been a continual work in progress, requiring resourcefulness and flexibility from all stakeholders in response to persistent and changing demands. Several success factors have, however, emerged as the PPP has evolved. Table 2 summarizes our FOCUSED recommendations, which can contribute to the success of PPPs for countries already engaged in a PPP or aspiring to engage in one in the future.

### **F = Frame Clear Goals, Roles, and Responsibilities for Partners**

PPPs that begin with common goals are known to be successful [28]. In this case, the partners, BD and the CDC (on behalf of the OGAC), were united by an understanding that, within the PPP, their common goal would be to promote laboratory strengthening in PEPFAR-supported countries. The partners outlined broad goals and objectives in a memorandum of understanding. This provided a shared context for countries that then

developed a country-specific work plan based on their own national laboratory strategic plan. Common goals enabled partners to outline roles and responsibilities, thus improving coordination. Specific and measurable objectives propelled partners into planning, organizing, and coordinating the initial phase of engagement between the 2 partners.

### **O = Operate With Open and Frequent Communication to Build Trust**

In-country CDC laboratory directors leveraged their existing relationships with the MOH and local champions, opening doors for BD's Global Health Fellows. The in-country CDC presence played an indispensable role in engaging local champions for the PPP (eg, the Ethiopian Public Health Institute, the Ugandan National Tuberculosis Reference Laboratory, and the African Centre for Integrated Laboratory Training). These preexisting relationships built trust and facilitated coordination among partners, enabling sharing and timely planning and execution of program activities. Mutual trust was a key ingredient for success.

### **C = Communicate Conflicts of Interest in Early Stages of Engagement**

It is important to disclose potential conflicts of interest early on to ensure transparency of the respective partners' underlying motivations. The interests of all organizations and feasibility of matching their expectations should be discussed openly in the early stages of engagement. If it appears that one of the partners has an agenda to promote its own commercial interest in addition to the common goal on which the partnership is built, then the purpose of the partnership should be revisited. If the interests still do not align, then the partners should consider abandoning the partnership while still in the preplanning phases. In this PPP, the memorandum of understanding made it clear that all partners would work together to address common goals. Potential conflicts of interest were addressed up front to avoid any confusion over BD's commercial goals versus those of the PPP.

### **U = Utilize the Strengths of Other Organizations to Enrich the PPP**

The complexity of healthcare systems demands multifaceted analyses and solutions. For example, one of the problems facing the tuberculosis program in Uganda was the difficulty of receiving and tracking multidrug-resistant tuberculosis samples and in providing accurate results to patients. To address this issue, BD's staff worked with external partners such as Direct Relief International to learn about powerful geographic information systems that could help analyze and interpret data to detect disease patterns, trends, and relationships. In turn, BD worked with the CDC and the Uganda MOH to train local laboratory workers how to use software and analyze data and then teach these skills to others, thus continuing the cycle of learning. The result was a highly skilled team of specialists armed with the tools and data needed to continually refine and optimize their specimen handling and result reporting infrastructure. Today, sites that have incorporated geographic information systems can, with a few mouse clicks, track the entire cycle of specimen collection and testing and can report results accurately and efficiently to patients. Through innovative thinking, the PPP found a way to address the problem and turn it into an opportunity to boost the existing system with new technology.

### **S = Share Best Practices and Foster Country Ownership to Ensure Sustainability**

The BD-PEPFAR PPP was established over an initial 5-year time frame, based on early understanding that driving sustainable change and skill-based training would not happen effectively in the short term. The core goal of the PPP was to comprehensively strengthen local health systems by working hand in hand with laboratory technicians and clinicians in-country. The partners shared the philosophy that the return on this investment was the long-term impact of establishing strong healthcare systems, sharing best practices, and ultimately fostering country ownership to significantly diminish the disease burden of HIV/AIDS and tuberculosis.

### **E = Evaluate and “Measure What Matters” Using an Outcomes-Based Approach**

Stakeholders should work together to recommended metrics to measure progress, and success should be agreed on before starting the intervention. In the case of the BD-PEPFAR PPP, the partners recommended that monitoring and evaluation should be an ongoing effort and not a one-time event. They also recommended engaging a third-party organization whose focus was monitoring and evaluation to get this done in a timely and effective manner.

### **D = Deploy the Right Human Resources; People Make All the Difference**

The PPP was managed by dedicated staff at both the head offices and local-level offices of BD and the CDC, with support and involvement from senior leadership within each entity.

The CDC’s strength lies in its expertise in disease prevention and detection, surveillance, and patient monitoring [29]. It leveraged the competencies of staff at the International Laboratory Branch for technical assistance in countries. Locally, the CDC used its in-country presence, deep knowledge of the operating environment, and existing strong relationships with the MOHs to facilitate and implement the PPP.

BD offered expertise as a medical technology company that serves healthcare institutions, clinical laboratories, industry, and the general public, with offices in >50 countries worldwide. The company has a long history of innovation, with the mission “to help all people live healthy lives.” BD created a system for recruiting the right people from its pool of experts to provide training in the field.

## **DISCUSSION**

The success of the PEPFAR program in Africa has challenged conventional wisdom on how global health is pursued. It has supported treatment of 7.7 million patients living with HIV/AIDS, while working to strengthen health and laboratory systems [1–3, 30]. Alongside this success, PEPFAR has worked in close collaboration with the public and private sectors, such as the CDC, MOHs, and BD, to establish PPPs. By combining the strengths, experiences, methods, and resources across sectors, these PPPs have been successful in supporting laboratory-strengthening projects relevant to PEPFAR’s core goals for HIV/AIDS prevention, treatment, and care.



The BD-PEPFAR PPP has had some key successes influencing patient care, such as returning laboratory results to physicians and patients in a timelier manner, a critical step in the care process. It has been reported that only between 35% and 88% of results reach patients in time to promptly start treatment [31]. This PPP helped reduce turnaround times in Uganda, an achievement later replicated in Ethiopia. In Ethiopia, using Ethiopian Postal Service Enterprise, the PPP standardized and streamlined specimen logistics to support laboratory network. In Addis Ababa, the results of the PPP reduced the turnaround time (measured from collection to delivery of results) for ART specimens from 7 to 2 days—a 71% decrease—and, in the Amhara region, reduced turnaround time from 10 to 5 days—a 50% decrease. In Uganda, referrals from persons with presumptive multidrug-resistant tuberculosis increased >10-fold, with 94% of specimens reaching the National Tuberculosis Reference Laboratory within the country's established turnaround time target of 3 days. Turn-around times for receiving specimens and reporting results to patients receiving antiretroviral therapy are used as a benchmark for laboratory performance [32]. Faster turnaround times have an important role in curtailing costs incurred by the patient and government [11]. These accomplishments decreased the time needed to initiate treatment, which has been shown to reduce opportunistic infections, encourage viral suppression, and potentially limit further transmission [33, 34].

A stronger workforce is key to achieving a nation's public health goals; however, it is a critical weakness in resource-limited settings [35]. In South Africa, the PPP worked to solve this crisis through innovative training programs for tuberculosis, eventually reaching 16 countries. In Mozambique, the PPP was instrumental in supporting the MOH to appoint dedicated personnel to lead the implementation of newly established quality assurance efforts, thus building local capacity and reducing the costs of audits and need for technical assistance from foreign laboratory professionals.

The early success of the PPP inspired both partners to build a series of collaborations, such as the BD-PEPFAR Safer Blood Collection Partnership, which has been implemented in Kenya, Tanzania, Zambia, and Kyrgyzstan. A new laboratory partnership, Labs for Life, was established in 2012 between BD and PEPFAR. This expanded PPP will run through 2017 with the support of \$20 million in funding and includes 2 new countries, India and Kenya.

From BD's perspective, there is recognition that PPPs are a critical platform for the company's global health initiatives, paving the way to building and upgrading clinical practices that influence human lives. The results-driven approach drives further investment in these programs. For MOHs, PPPs provide much needed technical expertise, access to critical technologies and supplies, and creative, flexible solutions to seemingly intransigent problems.

The success of this PPP indicates that this model is scalable and expandable to other countries with similar resources for health-systems strengthening. It also demonstrates that effective collaboration is possible and necessary between the public and private sectors to solve complex health programs.



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**Table 1**

Outcomes of Public-Private Partnership Between Becton, Dickinson, and Company and the Centers for Disease Control and Prevention in Select Countries Aided by the US President's Emergency Plan for AIDS Relief: 2007–2012

Country, Authors <sup>a</sup>	Key Activity	Key Outcome(s)
Ethiopia, Kebede et al	Establishment of standardized, streamlined specimen logistics, using EPSE to support laboratory network	Addis Ababa reduced TAT collection to delivery of results) for ART specimens from 7 to 2 d (71% decrease); the Amhara region reduced TAT time from 10 to 5 d (50% decrease)
Kenya, Kimani et al	Roll out of safe phlebotomy partnership, including integration of safe phlebotomy practices into preservice training	91 HCWs were trained in phlebotomy; average performance increase: 41% (95% CI, 29.3%–53.5%; $P < .001$ )
Mozambique, Skaggs et al	Establishment of NLQA program to facilitate stepwise quality improvement of laboratory service	MOH appointed designated quality assurance officers to work with selected laboratories to steer them toward accreditation
South Africa <sup>b</sup>	Training of 150 participants from 16 sub-Saharan Africa countries at ACILT in tuberculosis diagnostics	Developed more-competent health workforce for tuberculosis diagnostics; in 2010, 43 participants had 57% improvement in tuberculosis culture and identification test scores
Uganda, Joloba et al	Training and development of standardized tuberculosis specimen transport network	10-fold increase in referrals of patients with presumptive multidrug-resistant tuberculosis; 94% of submitted specimens reached NTRL within 3 d

Abbreviations: ACILT, African Centre for Integrated Laboratory Training; ART, antiretroviral therapy; CI, confidence interval; EPSE, Ethiopian Postal Service Enterprise; HCW, healthcare worker; MDR, multidrug-resistant; MOH, ministry of health; NLQA, National Laboratory Quality Assurance; NTRL, National TB Reference Laboratory; TAT, turnaround time.

<sup>a</sup>Found elsewhere in this supplement, unless otherwise indicated.

<sup>b</sup>Not presented in this supplement.

**Table 2**

**FOCUSED Recommendations for a Successful Public-Private Partnership**

Frame clear goals, roles, and responsibilities for partners.
Operate with open and frequent communication to build trust.
Communicate conflicts of interest in early stages of engagement.
Utilize the strengths of other organizations to enrich the program.
Share best practices and foster country ownership to ensure sustainability.
Evaluate and "measure what matters" using an outcomes-based approach.
Deploy the right human resources; people make all the difference.

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