AfricaCDC
Centres for Disease Control and Prevention

INVESTING IN HEALTH R&D: AFRICA'S NEXT ECONOMIC GROWTH FRONTIER

19 MAY 2026

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Africa Centres for Disease Control and Prevention

An entity of the African Union

Global Gateway

With the collaboration of the AU-EU Health Partnership

Global Health ECOSYSTEMS

Technical partner and report author Global Health Ecosystems

TABLE OF CONTENTS

ACRONYMS

ACRONYM	
AC_0	Absorptive Capacity
AFCFTA	African Continental Free Trade Area
AFRICA CDC	Africa Centres for Disease Control and Prevention
AMA	African Medicines Agency
AMRH	African Medicines Regulatory Harmonization Initiative
AU	African Union
AUDA-NEPAD	African Union Development Agency–New Partnership for Africa's Development
CEPI	Coalition for Epidemic Preparedness Innovations
CSIR	Council for Scientific and Industrial Research
DALYS	Disability-adjusted life years
DFIS	Development Finance Institutions
EDA	Egyptian Drug Authority
EU	European Union
FDA	Food and Drug Administration
GC ADDA	Global Health Clinical Research and Development Alliance
GDP	Gross Domestic Product
GERD	Gross Expenditure on Research and Development
HICS	High-Income Countries
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
IP	Intellectual Property
KEMRI	Kenya Medical Research Institute
KWTRP	KEMRI–Wellcome Trust Research Programme
LMICS	Low- and Middle-Income Countries
M&A	Mergers and Acquisitions
MENA	Middle East and North Africa
MPP	Medicines Patent Pool
MRNA	messenger ribonucleic acid
NEPAD	New Partnership for Africa's Development
NPV	Net Present Value
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
PIM	Perpetual Inventory Method
R&D	Research and Development
ROI	Return on Investment
RSV	Respiratory Syncytial Virus
SAMRC	South African Medical Research Council
TFP	Total Factor Productivity
UNECA	United Nations Economic Commission for Africa
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

In response to Africa CDC's New Public Health Order and the African Union (AU)'s Agenda 2063, there is growing recognition that health research and development (R&D) is not only a public good, but also a driver of economic growth and resilience. Building on this, a continent-wide study has been undertaken in partnership with Team Europe under the African Union–European Union (AU–EU) Health Partnership and with technical support from Global Health Ecosystems. The study aims to generate Africa-specific return on investment (ROI) evidence to strengthen the investment case and inform future financing strategies, policy decisions, and engagement with domestic and private capital. The analysis models impact across five key channels: gross domestic product (GDP) growth, employment creation and brain gain, private investment crowd-in, trade and competitiveness gains and long-run productivity and innovation spillovers.

Africa's economies need urgent expansion and diversification. They cannot remain narrowly focused on raw materials and labour. The transition toward a knowledge-based economy is essential. This includes building domestic capabilities in research, innovation, and local manufacturing. Strengthening these capacities will be critical to meeting the continent's growing demand for jobs, services, and products. This study demonstrates how increased investments in health R&D in Africa, will serve each of these key priorities and promise to be an engine of both economic growth and improved public health across the continent. In addition to presenting new macroeconomic evidence, the study also showcases meaningful insights from the social and impact investor community in Africa.

KEY FINDINGS:

1. **Investing in Africa's own health R&D is one of the highest-return economic decisions available to governments today.** Reaching the African Union's 1% R&D target, health R&D investments alone would generate $668 billion in additional GDP over 20 years- equivalent to a 137× return on investment- while breaking even within four years. This estimate excludes the value of lives saved, diseases prevented, and the insurance value of being able to respond faster to the next pandemic. The full return when taking the health gains into account is considerably higher.

2. **R&D investment pays back fast.** The model shows that investment breaks even within four years (2029), meaning returns begin within a single political cycle. By 2030, Africa's GDP growth rate is approximately 0.4 percentage points higher than baseline, rising to nearly 1 percentage point by 2035.

3. **Over 20 years, if Africa invests 1% GERD and 15% of that on health, the cumulative GDP gain will hit $668B,** which is equivalent to creating a new industrial sector across the continent and adding several years of telecom-sector scale growth to the economy.

4. **4.56 million jobs by 2044.** Full implementation of the 1% GERD target and 15% of that on health would support 4.56 million jobs across African economies by 2044. These are not temporary jobs or short-term stimulus positions. They are sustained, skilled employment in one of the most productive sectors of any modern economy.

5. **Not investing is an expensive choice.** If African health R&D spending falls 25% below the current baseline, the continent foregoes over $1.1 trillion in GDP over 20 years. The cost of standing still is not zero. The absence of sufficient investment carries major costs: higher morbidity and mortality, strained health systems, brain drain of skilled professionals, worsening trade imbalances, and missed opportunities for technological leadership.

The economic case is clear. Now is the moment to turn ambition into investment- moving from political commitment to funded, coordinated action across a shared system. This requires prioritising three main actions:

1. Build the foundations of a functioning market
Led by governments

- Enshrine the 1% GERD target, with 15% for health R&D
- Actively shape markets through procurement, incentives, and guarantees
- Strengthen regulatory frameworks and align incentives for innovation
- Invest in core data systems to enable transparency, targeting, and accountability

2. Coordinate a continental investment system
Led by Africa CDC

- Develop a continental investment blueprint with a pipeline of investable opportunities
- Aggregate demand and coordinate opportunities across countries
- Convene partners to align capital, priorities, and execution

3. Deploy capital that matches the reality of R&D
Co-led by Africa CDC, development finance institutions (DFIs), investors, and ecosystem actors

- Structure blended finance with genuine risk-sharing
- Align with long-term timelines and credible exit pathways
- Invest in shared public goods: data, trial platforms, and visibility systems

Africa is not starting from zero. This report shows what happens when the system is built: a $668 billion opportunity, millions of skilled jobs, and a health innovation ecosystem that serves African populations on African terms.

1. THE MANDATE: AFRICA'S SHIFT TO HEALTH SOVEREIGNTY

Africa carries an estimated 25% of the world's disease burden (Vos, 2020). Malaria, tuberculosis, HIV/AIDS, and a long list of neglected tropical diseases affect hundreds of millions of people on the continent every year. Yet Africa produces only a fraction of the global health research and development (R&D) that generates the medicines, diagnostics, and vaccines needed to address them.

This creates two problems. First, the diseases most prevalent in Africa do not always attract research funding, because products are developed where commercial returns exist (Luchetti, 2014). Where market failures occur, only public and philanthropic investment fills the gap. Second, Africa misses the economic returns that R&D investment generates. The jobs, patents, knowledge spillovers, and private capital that follow public funding flow to the investing countries, not to those that eventually use the products.

Underinvestment carries real costs: strained public finances, brain drain, import dependence on medicines and diagnostics, worsening trade balances, and foregone opportunities in health technology. These are not hypothetical. They are the current consequences of Africa's R&D gap, and they grow with each year the gap persists.

The COVID19 pandemic revealed Africa's dependence on global manufacturing and supply chains for key medicines and logistics, literally leaving the entire African population vulnerable. African leaders for the first time recognised that this status quo must be reversed, and Africa CDC's New Public Health Order (Africa CDC 2022) boldly calls for Health Sovereignty through increased local manufacturing. This aligns with Agenda 2063 – 'the Africa we want' (African Union 2015).

In the now collapsing global health architecture, investments in global health R&D have largely been driven by public and philanthropic funding from high-income countries (HICs). That investment has delivered extraordinary returns: a 2024 study demonstrated that every dollar invested in R&D for neglected diseases has the potential to return $405 in health and societal value (Impact Global Health 2024).

Strikingly, 90% of the economic benefits of that investment, the skilled jobs, scientific capacity, and industrial growth, have remained in the countries that funded it (Impact Global Health 2025). Of the 20,825 clinical trials initiated worldwide in 2023, only 819 (4%) were conducted in African countries (Mansouri, 2025). Despite carrying the world's largest disease burden, Africa produces only a fraction of the science needed to address it, relegating it as a consumer rather than a producer in the global health R&D economy.

The R&D of medicines for diseases that also affect African patients, most of which may not necessarily reflect local priorities are largely designed, tested and manufactured elsewhere, often without adequate account for African population diversity, local epidemiology, and health systems challenges.

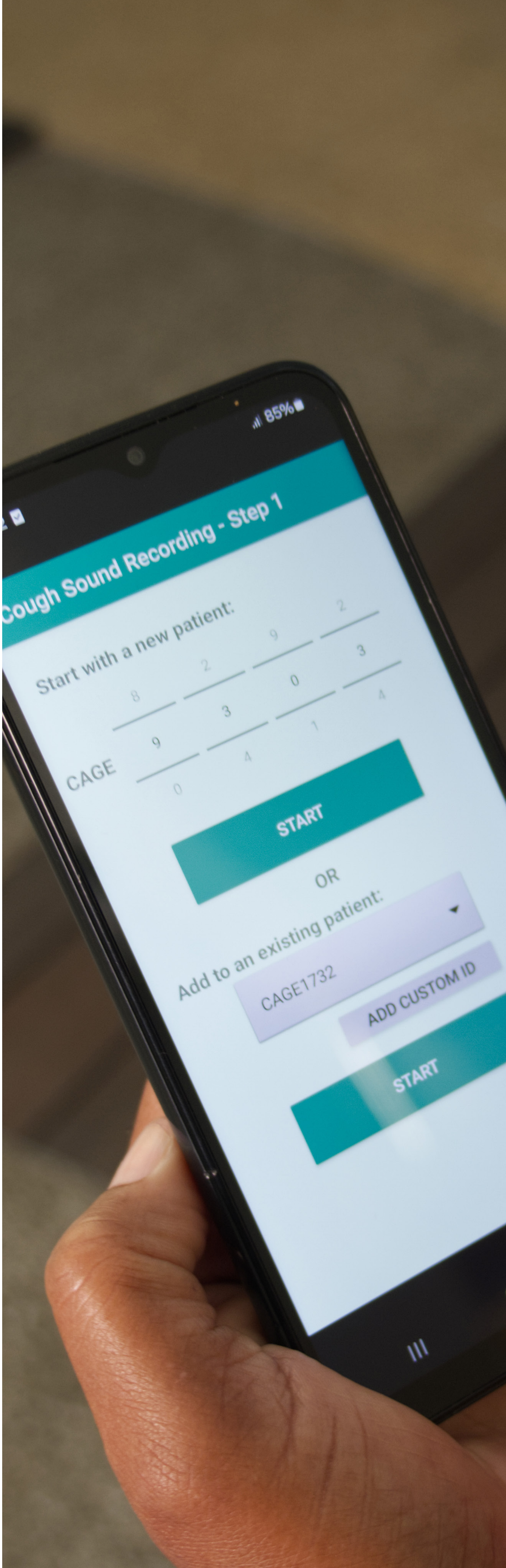
However, the context is now rapidly shifting. Since 2025, major changes in the funding landscape driven by funding cuts from HIC governments, have exposed the structural fragility of a global health R&D system built on external dependency. The latest figures from the Organisation for Economic Co-operation and Development reveal that aid funding from DAC member countries fell by 23.1% in real terms in 2025 compared to the previous year- a loss of $40.3 billion, or nearly one-fifth of the entire 2024 aid budget of $214.6 billion, in a single year. This is the largest annual contraction ever recorded in the history of official development assistance, bringing Official Development Assistance (ODA) to where it stood at the start of the 2030 Agenda for Sustainable Development (OECD 2026).

This shift is not only about health. It reflects a broader transition from aid dependency to economic sovereignty, where countries should generate local resources and invest in systems that generate domestic value, rather than relying on externally financed outcomes.

At the same time, political momentum is building. The 2023 Lusaka Agenda stirred the commitment of global health institutions to coordinate R&D and manufacturing efforts that prioritise African needs (Future of Global Health Initiatives, 2023). The 2025 Accra Reset rallied the global health community behind locally led investment strategies for sub-Saharan Africa (Presidency Communications 2025). Recent developments in continental health governance include strengthened coordination across institutions such as the African Medicines Agency, the African Continental Free Trade Area (AfCFTA), and Africa CDC (NEPAD Agency 2024). Discussion papers commissioned by Wellcome to reimagine a reformed global health architecture call for regional R&D platforms and finance aligned to country-set priorities (Wellcome, 2025). Africa CDC's 2023 – 2027 strategic plan identifies strengthened health research and innovation as a key driver of economic transformation. It highlights continental R&D coordination platforms, mobilised domestic and blended financing, and the development of an investment case for health R&D as critical enablers of a shift from a predominantly consumptive health sector to one that generates economic returns (Africa CDC 2023).

This moment presents a genuine opportunity. With the right evidence, incentives, and investable pathways, scaling health R&D in Africa can do far more than improve health outcomes. It can drive economic growth, create high-value employment, stimulate private investment, reduce long-term import dependency, and reposition African countries as producers rather than consumers in the global health economy. Realising that opportunity requires a credible, evidence-based investment case to move from political commitments to actions by ministries, domestic investors, and regional capital holders.

This report aims to provide the investment case, aligned with the African health reform agenda and designed to support the shift toward self-financed, sovereign and resilient health systems. It provides the economic evidence needed to translate political ambition into actionable investment strategies. By quantifying the returns to health R&D, it supports domestic financing decisions. It reframes health R&D as a sovereign economic asset rather than a donor-driven activity and makes the case for regional investment in the systems required to build a self-sustaining health innovation economy in Africa.



2. THE OPPORTUNITY: A NEW ECONOMIC GROWTH FRONTIER

Health research and development drives economic growth, creates skilled jobs, and builds the institutional capacity to compete in global markets. Yet Africa remains profoundly underrepresented in global R&D. Despite comprising approximately 19% of the world's population (United Nations, 2024), the continent accounts for just 1.1% of global R&D investment (Simpkin, 2019).

The gap is an economic one too. Countries that invest in R&D grow faster, create more skilled jobs, attract private capital, and build the technological capacity to compete in global markets. Africa's underinvestment means it is missing out on all these returns, year after year. The African Union recognised this in 2007, calling upon member states to invest at least 1% of GDP in research and development (United Nations Economic Commission for Africa 2018). Nearly two decades later, the continent's average sits at 0.45%, well below the global average of 1.7% (World Bank 2025). Fewer than ten of Africa's 55 member states invest more than 0.6% of GDP in R&D, and three countries (South Africa, Nigeria, and Egypt) account for nearly two-thirds of all African R&D expenditure. Much of what is invested in health research is externally funded, leaving national health research systems vulnerable to shifting donor priorities.

On top of this, governments face rising pressure to deliver jobs, growth, and resilience under fiscal constraints made increasingly tight by climate pressures, conflict and rising commodity prices. Investing in health R&D directly addresses these pressures by:

- Creating skilled employment for young populations
- Reducing dependency on imported health technologies
- Retaining scientific talent
- Building new industrial sectors

The COVID-19 pandemic demonstrated that with the right combination of political will, regulatory harmonisation and catalytic investment, a robust R&D ecosystem can deliver scaled innovation, faster. This report demonstrates that economic returns are not only robust, but also highly strategic and proximal:

- **Returns within one political cycle.** Early gains are visible in 4 years.
- **Reduces import dependency.** Builds domestic industry and local procurement power.
- **Aligns health and economic strategy.** Jobs, companies and retained talent.

Unlike many public investments, R&D generates both economic and health returns simultaneously. Africa already has the base research capacity and quality to produce viable healthcare assets. The following sections present the results of the economic modelling exercise, as well as key insights from the African health, social and impact investor community around how to structure, coordinate and activate the investment required to realise this new growth frontier.

3. THE RETURNS: ECONOMIC IMPACT OF INVESTING IN HEALTH R&D

In collaboration with scientists, advocates and political leaders across Africa, we co-created a reduced-form ROI model to assess the macroeconomic impact of increased public investment in health R&D in Africa. The model uses the best available global evidence and African parameters to predict economic outcomes of R&D investments and quantifies returns across five investment scenarios over a 20-year horizon (2025–2044) through five economic channels: GDP, employment, private investment, trade balances, and researcher retention. These five economic channels work on different timescales and through different mechanisms, but together they build a picture of an investment that pays out for decades after the initial commitment is made.

Brief overview of the modelling methodology

The model converts a policy input, a decision to increase or decrease public health R&D spending, into economic outputs through three sequential steps. First, annual R&D investments are converted into a cumulative stock of knowledge using the Perpetual Inventory Method (PIM), whereby new spending adds to the stock while existing knowledge depreciates over time at a rate of 12.5%. Second, this accumulated knowledge is translated into economic impact through five parallel channels each operating with its own time lag. Third, the model compares five investment scenarios (S1–S5) (Table 1), with all results expressed relative to the status quo (S1), to illustrate the gains from increased investment or the losses associated with cuts or no investments.

Each step is standard in the economics literature but is made specific to Africa by the parameters applied within each step. Key parameters fall into three categories: (1) borrowed directly from global R&D economics literature, (2) adjusted downward for Africa, and (3) derived from African data sources. Every Africa-specific adjustment makes the model more conservative than global literature would produce.

Applying this framework, the results are presented by examining each of the five economic channels, showing how different investment scenarios shape economic outcomes over time.

Scenario	Investment Level	Rationale
S1: Status Quo	~0.45% GERD, declining post-ODA shock (-2%/yr yrs 1–3, +2%/yr yrs 4+)	Post-2025 baseline reflecting USAID dissolution and UK ODA cuts. The cost of inaction.
S2: Modest Uplift (+25%)	~0.56% GERD, focused on top 5 R&D economies	Achievable near-term from existing budget lines without structural reform.
S3: AU 1% GERD Target	Health R&D to 0.15% GDP by 2030 (2.22× baseline)	The AU's own political commitment. This is the central scenario around which we have built this report.
S4: Shock / Decline (-25%)	Persistent -25% from S1; no domestic substitution	Full cost-of-inaction: donor withdrawal not replaced. Negative ROI by design.
S5: Transformative	Health R&D to 0.30% GDP by 2035 (3.33× baseline)	Stretch scenario to reach global average. Upper bound of plausible returns.

Table 1: Five investment scenarios use in the modelling

In addition, the model includes an eight-scenario matrix (SC0–SC7) that independently varies the parameter package while varying investment levels. This separates investment-level effects from parameter uncertainty. For more details on the key parameters, modelling methodology and references please refer to Appendix I.

The key results: What investment delivers

Each of the following are results modelled under scenario 3 where Africa achieves the continent-wide AU 1% GERD target fully by 2030 and commits 15% of that to health R&D.

When a government funds health R&D, it creates jobs. Directly, it employs scientists, laboratory technicians, clinical trial coordinators, and data analysts. But those direct jobs are only the beginning. The researchers need equipment, which means manufacturing jobs. They need facilities, which means construction and maintenance. They spend their salaries in local restaurants, on school fees, on housing, each creating demand elsewhere in the economy.

The international evidence shows that every $1 million invested in health R&D supports around ten jobs across the economy as a whole. Applied to full implementation of the AU target, our model finds that Africa would support 4.56 million jobs by 2044. These are not temporary construction jobs or short-term stimulus positions. They are sustained, skilled employment in one of the most productive sectors of any modern economy.

Health R&D investment raises the productivity of the broader economy. Research discoveries spill over into adjacent industries. Scientists bring skills that are valuable across sectors. The institutional knowledge built by a functioning research system, regulatory capacity, data infrastructure, and manufacturing standards, increases what African economies can produce and export.

Jobs, and not just in laboratories

4.56m

jobs supported across African economics by 2044

Growth, faster and more resilient

$668b

in nominal terms over the 20-year horizon

137x

total economic return. Every dollar invested returns $137

Our central projection is that full implementation of the AU target would add 0.4 percentage points to Africa's GDP growth rate by 2030 and generate a cumulative GDP gain of $668 billion in nominal terms over the 20-year horizon. The GDP level premium, the difference in absolute GDP between investing and not investing, reaches $71.9 billion per year by 2044. That is an annual figure, not a cumulative total. The gap widens each year. This all translates into an ROI of 137, with every dollar invested returning $137 in total economic value over time.

Public investment brings private money

20%

crowding in rate of private R&D spending

A consistent finding in the R&D investment literature is that public funding attracts private investment rather than displacing it. When governments fund health R&D, they create the platforms, results, trained researchers, and regulatory clarity that private companies need before committing their own capital.

The model finds that every $5 of public health R&D invested generates a private sector multiplier effect, with approximately $1 in private spending following, beginning around year three. Over the full evaluation period, this adds up to $17bn in private capital mobilisation. For development finance institutions and blended finance advocates, this crowding-in effect is central to the investment thesis: public investment in health R&D is one of the most reliable ways to release private capital for African health systems.

Trade, spending less on imports, building capacity to export

$1.9b

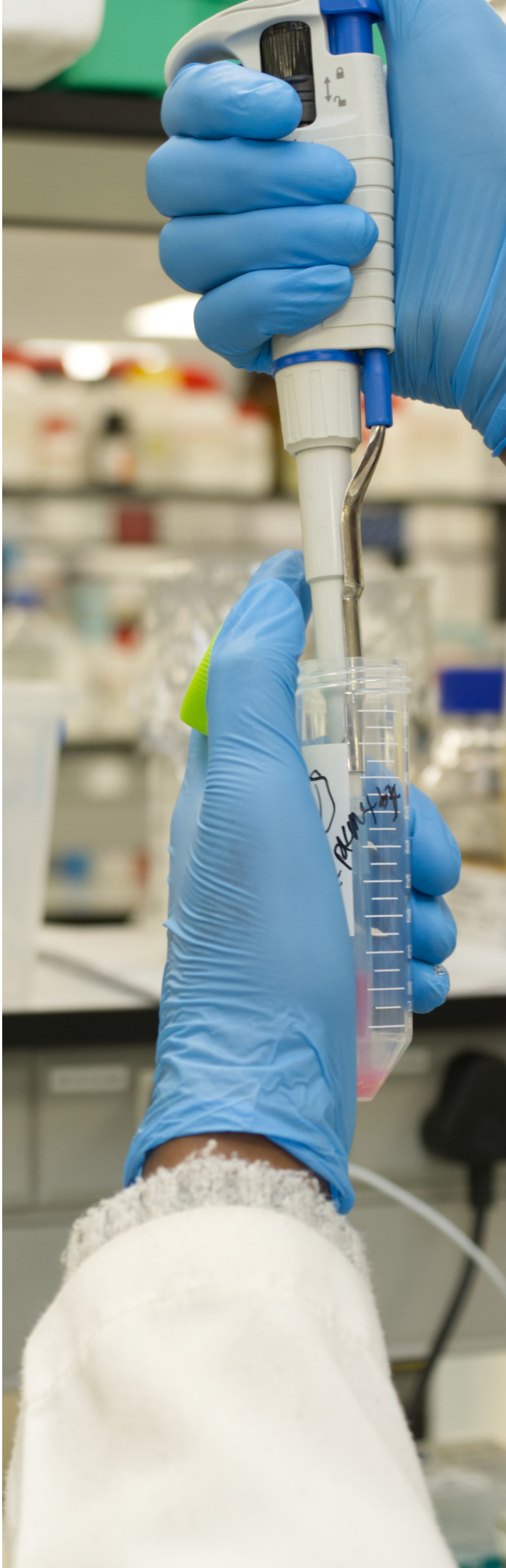
in annual improvement in Africa's trade balance

Africa imports the majority of its pharmaceutical and medical products. Health R&D investment shifts this over time. As domestic capacity builds, countries produce more of what they need and begin to export health technologies to regional markets.

Over the full evaluation period, the cumulative trade balance improvement reaches approximately $14 billion, a persistent reduction in the health import bill and a growing contribution to export revenues.

Underinvestment in health R&D drives talent abroad. Africa trains scientists and researchers at public expense, then loses many to better-resourced institutions elsewhere. This is a rational response to a system that cannot offer competitive infrastructure, salaries, or research opportunities at home.

A stronger domestic system changes that calculation. It creates viable research careers, builds scientific networks, and retains the talent that drives long-run productivity growth. Every researcher who stays contributes to the knowledge base and training pipeline that attract further investment.



CASE STUDY

South Africa: Afrigen and the mRNA Technology Transfer Programme

With total funding of $117 million as of April 2023, the WHO mRNA Technology Transfer Programme is a first-With total funding of $117 million as of April 2023, the WHO mRNA Technology Transfer Programme is a first-of-its-kind model of South-led technology development and South-South knowledge transfer. At its centre is Afrigen Biologics, designated by the WHO and the Medicines Patent Pool in 2021 as the global hub for the mRNA Technology Transfer Programme- producing AfriVac 2121, the first mRNA vaccine designed and developed in Africa.

Knowledge capital and spillovers: Afrigen is advancing six novel vaccine candidates (RSV, Rift Valley Fever, gonorrhoea, HIV, mpox, and tuberculosis), co-developed with SAMRC and South African universities. The WHO mRNA programme has transferred technology to 14 manufacturing partners across six WHO regions, including Egypt, Kenya, Nigeria, Senegal, and Bangladesh — a direct demonstration of the international knowledge spillover mechanism ($\phi_2 = 0.05$).

Brain gain: Afrigen and the Biopharmaceutical Workforce Training Hub (Afrigen, Biovac, CSIR and the South African Medical Research Council (SAMRC)) has built a cadre of molecular biologists, immunologists, and bioprocess engineers working in Africa rather than emigrating. Over 200 scientists from partner countries attended training in Cape Town; 14 of 15 manufacturing partners have received hands-on training at the hub. The University of Cape Town, Stellenbosch University, Biovac, the Council for Scientific and Industrial Research and Wits University's infectious disease programmes extend the pipeline further, training PhD and postdoctoral researchers who remain on the continent.

Why is this relevant: South Africa's broader pharmaceutical manufacturing sector, including Aspen Pharmacare's operations, Biovac, and the Serum Institute partnership with Aspen Pharmacare, shows what becomes possible when an R&D system creates the regulatory science, technical workforce, and process knowledge that manufacturers need. Biovac's mRNA filling capability, brought to commercialisation in 2024, was enabled by the knowledge and quality systems developed through the R&D system. The country's pharmaceutical import deficit (the fifth largest in South Africa's current account) is progressively being addressed as local manufacturing capacity grows. However, the economic returns from manufacturing, jobs, trade balance improvement, FDI attraction, are consequences of the upstream R&D investment, not the investment itself.

South Africa's experience directly supports the findings of this report particularly when it comes to knowledge capital, GDP/TFP, and brain gain channels. It demonstrates that African institutions can conduct frontier R&D, not merely adopt imported technologies, and that this investment generates compounding returns through talent retention, knowledge spillovers, downstream manufacturing capacity, trade and employment benefits.

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Increasing investment in health R&D as a key component of reaching the African Union's target of 1% GERD generates positive economic returns that exceed any reasonable public investment threshold (even under the most conservative assumptions about Africa's institutional and absorptive capacity). It generates a fiscal return of ~35%, meaning that within 10 years, additional tax revenues from growth exceed the cost of borrowing. Discounting all future benefits back to today's money at a 5% rate, the investment produces a net present value of $85.8 billion under a standard cash-flow approach, or $1,007 billion when the full, permanent upward shift in Africa's GDP level is accounted for. See Appendix I for a review of impact figures across each of the modelled scenarios.

When the full, permanent upward shift in Africa's GDP level is accounted for, the investment produces

$1.007b

in net present value under a standard cash-flow approach

When do returns happen?

A common objection to R&D investment is that returns are too distant to matter politically. The data does not support this. In fact, it demonstrates a **breakeven in four years.** Our model traces the timeline of returns year by year. The picture is this:

- **Years 1–3 (2026–2028):** Investment ramps up. Public health R&D spending increases toward the 1% target. The economy does not yet feel the benefits, but knowledge capital is accumulating and the foundation is being built. Job creation in research, trials and manufacturing materialises and early private investment is mobilised.

- **Year 4 (2029):** Breakeven reached. The first economic returns materialise. GDP begins to rise above what it would have been without the investment. Cumulative returns turn positive, and the investment has already begun paying for itself.

- **Year 5 (2030):** The AU 1% target is reached. Investment stabilises. Employment effects are clearly visible. The GDP growth premium has reached 0.4 percentage points above the baseline trajectory.

- **Year 7 onwards:** Trade balance improvements begin as domestic manufacturing capacity builds. Supply chains strengthen and private investment is now flowing in consistently, multiplying the impact of every public dollar.

- **Years 15–20:** Full economic transformation. 4.2 million jobs. $55 billion annual GDP premium and $668 billion overall GDP gain realised. $1.9 billion annual trade balance improvement. The investment made in 2026 is still generating returns and will continue to do so.

What do these results mean?

This is not a distant payoff- it is a near-term economic strategy with compounding returns. These results position health R&D as economic infrastructure, the scale of which is comparable to Africa's telecom and mobile revolution, which today contributes over $220 billion annually to GDP and supports millions of jobs. Health R&D investment offers a similar opportunity to create a new industrial sector, to build export capacity, and to anchor long-term productivity growth. This is not incremental growth. It is structural transformation.

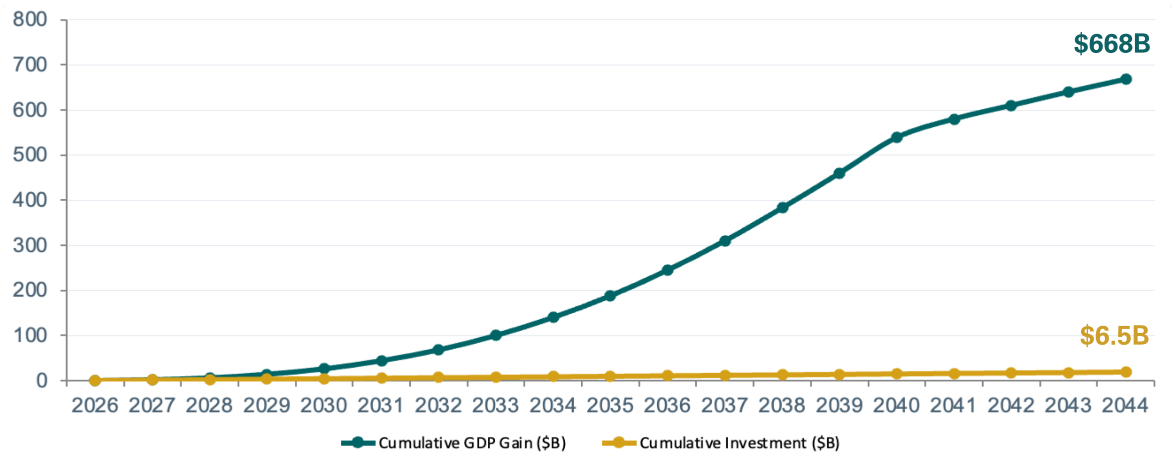

Figure 1. Cumulative GDP gain, 2026-2044

The cost of inaction

If African health R&D spending falls 25% below the current baseline, the continent foregoes over $1.1 trillion in GDP over 20 years. The absence of sufficient investment carries major costs: higher morbidity and mortality, strained health systems, brain drain of skilled professionals, worsening trade imbalances, and missed opportunities for technological leadership. The cost of standing still is not zero.

CASE STUDY

Egypt: Domestic R&D Financing and Pharmaceutical Self-Sufficiency

Egypt is the only African country to have reached the African Union's 1% GERD target — and it did so through state budget financing, not donor support. This makes it a key example for the continent and provides a critical proof-of-concept for the central scenario modelled in this report.

Investment: The Egyptian state has financed health R&D continuously through VACSERA (operational since 1893), the Egyptian Drug Authority (EDA), and a network of 191 pharmaceutical factories with approximately 2,000 associated firms. Gypto Pharma, inaugurated in 2021, added 160 dedicated production lines for novel therapies. Egypt also participates in the WHO/MPP mRNA Technology Transfer Programme, receiving technology from South Africa's Afrigen hub.

Economic returns: Egypt's pharmaceutical exports exceeded $1 billion for the first time in 2023. The government targets this figure to grow to $5 billion by 2030. Pharmaceutical imports fell by approximately $500 million year-on-year in the same period. The country now produces over 94% of the medicines it consumes domestically, demonstrating the import substitution mechanism at scale. In 2024, Egypt achieved WHO Maturity Level 3 regulatory status- one of only four African countries- unlocking export market access across Africa, MENA, and beyond.

Why is this relevant: Egypt's trajectory directly evidences the trade channel and knowledge capital accumulation modelled in Section 3. The technology transfer partnerships with the WHO/MPP mRNA programme and European biopharma firms directly populate the AC_0 absorptive capacity trajectory (it shows what AC_0 improvement looks like in practice when domestic financing enables receptive institutions). It also demonstrates that domestic financing, sustained over decades, can deliver 94% pharmaceutical self-sufficiency and $1B+ in annual exports- the very outcomes this report projects for Africa if the AU 1% GERD target is met.

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4. UNLOCKING INVESTMENT: WHAT NEEDS TO BE BUILT

The economic modelling presented in the preceding chapters makes a compelling case: investing in African health R&D generates extraordinary returns. Yet if the returns are so clear, why has investment not followed? The model projects $17.1 billion in cumulative private R&D crowding-in, with private co-investment beginning around year three at a rate of $0.20 for every public dollar committed. That figure depends on the existence of an ecosystem in which private capital can actually find, assess and commit to opportunities. This chapter draws on qualitative insights from semi-structured interviews with investors, development finance professionals, innovation ecosystem builders and entrepreneurs working across the continent around why that ecosystem does not yet fully exist and what would be required to build it. Their answers converge around a shared view that the problem is not a shortage of African research, nor a shortage of investor interest. There is a need to build a broader ecosystem in which these two aspects can thrive.

> "Investors will not fund science or R&D in isolation. They fund systems that will translate that science into revenue."
>
> - Sarah Ngamau, Managing Director & Partner, Moremi Fund, Kuramo Capital

A core system failure: the missing middle

Africa's health R&D landscape is characterised by a fundamental structural gap. There is a growing base of scientific research (universities, research institutions, and a new generation of trained scientists) producing published work of international quality. Additionally, there is investor capital, ranging from impact funds to development finance institutions, that is actively looking for opportunities on the continent. What does not exist is the connective tissue between them: the ecosystem of incubators, technology transfer offices, clinical trial networks, translational funding, and commercialisation pathways that turn laboratory research into investable products and companies.

Interviewees describe this as “the missing middle”: a structural void that sits between early-stage discovery and the point at which commercial capital can responsibly enter.

This is not a marginal gap. It is a system failure that operates at every stage of the innovation value chain and across every country on the continent. Understanding it, and what is required to close it, is the starting point for any credible investment strategy in African health R&D.

Bottlenecks and barriers

The interviews identify five interlocking barriers that together explain why the missing middle persists.

Weak commercialization pathways. The dominant incentive structure in African universities rewards publication and citation, not commercial outcomes. Researchers have no financial stake in commercialising their work and most institutions lack technology transfer offices or spin-off infrastructure. The result is a large body of research with genuine commercial potential that has never moved beyond the journal article. Reforms that have been shown to work remain the exception rather than the rule. Some examples of models that seem to be working well include Ethiopia’s model of transferring full intellectual property rights to the researcher with royalty-sharing arrangements back to the university, and start-up sabbatical schemes that give researchers paid time to commercialise validated discoveries.

> “We don’t have a shortage of research in Africa, but we have a shortage when it comes to commercialisation. If you ask universities how many spin-offs they have had, the number is negligible”
>
> - Wilfred Njagi,
> Co-Founder and CEO, Villgro Africa

Misaligned incentives across the ecosystem. Incentive misalignment operates at every level: in universities, in regulatory agencies, and among investors. Regulatory bodies across Africa are implicitly incentivised to approve foreign-manufactured products bearing FDA or CE certification, because this reduces their institutional risk. Locally developed innovations face a disproportionate approval burden, not because of weak evidence, but because of structural bias in regulatory culture. As one interviewee notes, there are no KPIs for how many local innovations a regulatory agency has approved or facilitated and approving a locally made device is treated as a burden rather than an achievement. Until these incentive structures are reformed, the pipeline from African research to African-manufactured product will remain blocked at the regulatory stage.

Regulatory fragmentation at continental scale. Africa's 55 countries each operate independent regulatory regimes for pharmaceuticals, medical devices, and clinical trials. A product approved in one country requires full re-approval in every adjacent market. This makes pan-African scale prohibitively expensive and deters investors from backing locally developed innovations that cannot realistically reach the market size needed for commercial viability. Harmonisation efforts, including AUDA-NEPAD's efforts, in collaboration with partners, in leading the African Medicines Regulatory Harmonization Initiative (AMRH), exist but remain fragmented. Interviewees suggest a "poster child" strategy: make harmonisation work in one or two high-capacity markets first, demonstrate results, and then extend progressively under African Continental Free Trade Area frameworks.

Critical gaps in the financing continuum. Even where innovative companies exist and have reached proof of concept, the financing landscape has structural gaps that prevent them from growing to scale. The equity cheque in the USD 2–5 million range (commonly seen as the bridge between seed investment and growth capital) is largely absent from the regional landscape. Many companies are stranded: too large for seed investors, too early and too risky for growth capital. Equally absent is the translational development funding that bridges academic discovery and clinical-stage product development. And perhaps most critically, exit mechanisms including the merger and acquisition markets, IPO pathways, and strategic buyer networks that allow investors to realize returns, are almost entirely undeveloped. Without functioning exit mechanisms, rational investors will not enter. As one interviewee argues plainly:

> “The underestimated bottleneck is exit opportunities. If you don’t get mergers and acquisitions at the end, then investors’ money is tied up and you disenfranchise the entire system”
>
> -Wilfred Njagi,
> Co-Founder and CEO, Villgro Africa

Absence of data infrastructure. Investors cannot allocate capital into markets they cannot see. Africa currently lacks the basic data infrastructure that investment decisions require including unified registries of clinical trials, research outputs, and product pipelines; standardised due diligence frameworks; or publicly available investment flow data. This lack of visibility suppresses investor confidence and leads to duplication of effort across research institutions that are unaware of each other’s work.

What investors say is missing: the ecosystem, not just the product

A recurring and strongly expressed theme across the interviews is that investors are not simply looking for good companies. They are looking for ecosystems- functioning systems of supporting infrastructure that give individual companies the conditions to reach scale. A standalone health technology product, however well designed, will not achieve commercial viability without regulatory pathways that can approve it, skilled workforces that can operate it, supply chains that can distribute it, and follow-on capital networks that can support its growth.

Interviewees describe the components of a functioning health R&D ecosystem in consistent terms. It requires incubators and accelerators that can support early-stage companies through proof of concept. It requires locally embedded fund managers: capital allocators with genuine on-the-ground knowledge, deal-sourcing relationships, and the contextual understanding that remote governance consistently fails to replicate. It requires technical assistance infrastructure: legal, financial, and operational capacity-building for researchers, entrepreneurs, and fund managers who may be technically excellent but lack commercial experience. It requires exit infrastructure that can generate investor liquidity, and it requires the data infrastructure described above.

The implication is that the unit of intervention is not a company or a product, but the ecosystem itself. Public investment that backs individual innovations without simultaneously strengthening the surrounding system is unlikely to generate durable and sustainable returns.

Opportunities: What Africa has that others do not

Against this demanding picture of structural gaps, the interviewees are also clear about the distinctive strengths Africa brings. If activated, these advantages make the opportunity genuinely compelling rather than merely aspirational.

Clinical trials as a strategic platform. Africa's genomic diversity, the global distinctiveness of its disease burden, and the significantly lower cost of conducting trials on the continent constitute a globally competitive advantage that remains almost entirely unrealised. Building clinical trial infrastructure is not simply a health investment: it creates a critical mass of trained scientists, signals investor confidence, anchors the drug discovery pipeline, and builds the regulatory and institutional capacity that broader health R&D requires. Nigeria's Presidential Initiative for Unlocking the Healthcare Value Chain has begun to build this infrastructure and is already attracting interest from major international contract research organisations. Interviewees suggest a counter-intuitive but compelling sequencing logic: rather than waiting for drug discovery to precede trial infrastructure (as in high-income countries), Africa may build clinical trial capacity first, develop its scientific workforce through that process, and create the conditions for domestic drug discovery subsequently.

> “I think if we structure it correctly, the cost of clinical trials in Africa can be significantly cheaper than in the rest of the world. I also think that in Africa we have the added advantage of the genome being quite unique.”
>
> - Kolawole Owodunni, Chief Investment Officer, Nigeria Sovereign Investment Authority

Technology and AI as a leapfrog lever. Digital health, AI diagnostics, drone logistics, and telemedicine represent the most active current frontier of health R&D investment in Africa -a domain in which the absence of legacy infrastructure can be an advantage rather than a constraint. AI-enabled diagnostic tools that screen for tuberculosis via connected stethoscopes, language translation tools that enable clinical interactions across language barriers, and drone delivery networks for medical supplies are all at proof-of-concept to pilot stage and attracting early investor interest. Critically, these opportunities require regulatory frameworks to keep pace; the same regulatory fragmentation that blocks pharmaceutical innovation also risks blocking digital health deployment.

Africa's demographic trajectory as investable capital. Interviewees consistently reframe Africa's large and growing population, projected to reach two billion by 2050, with one in four people globally being African, as a strategic investment asset rather than a development challenge. A large and growing market, a unique disease profile, a distinctive genetic resource, and an expanding workforce of trained scientists constitute a combination that no other region of the world can offer. As one interviewee argues:

> If I were to make the case for investing in R&D in Africa today, I would not start with risk or gaps - I would start with talent; with a young, rapidly growing population being trained to compete at the highest global level of innovation.
>
> -Almaz Negash, Executive Director, African Diaspora Network

The diaspora is technically skilled, globally networked and often motivated to invest in countries of origin, representing a further underutilised asset, for which structured pathways into health R&D financing and governance remain largely undeveloped.

The architecture of investment that can unlock the system

Across the interviews, a clear architecture emerges for the kind of investment that could close the missing middle and activate Africa's health R&D potential. It has three interlocking components.

Public and philanthropic funding must absorb early-stage risk. There is convergence among interviewees that commercial capital cannot and should not enter the earliest stages of health R&D without strong public and philanthropic de-risking. Grants and concessionary capital must anchor discovery through proof of concept, just as they do in high-income countries where the transition to commercial financing typically occurs around phase two of clinical development. What Africa currently lacks is the public financing infrastructure to adequately fund these earlier stages. Establishing revolving national research funds, with clear commercialisation metrics but without short-term return pressure, is identified as a foundational requirement.

Blended finance structures must bridge the transition to commercial capital. Once de-risking has occurred, the financing gap requires purpose-designed blended instruments: first-loss capital tranches that protect commercial investors' returns up to a defined threshold, priority review vouchers that can change the economics of late-stage trials for neglected diseases, and bridge financing mechanisms for fund managers who need to close transactions while still fundraising. Time horizons must likely target 10 to 20 years, which is comparable to drug development timelines globally. Fund structures must be designed accordingly, with longer fund lives, milestone-based interim liquidity events, and catalytic capital classes that are explicitly designed to absorb early losses in exchange for later system-level gains.

Public investment must shape the market, not just fund individual outputs. Perhaps the most important insight from the interviews is that investor confidence is not primarily driven by individual investment opportunities. It is driven by signals from governments and public institutions that a market is open, supported, and safe. Tax incentives, political risk insurance, regulatory KPIs for local innovation, and coordinated demand signals (such as regional pooled procurement and advance purchase commitments) are the instruments through which public actors create the conditions for private capital to follow. This market-shaping function is distinct from the direct funding of research, and it is as important.

> "You cannot ask Africa to deliver your return on investment in three years when we did not have the infrastructure to begin with."
>
> -Almaz Negash, Executive Director, African Diaspora Network

CASE STUDY

Rwanda: BioNTech mRNA Facility and Blended Finance in Practice

The BioNTech mRNA vaccine manufacturing facility in Kigali is the largest health R&D-related FDI commitment in sub-Saharan Africa outside South Africa. It is also the clearest real-world demonstration of blended finance unlocking private health R&D investment on the continent.

Investment and structure: BioNTech has invested approximately $150 million in the Kigali facility, with construction beginning in June 2022 and the first BioNTainer modular manufacturing units inaugurated in December 2023. The project attracted €95 million in blended financing from the European Investment Bank and European Commission (€35M grant + €60M loans), €130 million from CEPI for vaccine development, and a further €40 million in EU Global Gateway support for workforce training and supply chains. Total committed capital: over $500 million across public, concessional, and private sources.

Employment and technology transfer: The facility employs approximately 100 specialised staff in its initial phase, with training coordinated from BioNTech's German sites covering mRNA production, quality assurance, and laboratory operations. Initial production capacity is 50 million vaccine doses per year, targeting malaria, tuberculosis, HIV, and mpox- diseases with the highest burden in Africa.

Blended finance model: The investment package demonstrates a leverage ratio of approximately 3–4:1 (public concessional finance to private investment), directly consistent with the crowding-in elasticity ($\gamma_1 = 0.20$) used in the model in Section 3. Public de-risking — through EU guarantees, EIB lending, and CEPI commitments — created the conditions for BioNTech's commercial capital to follow. This is the architecture this report advocates: public investment absorbs early risk; blended instruments bridge to commercial capital.

Key References

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Urgency: the window is real

Interviewees are consistent in their assessment that the current moment is genuinely urgent and simultaneously opportune. The deterioration of the global aid landscape, marked by substantial declines in ODA and the withdrawal of major donors, exposes the structural fragility of a health R&D system built on external dependency. But the same moment that has created this vulnerability has also created the political conditions for change: a continental reform agenda with genuine momentum, a growing body of African-led capital and expertise, and a global reconfiguration of supply chains that makes distributed, regional innovation more attractive than it has ever been.

A recurring and strongly expressed conviction across the interviews is that externally driven R&D (designed, funded, and owned by high-income country actors) perpetuates dependency rather than building durable African capacity. The case for African-led ownership of the innovation pipeline with African IP, African fund managers, African regulatory approval, and African-manufactured products, is not only a matter of equity. It is also the architecture that will generate the domestic returns, the retained talent, and the institutional strength that make health R&D investment self-sustaining over time.

The economic evidence presented in this report demonstrates that the returns from getting this right are extraordinary.

The investors and ecosystem builders interviewed for this report are not describing an impossible system. They are describing one that does not yet fully exist, but that is already being built, in parts, across the continent. The pieces are visible: a reform agenda with political momentum and African leadership, a generation of African scientists and entrepreneurs ready to lead, a growing community of impact investors looking for the right entry points, and an economic case that is rigorously quantified. What has been missing is not ambition or evidence. It is coordination, commitment, and the translation of insight into action. The following chapter sets out concrete steps that governments, funders, and regional institutions can take now to turn this window of opportunity into a durable, self-sustaining health innovation economy for Africa.


REPUBLIC OF ZAMBIA
MINISTRY OF HEALTH
CHILANGA DISTRICT
MOUNT MAKULU URBAN HEALTH CENTRE
YEAR
2025
ADMISSION
SKILLED DELIVERED
BBA
SVD
BREECH
MD
TWIN
PREMATURITY
OFFICE
REPUBLIC OF ZAMBIA
MINISTRY OF HEALTH
UNFPA
jhpiego

CASE STUDY

Kenya: KEMRI, a Regional Anchor for Health R&D Capacity

Kenya's health research ecosystem offers one of the clearest examples of how sustained investment and strategic partnerships can build world-class research capacity in Africa, with spillover benefits across the region.

The returns of sustained investment: The Kenya Medical Research Institute (KEMRI), established in 1979, has grown into one of Africa's leading centres of excellence. It operates 15 research centres across the country, employing between 1,000 and 5,000 staff across centres. Kenya invests approximately 0.8% of its GDP in R&D - the second highest on the continent- and the KEMRI-Wellcome Trust Research Programme (KWTRP) has become a leading hub for health systems research, clinical trial training, and PhD development, producing researchers who remain in-country.

The EU Horizon Europe-funded GC ADDA and RAFIKI networks position Kenya as East Africa's leading translational drug discovery hub. KEMRI has contributed to health research capacity development across the East African region, hosting the East African Health Research Commission's activities, the African Journal of Health Sciences, and regional training programmes on disease control (KEMRI, 2022). Kenya's clinical trial infrastructure, anchored by KEMRI and its international partnerships, attracts substantial foreign investment in health research. International pharmaceutical companies and product development partnerships conduct trials through KEMRI's network, bringing research funding, technology, and expertise into the country. The KEMRI-based drug discovery consortium (part of the EU Horizon Europe-funded GC ADDA and RAFIKI networks) puts Kenya as East Africa's leading hub for translational drug discovery.

Sustaining and scaling the model: While KEMRI's trajectory illustrates what is possible, it also highlights the importance of sustained and balanced financing models. Despite its scientific strength, KEMRI receives only around 14% of its budget from the domestic Treasury. The downward trend of bilateral support has created an acute funding crisis: critical research projects risk being delayed or halted. Kenya's stated commitment (2% of GDP to R&D under the 2013 Science, Technology and Innovation Act) remains unmet. Actual spending stands at 0.8%, and the funding allocated for health R&D has been 83% below government commitments. Strengthening domestic investment, aligned with Kenya's existing policy commitments, would help consolidate gains and ensure long-term sustainability.

Why is this relevant: The KEMRI ecosystem demonstrates that African institutions can build world-class research capacity when investment is sustained. The funding crisis that followed the decline of bilateral support demonstrates, with equal clarity, that capacity built on external financing is inherently fragile. Closing the gap between Kenya's statutory commitment and its actual spend would not just consolidate KEMRI, it would validate the investment logic this report makes for every African government considering the same step.

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5. CALLS TO ACTION: TURN AMBITION INTO INVESTMENT

The economic case is strong. The opportunity is real. Now is the moment to turn ambition into investment- moving from political commitment to funded, coordinated action across a shared system. This requires prioritising three main actions:

1. Build the foundations of a functioning market

Led by governments

- **Enshrine the African Union's 1% GERD target in national budgets,** with a protected minimum allocation of 15% for health R&D.

- **Actively shape the national and regional markets.** Beyond direct funding, governments must play an active market-shaping role, deploying the full set of policy tools available to the public sector: tax incentives, political risk guarantees, advance purchase commitments, and coordinated regional procurement. These signals are what convert policy intent into investable opportunity.

- **Strengthen regulation and align incentives.** Essential reforms include:
  - regulatory frameworks updated and harmonised under AfCFTA, ideally updated with explicit KPIs for rates of local innovation approval
  - shifting IP ownership toward researchers, with royalty-sharing arrangements that align academic and commercial incentives.

- **Invest in core data systems.** All these must be underpinned by investment in foundational data systems and infrastructure to track R&D investment, spending, pipelines, clinical trials, and outcomes. Without credible and interoperable data, investments cannot be effectively targeted, risks cannot be assessed, and returns cannot be demonstrated. Strengthening data systems is therefore a prerequisite for scaling investment.

2. Orchestrate a continental investment system
Led by Africa CDC

- **Develop a co-created continental investment blueprint.** Articulate a continental health R&D investment blueprint that translates strategic priorities into a structured pipeline of investable opportunities, with clearly defined capital needs and risk-sharing structures.

- **Market coordination platform.** Aggregate investment opportunities across countries and regions, actively orchestrating alignment across national efforts, reducing fragmentation and creating scale-efficient investment propositions that improve investor confidence and reduce transaction costs.

- **Convene partners to align capital, priorities and execution.** Convene a continental health R&D investment summit, bringing together governments, DFIs, and private investors to align on priorities, financing mechanisms, and implementation pathways.

3. Deploy capital to match the reality of health R&D

Co-led by Africa CDC, DFIs, investors, advocates and other ecosystem actors

- **Blend financing mechanisms.** With the right foundations and signals in place, capital must be structured to match the realities of health R&D. Development finance institutions and private investors should align with the continental investment blueprint and co-design blended finance vehicles with genuinely catalytic first-loss tranches that absorb early-stage risk and crowd in commercial capital.
- **Plan for realistic timelines.** Fund structures must reflect long development cycles, typically 10 to 20 years, supported by milestone-based liquidity mechanisms. Equally important is the deliberate development of exit pathways, including M&A facilitation, strategic buyer networks, and special purpose vehicles. Without credible exit infrastructure, capital cannot be recycled, and the system cannot scale.
- **Invest in shared public goods:**
  - **Integrated data infrastructure:** A unified, publicly accessible registry of clinical trials, research outputs, and R&D investment flows should be established to strengthen transparency, enable due diligence, and signal market maturity to investors and policymakers.
  - **Strategic trial and research platforms:** Clinical trial and research infrastructure should be treated as a strategic continental asset rather than a fragmented service function, designed to generate scientific capacity, credible evidence, and investable proof points that build investor confidence over time.
  - **Success narratives and visibility systems:** Africa's health R&D successes should be systematically documented, amplified, and celebrated through sustained visibility mechanisms, recognising that investor and policy perceptions are shaped not only by data and returns, but also by credible, consistent demonstration of impact.

Africa is not starting from zero. The science, the talent and the demand exist, but what has been missing is the system to connect them.

This report shows what happens when that system is built: a $668 billion opportunity, millions of skilled jobs, and a health innovation ecosystem that serves African populations on African terms.

The window is open and the priorities are clear. The only question now is whether ambition will finally be matched by coordinated investment and collective.

APPENDIX I. MODELLING METHODOLOGY

Overview

The model converts a policy input, a decision to increase or decrease public health R&D spending, into economic outputs through three sequential steps. Each step is standard in the economics literature; the Africa-specific work lies in the parameters applied within each step.

1.1 The Three Steps

Step	Name	What It Does
1	Turn money into knowledge	Annual R&D spending accumulates into a knowledge stock using the Perpetual Inventory Method (PIM). The stock grows with investment and shrinks with depreciation
2	Turn knowledge into economic effects	The knowledge stock flows through five parallel economic channels: GDP/productivity, employment, private investment crowding-in, trade, and brain gain. Each channel has its own time lag.
3	Compare five futures	Five investment scenarios (S1–S5) are run. All outputs are expressed as differences from the status quo (S1), framing results as gains from investing or losses from cutting.

1.2 The Five Economic Channels

Each channel activates at a different point in time, reflecting evidence on how R&D investment transmits through an economy.

Channel	Activates	Mechanism
GDP / Productivity	Year 4 (3-yr lag)	Knowledge raises TFP, which raises GDP.
Employment	Year 3 (phased)	Direct research jobs plus indirect jobs. GDP-linked employment via output-employment elasticity.
Private Investment	Year 3	Public R&D de-risks the investment environment, attracting private co-investment.
Trade	Year 7 (long-term)	Domestic R&D reduces pharma imports and grows health product exports.
Brain Gain	Year 5	Stronger R&D environment retains scientists and attracts diaspora. Valued at $25,000/yr average researcher salary.

1.3 Key Model Parameters

Parameters fall into three categories: (1) borrowed directly from global R&D economics literature, (2) adjusted downward for Africa, and (3) derived from African data sources. Every Africa-specific adjustment makes the model more conservative than global literature would produce.

Parameters Borrowed from Global Literature

Parameter	Value	Source
R&D knowledge elasticity (α_3)	0.15	Guellec & van Pottelsberghe (2004); Hall et al. (2010)
R&D-to-TFP time lag (τ)	3 years	Pakes & Griliches (1984); Sena (2004)
Physical capital elasticity (α_3)	0.38	Penn World Tables 10.01
Labour elasticity (α_3)	0.52	Penn World Tables 10.01
Social discount rate	5%	Ramsey rule; AfDB (2021); IMF SSA guidance

Parameters Adjusted Downward for Africa

Parameter	HIC Benchmark	Africa Value	Reason
Absorptive capacity (AC_0)	0.70–0.85	0.35	Composite of 5 Africa-specific indices. Raw composite; institutional uplift removed per review committee.
Crowding-in elasticity (γ_1)	0.85–0.90	0.20	Early-stage private health R&D sector; weak IP enforcement; limited venture capital.
Additionality factor (α)	0.85–0.90	0.75	Governance constraints; absorption risks.
Knowledge depreciation (δ)	10–15%	12.5%	Africa's mixed basic/applied research composition. Midpoint judgment.

Parameters Derived from African Data

Parameter	Africa Value	Source
Baseline health R&D	$2,073M	IMF WEO GDP × UNESCO GERD (0.45%) × WHO health share (15%)
Researcher salary	$25,000/yr	WHO HRH data; validated vs SA DSI Survey 2022/23
Employment intensity (θ_1)	10 jobs/$1M	UNESCO UIS; ILO Africa (higher than HIC 5–7 due to lower salaries)
Pharma import dependence	70%; $17.4B	AU Pharmaceutical Manufacturing Plan; UNCTAD 2023
Import growth rate	8%/yr	IQVIA Africa 2023
Output-employment elasticity	0.40	ILO SSA (0.35–0.55); AfDB (2018)

Scenarios

2.1 Five Investment Scenarios

The model runs five scenarios representing distinct policy choices. All results are expressed relative to Scenario 1 (status quo).

Scenario	Investment Level	Rationale
S1: Status Quo	~0.45% GERD, declining post-ODA shock (-2%/yr yrs 1–3, +2%/yr yrs 4+)	Post-2025 baseline reflecting USAID dissolution and UK ODA cuts. The cost of inaction.
S2: Modest Uplift (+25%)	~0.56% GERD, focused on top 5 R&D economies	Achievable near-term from existing budget lines without structural reform.
S3: AU 1% GERD Target	Health R&D to 0.15% GDP by 2030 (2.22× baseline)	The AU's own political commitment. Central advocacy scenario.
S4: Shock / Decline (-25%)	Persistent -25% from S1; no domestic substitution	Full cost-of-inaction: donor withdrawal not replaced. Negative ROI by design.
S5: Transformative	Health R&D to 0.30% GDP by 2035 (3.33× baseline)	Stretch scenario to reach global average. Upper bound of plausible returns.

Scenario Descriptions

- **S1- Status Quo:** The baseline against which all other scenarios are measured. Africa continues at ~0.45% GERD with declining donor flows following the 2025 ODA contraction. The model applies a −2%/yr real growth trajectory for years 1–3, reflecting USAID dissolution and UK ODA cuts, recovering to +2%/yr from year 4 onward as partial domestic substitution occurs. NPV is zero by definition; S1 is the cost of doing nothing.

- **S2- Modest Uplift (+25%):** A 25% increase in health R&D investment concentrated in Africa's strongest R&D economies, bringing GERD to ~0.56% GDP. This is the near-term achievable scenario- reachable from existing budget lines without structural reform or new political commitments. Used as the pragmatic lower bound for discussions with finance ministries.

- **S3- AU 1% GERD Target:** The central advocacy scenario and the primary reference case throughout this report. Health R&D reaches 0.15% of GDP by 2030, approximately 2.2× the current baseline, consistent with the AU's own political commitment. This scenario supports the headline BCR of 137× and NPV of $1,007B.

- **S4- Shock / Decline (-25%):** Models a persistent 25% fall from the S1 baseline with no domestic substitution for donor withdrawal, with GERD falling to 0.34%. This scenario is designed to produce a negative return and is the primary vehicle for quantifying the full economic cost of inaction. NPV is negative by design.

- **S5-Transformative:** The upper-bound stretch scenario. Health R&D reaches 0.30% of GDP by 2035, approximately 3.3× the current baseline and equivalent to the global developing-country average. Returns are large but require sustained multi-year political commitment and private co-investment. Presented to illustrate maximum plausible upside, not as an advocacy target.

The figures reported refer to S3, which is the current AU target. Note: The S3 scenario requires health R&D spending to reach approximately $5.3 billion per year by 2034, roughly 2.2 times the 2025 baseline of $2.1 billion. This pace of scale-up is the primary execution risk in the central scenario. It requires multi-year budget commitments across AU member states, not a single policy decision. The absorptive capacity parameter (AC0 = 0.35) partially captures the institutional constraints on how quickly new investment translates into productive research activity. Governments seeking to reach S3 within the modelled timeframe should treat institutional capacity-building as a prerequisite investment, not a downstream benefit.

Results

All incremental figures shown vs Scenario 1 (Status Quo). 3% social discount rate (central).

3.1 Investment Profile

Indicator	S1: Status Quo	S2: Modest +25%	S3: AU 1% GERD	S4: Shock -25%	S5: Transformative 2%
Health R&D Investment 2034 ($M)	$2,197M	$2,746M	$5,336M	$1,648M	$6,420M
Health R&D Investment 2044 ($M)	$2,678M	$3,348M	$6,504M	$2,009M	$5,990M
Knowledge Capital Stock 2044 ($M)	$18,834M	$23,542M	$32,898M	$14,125M	$44,872M

3.2 GDP Effects

Indicator	S1	S2	S3 (central)	S4	S5
Cumul. Incremental GDP vs S1 - 10 yr ($B)	-	$300.4B	$135.7B	-$366.3B	$303.4B
Cumul. Incremental GDP vs S1 - 20 yr ($B)	-	$905.9B	$668.2B	-$1,099.1B	$2,708.7B
GDP Multiplier at 2044 (vs S1)	1.00x	1.011x	1.010x	0.987x	1.050x

A note on the GDP multiplier figure: the multiplier at 2044 of 1.010x reflects the ratio of total GDP levels in S3 versus S1 in that single year. Because GDP is a large base (over $8 trillion by 2044), a 1% level difference represents approximately $80 billion in annual output. The $668 billion cumulative figure is the sum of annual level premiums across all 16 benefit years from 2029 to 2044. The small persistent annual gains, compounded over time, produce large cumulative totals.

3.3 Employment Effects

Indicator	S1	S2	S3 (central)	S4	S5
Total Employment Effect 2034 ('000 jobs)	-	1,101	3,007	-	11,001
Cumul. Job-Years vs S1- 20 yr ('000 j-yrs)	-	5,492	17,550	-	15,714

3.4 Private R&D Crowding-In

Indicator	S1	S2	S3 (central)	S4	S5
Annual Private R&D Induced 2044 ($M)	-	$364M	$2,079M	-$364M	$1,800M
Cumul. Private R&D Induced- 20 yr ($B)	-	$3.1B	$17.1B	-$3.1B	$34.8B

3.5Trade / Import Substitution

Indicator	S1	S2	S3 (central)	S4	S5
AnnualTrade Benefit 2044 ($B/yr)	-	$0.7B	$1.87B	-$0.7B	$3.4B
Cumul.Trade Balance Improvement- 20 yr ($B)	-	$5.9B	$14.2B	-$5.9B	$29.5B

3.6 Brain Gain / Researcher Retention

Indicator	S1	S2	S3 (central)	S4	S5
Cumul. Value of Retained Researchers- 20 yr ($M)	-	$17.4M	$98.2M	-$17.4M	$107.9M

3.7 Fiscal Returns & ROI

Indicator	S1	S2	S3 (central)	S4	S5
Cumul. Tax Revenue from Delta_Y - 10 yr ($B)	-	$38.7B	$18.1B	-$47.1B	$38.5B
Economic ROI - $ per $1 invested (10 yr, 3%)	-	$54.7	$6.9	$66.5	$14.0
Economic ROI - $ per $1 invested (20 yr, 3%)	-	$74.5	$12.2	$90.0	$40.2

3.8 Cost of Inaction (S4 vs S1)

Indicator	Value	Notes
GDP Foregone vs S1 - 10 yr ($B)	$366.3B	Economic cost of donor withdrawal without domestic response
GDP Foregone vs S1 - 20 yr ($B)	$1,099.1B	Primary cost-of-inaction headline figure

3.9 Channel-by-Channel Breakdown

GDP / Productivity Channel
The GDP channel is the dominant economic pathway, driving approximately 45% of total returns. Through the TFP mechanism, the growing knowledge stock raises economy-wide productivity. Under v8 parameters (effective elasticity α_3_eff = 0.15 × 0.35 = 0.0525), the model projects:

Timepoint	GDP Increment ($B)	Cumulative Nominal ($B)
2030 (Year 5)	~$14.9B	-
2035 (Year 10)	~$44.6B	-
2040 (Year 15)	~$55.5B	-
2044 (Year 20)	~$71.9B	~$668.2B

Note: Annual GDP increment figures at 2030, 2035, and 2040 represent point-in-time year values - the additional GDP generated in that specific year relative to S1. Cumulative nominal GDP ($668.2B) is shown at the terminal year (2044) only, representing the full 20-year horizon sum of annual increments (2029–2044, undiscounted). Partial-period cumulative figures are not shown as they would be incomplete sums and potentially misleading at non-terminal milestones. M1 TFP channel only.

Employment Channel
The employment channel captures both direct R&D jobs (10 per $1M invested- higher than HICs due to lower salaries) and indirect/induced jobs through supply chain multipliers (2.0× at full phase-in). A second component links GDP growth to labour market expansion via the output-employment elasticity (0.40). At full maturity (2044), the model projects approximately 4.56 million jobs under the confirmed parameters.

Private Investment Crowding-In
Public health R&D signals opportunity and de-risks the investment environment, attracting private co-investment. The crowding-in elasticity (γ_1=0.20) is set well below the HIC benchmark (0.85–0.90) because Africa's private health R&D sector is early-stage. This is the most conservative channel. Even so, it generates cumulative private R&D over the 20-year horizon.

Trade / Import Substitution
Africa currently imports approximately 70% of its health commodities, a $17.4B annual bill growing at 8% per year. As domestic R&D capacity grows, the model projects reductions in this import bill and growth in health product exports. The 5-year manufacturing lag reflects the reality that moving from R&D to manufactured product requires regulatory approval and scale-up. By 2044, the annual trade benefit is estimated at approximately $1.87B/yr under central parameters.

Brain Gain / Researcher Retention
A stronger R&D environment retains scientists who would otherwise emigrate and attracts diaspora researchers back. Valued at an average researcher salary of $25,000/year, the brain gain channel contributes 8–12% of total returns. While the smallest channel, it represents a real shift: from losing human capital to building it.

3.10 The Cost of Inaction

Scenario 6 (Budget Cut) shows what Africa loses if health R&D investment declines by 25% from the status quo. Under this scenario, the NPV is-$40B, the BCR falls below 1×, and the continent loses approximately 900,000 jobs by 2040. This reflects the trajectory implied by continued donor withdrawal without domestic substitution.

Sensitivity Analysis and Robustness

This section tests how sensitive the headline results are to changes in the model's key structural assumptions. This section varies the parameters most likely to be contested, including absorption capacity (AC0), the R&D-to-TFP elasticity (alpha3), implementation lag, and the discount rate, across plausible ranges drawn from the empirical literature. The purpose is to establish that the core findings hold across a wide range of assumptions, and to identify which parameters drive the most variation in outcomes, so that analytical attention and future data collection can be directed accordingly. The results confirm that the central case is robust and that even under pessimistic assumptions the returns to investment remain strongly positive.

4.1 One-Way Sensitivity

Each parameter is individually varied between its low and high bounds while holding all others at central values. The table below ranks parameters by their impact on headline GDP outputs.

Parameter	Low	Central	High	Impact
R&D elasticity (α_3)	0.10	0.15	0.20	HIGHEST impact
Absorptive capacity (AC_0)	0.35	0.35	0.65	HIGHEST
proportional				
TFP time lag (τ)	2 yr	3 yr	5 yr	HIGHEST- 2yr: +19%; 5yr:-37%
Depreciation (δ)	10%	12.5%	15%	HIGH
Crowding-in (γ_1)	0.10	0.20	0.35	HIGH
Discount rate (r)	3%	5%	8%	HIGH- on NPV
Import subst. (ε_IS)	0.05	0.08 ✓	0.25	HIGH
Employment mult. (Ω)	1.5×	2.0×	2.5×	MEDIUM
Additionality (α)	0.65	0.75 ✓	0.90	MEDIUM

4.2 Joint Sensitivity- GDP Impact (S3 Central)

The joint sensitivity table shows how headline GDP outputs change when multiple parameters vary together. This reveals whether the direction of the finding holds under pessimistic combinations.

Variant	2030 ($B)	2040 ($B)	2044 ($B)	Cumul. ($B)
Conservative ($α_3$=0.10, AC=0.35, τ=4)	$4.5B	$33.4B	$42.0B	~$390B
Low $α_3$ only (0.10)	$9.9B	$44.3B	$47.9B	~$545B
Central ($α_3$=0.15, AC_0=0.35, τ=3)	$14.9B	$55.5B	$71.9B	$668.2B
High AC only (0.65)	$19.5B	$82.0B	$93.5B	~$1,065B
Short lag only (τ=2)	$22.3B	$75.2B	$85.9B	~$975B
Optimistic ($α_3$=0.20, AC_0=0.65, τ=2)	$30.6B	$126.0B	$143.4B	~$1,600B

M1 TFP channel only. Total GDP impact including all channels approximately 1.8–2.5× larger.

4.3 NPV Sensitivity to Discount Rate

Discount Rate	NPV of M1 GDP Gains ($B)	Ratio to R&D Cost (~$7.4B)
3% (public good)	$636B	~76×
5% (AfDB central)	$458B	~62×
8% (sovereign cost)	$287B	~46×
10% (commercial)	$213B	~36×

Key finding: Even at a 10% commercial discount rate, the M1 channel alone returns 36× the public investment cost. The investment case holds across all tested discount rate assumptions.

4.4 Monte Carlo Simulation

The model includes a Monte Carlo framework (10,000 iterations recommended) drawing all key parameters simultaneously from uniform distributions across their low–high ranges. The model is designed so that even at the 10th percentile of outcomes, the direction of the finding for S3 versus S1 does not reverse.

Key findings from the 10,000-run simulation:

- P(BCR all channels > 5×): 100% -- not a single simulation produces a BCR below 5×
- P(BCR all channels > 10×): 100% -- returns exceed $10 per $1 in every run
- Median BCR: ~60× (stock-level framing consistent with advocacy BCR range)
- The 5th to 95th percentile range is tight (44× to 79×), indicating the investment case is robust across the full parameter space, not just at central values
- AC0 (absorptive capacity) is by a significant margin the single largest driver of output uncertainty- which is consistent with the model design and supports the argument for institutional investment alongside R&D spend

Methodological note: the simulation uses a reimplemented version of the core PIM + Cobb-Douglas equations to allow 10,000 iterations to run in seconds. The BCR outputs align with the stock-level advocacy framing (cumulative GDP level premium discounted / PV costs) rather than the annual-flow DCF approach in METRICS.

Parameters are sampled from triangular distributions bounded by [low, central, high]. Model computes a simplified 20-year PIM knowledge stock, GDPTFP effect (Cobb-Douglas), employment (output-employment elasticity), and trade (reduced-form elasticity with manufacturing lag). Each iteration independently samples all 12 parameters. The simulation does not vary the S3 investment trajectory (AU 1% GERD)- only the structural parameters governing economic returns.

Parameters Used

5.1 Known Limitations

Limitation	How Addressed	Effect on Conclusions
UNESCO GERD data covers only 19/55 AU states	Sensitivity range ±30%; triangulated with G-FINDER and AUDA-NEPAD data	Directional finding unchanged
Channels modelled separately; interactions not captured	Conservative channel multiplier (2.2×) applied	Outputs likely conservative
No health outcomes (DALYs, lives saved)	Deliberately excluded; economic returns only	All outputs are economic floor estimates
Uniform policy implementation assumed	Absorptive capacity range (0.35–0.65) captures heterogeneity	Continental aggregate may overstate weak states
Trade elasticities have limited Africa-specific evidence	Conservative estimates; wide sensitivity range	Trade results are directional

5.2 Parameters Used

Parameters- Full Set

#	Parameter	Confirmed Value	Basis
1	Health R&D share of GERD	15%	WHO R&D Observatory Africa median 14.4%. No further revision.
3	Absorptive capacity (AC_0)	0.35	Raw composite. Institutional uplift (+0.15) formally rejected.
4	Import substitution elasticity (ε_IS)	0.08 (single value)	UNIDO lower bound. Resolves M5/M_TRADE inconsistency. Most conservative defensible.
5	Crowding-in elasticity (γ_1)	0.20	Appropriate for Africa's early-stage private health R&D sector. Affects crowding-in channel only.
6a	R&D spend per FTE	$45,000/yr	South Africa DSI 2022/23 as continental anchor. OECD Frascati Manual Africa-adjusted.
6b	Indirect employment multiplier (ψ)	2.5×	OECD (2013); Moretti (2010); ILO (2013). 1 R&D FTE → 2.5 indirect jobs.
7	Additionality factor (α)	0.75	Conservative vs HIC (0.85–0.90). Sensitivity range 0.65–0.90 now formally populated.

Parameter Description

Import substitution elasticity (ε_IS = 0.08). the UNIDO lower bound. This resolves the internal inconsistency between M5_TRADE (0.08) and M_TRADE (0.12): a single value of 0.08 now applies across all trade modules. The 0.08 value implies that a 1% increase in the knowledge stock ratio reduces health commodity imports by 0.08%- a conservative estimate that reflects regulatory barriers, existing multinational supply chains, and the manufacturing scale-up lag (5 years) before import substitution can materialise. The primary advocacy weight for the trade channel rests on the import dependence fact ($17.4B, 70% imported) rather than the elasticity magnitude.

Crowding-in elasticity (γ_1 = 0.20). Determined as appropriate for Africa's current market conditions. Every dollar of public health R&D investment is estimated to crowd in 20 cents of private R&D- less than a quarter of the HIC benchmark of 0.85–0.90. This conservative calibration reflects Africa's near-zero baseline of private health R&D activity, weak intellectual property enforcement regimes, and the limited venture capital market for health innovation on the continent. Sensitivity range 0.10–0.35 is retained; the upper bound of 0.35 represents a plausible optimistic case if AfCFTA creates private investment incentives.

R&D spend per FTE ($45,000/yr). Determined using the South Africa DSI Annual R&D Survey 2022/23 as the continental anchor- the most thorough country-level dataset available on the continent. The $45k figure is a weighted average across postdoctoral researchers, senior scientists, and research support staff, adjusted for the wide salary range across AU member states ($30k in fragile-state university settings to $65k in hub institutions such as KEMRI, NRF, and EDCTP-funded centres). This is approximately one-third of the OECD average, reflecting lower wages, shared infrastructure, and the dominance of academic over industry research in Africa's current R&D landscape.

Indirect employment multiplier (ψ = 2.5×). 2.5 indirect jobs per direct R&D FTE. This multiplier captures supply chain linkages (laboratory equipment, reagents, IT services), service-sector spending by employed researchers, and downstream manufacturing associated with R&D outputs. The 2.5 central value is drawn from OECD (2013) R&D sector input-output modelling and Moretti (2010) and ILO (2013) knowledge cluster analysis; it sits at the lower-middle of the empirical range (1.5–4.0), avoiding the cluster-development upper bound that would require sustained multi-year ecosystem investment beyond the current scenario.

Additionality factor (α = 0.75). Determined at 0.75, with the sensitivity range 0.65–0.90 now formally populated in the SENSITIVITY sheet (previously blank in row 19). The additionality factor asks how much of each new public dollar of health R&D constitutes genuinely new research activity rather than displacing spending that would have occurred regardless. The 0.75 central value is conservative relative to the HIC literature consensus of 0.85–0.90, calibrated to reflect governance constraints and the risk that some funds are absorbed as institutional overhead rather than translating into research activity. David, Hall & Toole (2000) established the econometric framework; Rochina-Barrachina et al. (2024) provide the most recent meta-analytic support.

S1 Baseline Shock Trajectory

S1 baseline trajectory: The S1 counterfactual uses a -2%/yr real growth in health R&D investment for years 1–3 (2025–2027, reflecting the acute USAID dissolution and UK ODA contraction), followed by stabilisation at +2%/yr from year 4 onward (partial domestic substitution, renegotiated bilateral flows, adaptation of health financing plans). This trajectory is anchored to IMF WEO Oct 2025 baseline GDP growth of 4.0%.

APPENDIX II. MODEL PARAMETERS

The tables below list all key model parameters, grouped by origin.

Table A1 - Parameters adopted from global literature

Parameter	Value	Africa note	Source(s)
R&D knowledge elasticity (α_3)	0.15	Applied unchanged	Guellec & van Pottelsberghe (2004); Hall et al. (2010)
R&D-to-TFP time lag (τ)	3 years	Applied unchanged	Pakes & Griliches (1984); Sena (2004)
Physical capital elasticity (α_1)	0.38	Standard LMIC value	Penn World Tables 10.01
Labour elasticity (α_2)	0.52	Standard LMIC value	Penn World Tables 10.01
Crowding-in framework	Elasticity-based	Framework unchanged; coefficient adjusted for Africa	Hall & Van Reenen (2000); Arrow (1962)
Knowledge stock accumulation (PIM)	Perpetual Inventory Method	Applied unchanged	OECD Measuring Capital Manual (2010); Griliches & Mairesse (1984)
Additionality framework	Elasticity-based; α = 0.75	Value adjusted downward for Africa context	David, Hall & Toole (2000); Rochina-Barrachina et al. (2024)
Social discount rate	5%	Consistent with AfDB project appraisal guidance	Ramsey rule; AfDB (2021); IMF SSA country guidance

Table A2- Parameters calibrated for Africa

Parameter	Value	Africa note	Source(s)
Absorptive capacity-baseline (AC_0)	0.35	Raw composite score; institutional uplift not applied	World Bank HCI; UNESCO UIS; ITU; WGI; Cohen & Levinthal (1990)
Absorptive capacity-ceiling (AC_max)	80%	Assumes no full convergence with HIC within 20-year horizon	Structural cap; no published benchmark for this ceiling
Crowding-in coefficient (γ_1)	0.20	Reduced from HIC range of 0.85–0.90	Hall & Van Reenen (2000); sensitivity tested 0.10–0.35
Private R&D additionality (α)	0.75	Reduced from HIC range of 0.85–0.90	David et al. (2000); Rochina-Barrachina et al. (2024)
Knowledge depreciation rate (δ)	12.5%	Midpoint of 10–15% range used for Africa context	Hall (2007); OECD (2010); Li (2016)

Table A3- Parameters derived from African data

Parameter	Value	Derivation / source
Baseline health R&D spending	$2,073M (2023)	IMF WEO GDP × UNESCO GERD ratio (0.45%) × WHO health R&D share (15%)
Researcher salary- Africa	$25,000/yr	WHO HRH data; SA DSI R&D Survey 2022/23
Employment intensity	10 jobs per $1M R&D	UNESCO UIS R&D workforce data; ILO Africa labour statistics
Pharmaceutical import dependence	70% of consumption; $17.4B total imports	AU Pharmaceutical Manufacturing Plan; UNCTAD (2023)
Pharmaceutical import growth rate	8%/yr	IQVIA Africa Market Report (2023)
Output-employment elasticity (ε_EL)	0.40	ILO (2013); AfDB (2018); Kapsos (2005)
Labour force size and growth	700M; 2.8%/yr	ILO ILOSTAT (2024); UN World Population Prospects (2024)
Trade impact lag	5 years	Makoni (2022); COVID-19 vaccine localisation timeline
Import substitution elasticity (ε_IS)	0.08	UNIDO (2019); confirmed April 2026 sensitivity run
Export growth elasticity (ε_EX)	0.20	Lall (2000); AfCFTA Protocol on Trade in Services (2023)
R&D expenditure per FTE	$45,000/yr	SA DSI R&D Survey 2022/23; OECD Frascati Manual norms
Scenario 1 baseline trajectory	-2%/yr (yrs 1–3); +2%/yr (yrs 4+)	USAID dissolution data; FCDO programme data (2025–26)

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