

# Mitigating South Africa's HIV Epidemic: The Interplay of Social Entrepreneurship and the Innovation System

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**Abstract** With the struggle against apartheid achieved, South Africa faced the new struggle of overcoming the HIV/AIDS pandemic. This paper examines the response of government, the innovation system and civil society in rising to the challenge. The response included a fatal denialism concerning the etiology of AIDS, a fatalism that constitutes political market failure. This political market failure was counteracted through the emergence of social entrepreneurship in the form of the Treatment Action Campaign (TAC) that mobilized civil society and like-minded health practitioners and researchers within the innovation system. Dependency Theory coupled with a Quadruple Helix model of the innovation system offer possible explanations of this complex human tragedy and the way that government was compelled to embark on a massive program of providing anti-retroviral therapy that has now significantly improved life expectancy. The paper provides socio-economic context, appraisal of the innovation system, and a sketch of how the Quadruple Helix took form. Of special importance is the independence of South Africa's 'Republic of Science.' Independent courts were critical in allowing TAC to obtain remedy against government, Big Pharma, and AIDS dissident scientists. It is argued that its Republic of Science met its obligation of objectivity by shifting emphasis to the cause of AIDS research in the face of official denialism. In effect, the system of innovation and social entrepreneurs are shown to have acted in concert in constituting a Quadruple Helix.

**Keywords** South Africa · Underdevelopment · Innovation system · Quadruple Helix · Social entrepreneurship · HIV/AIDS · AIDS denialism

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## Introduction

Mention of South Africa invariably brings to mind the late Nelson Mandela and the struggle against apartheid. Today South Africa faces a different but equally compelling struggle, namely to overcome the HIV/AIDS pandemic. As apartheid was being consigned to the dustbin of history, so did this epidemic manifest, presenting an existential crisis for the young democracy, absorbing scarce resources, and impacting on morale and the social fabric. The epidemic is most severe for the poor, the majority of whom are ethnic Africans.<sup>1</sup>

It is the primary task of this paper to examine the differing ways that the national innovation system, comprising researchers, social entrepreneurs and donors responded to this challenge. The paper offers a case study of social entrepreneurship in a highly politicized environment.

The facts concerning the HIV/AIDS pandemic are both open and obscured. An open fact is that from the 1960s life expectancy had been on an upward trajectory, but then it began to plummet, falling from 65 years in 1990 to a low of 51.6 in 2005 (Stats SA 2014), with total mortality doubling from 300,000 per annum in 1997 to 600,000 in 2006. An obscured fact is the cause of this increased mortality since official health statistics do not include the category 'AIDS.' Instead, mortality statistics record the leading cause of death as tuberculosis (TB) that at 10.7% is alarming enough (Stats SA 2014). One is thus constrained in making a direct causal link between HIV/AIDS and death.

Paradoxically, this decline in life expectancy occurred alongside sustained, albeit modest economic growth and the lifting of millions out of absolute poverty. The human catastrophe thereby points to political market failure for health policy delivery (Cirone and Urpelainen 2013). The politicization of the response to HIV/AIDS is evident in the facts of official denialism regarding its etiology, a denialism that until 2008 retarded the provision of large-scale anti-retroviral (ARV) therapies. What is obscured is the reason for this denialism.

This political market failure was countered through civil society action that eventually pressured government to alter its stance. The outcome was a sharp reduction in mortality, and by 2011 mortality had fallen some 16%.

The facts of HIV/AIDS are difficult to reconcile with South Africa's prior achievements in medical science. After all, this is the country that gave the world its first human heart transplant, and it is the continental leader in science, technology and innovation. Given this history of achievement in enlightenment science, the AIDS denialism begs comprehension. One is not dealing with a simple case of technology market failure.

Mainstream thinking holds that HIV/AIDS prevalence has links with poverty and under-development, and with sexual behavior, but that these are insufficient explanatory factors (Nattrass 2004). A virus lies at the heart of the disease, and unraveling its mutation together with the genetic predisposition of the host are

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<sup>1</sup> Though apartheid regulations have been removed from the statute books, the racial typology of the apartheid years endures. Official policy considers the population to be comprised of the same four groups of the apartheid years: Africans, Coloureds, Indians and Whites.

problematic for medical geneticists and immunologists (He et al. 2008; Chatterjee 2010).

The paper draws on a combination of political economy (Dependency Theory) and the innovation systems approach in order to explain this political market failure and its eventual remedy. A civil society organization, the Treatment Action Campaign (TAC) played a leading role as a social entrepreneur in effecting this remedy. The contribution of the paper rests in showing that a health-focused sectoral innovation system, a Quadruple Helix combining civil society, higher education, public research organizations, and business, together with an independent judiciary, was critical to the turnaround. By so doing the paper links political economy and technology resonating with Perez' (2002) emphasis on the intimate links between technology and economy.

The case study emphasizes the pivotal role of the Treatment Action Campaign (TAC), a single-issue non-governmental organization that leads the campaign for the provision of anti-retroviral therapies for HIV positive persons. The TAC is the fourth component of what is termed the Quadruple Helix.

The analysis draws on secondary sources, and as applicable, uses science, technology and innovation (STI) indicators to measure innovation system performance and institutional responses to the AIDS crisis. It will be argued that the joint efforts of the TAC, the law courts and medical scientists were crucial in turning the tide of the disease. Without a robust innovation system this would have been impossible (Nattrass 2012).

The paper is structured as follows. Following this introduction, the next section adopts a theoretical framework that poses two conjectures. This is followed by an examination of the new Rainbow Nation, briefly tracing the evolution of apartheid from colonial times to its 1994 demise, and the irruption of the AIDS pandemic. The rise and eclipse of social entrepreneurship over this period is highlighted. The third section uses STI indicators to 'tell the story' of the modest sized innovation system. Attention is given to the changing social contract between science and society, the role of innovation policy and its achievement. The fourth section provides the case study of the AIDS pandemic, the political failure of the new government, and intervention of civil society. This intervention came via the now renowned Treatment Action Campaign that worked in concert with researchers embedded in the system of innovation, thereby constituting a Quadruple Helix. The fifth section discusses the findings, with a final section offering concluding remarks and suggestions for further research.

## Theory and Conjectures

This paper attempts to explain a highly complex set of circumstances that by some estimates saw up to three hundred and fifty thousand premature deaths (Nattrass 2008). The object of study is the political market failure of health policy.

There have been many characterizations of the political economy of South Africa. Saul and Gelb (1981) explained the state of affairs as "colonialism of a special kind." Simons and Simons (1968) studied the interaction of class and race, while Lipton

(1985) sought to locate its peculiarities within liberal economics. Fine and Rustomjee (1996) saw a distorted market economy co-existing with an interventionist state that controlled the commanding heights of the economy. What they labeled the “minerals-energy-complex” and its stepchild of migrant labor continue to dominate the economy. Maharajh (2011) offers a Marxist view of apartheid as “racial capitalism.” Other approaches stress the importance of institutions to explain differences among national economies. North et al. (2009) would classify apartheid South Africa as a “mature natural state,” while Acemoglu and Robinson (2012) see it as an archetypical extractive political and economic system.

In the main these analyses do not sufficiently address South Africa’s position in the world system. For this reason it is proposed that Dependency Theory is a more appropriate framework for political analysis. A broad school of scholarship associated with the dependency thesis developed from roots in the work of Prebisch (1950) and Frank (1966) in Latin America, and Leys (1975) and Amin (1977) in Africa. Kay (2010) and Kitching (2010) provide contemporary reviews. Dependency Theory takes the view that the industrialized metropolises of ‘the West’ maintained their former colonies and dependencies in a condition of underdevelopment. As such, Dependency Theory stands in opposition to the basic tenet of Modernization Theory that sees a common trajectory for countries. Dependency is the by-product of political domination, extending into the relations of production, social reproduction and culture. The main thrusts of Dependency Theory entered international debates at the height of the Cold War at the point when the liberation movements of South Africa were most heavily engaged in armed conflict. Its proposals met fertile ground in the rhetoric of struggle.

For South Africa dependency relationships took form externally and internally. Externally as a country originally subordinate to the British Crown; internally since Apartheid excluded Africans from skilled occupations, denied them trading opportunities and consigned them to a life of manual labor, and if unemployed, to be summarily ejected to labor reserves. This created a second dependency relationship between the industrializing (White) metropolises and a marginalized domestic periphery.

Over time South African capital developed a modicum of independence that allowed South Africa to become a regional metropole and ultimately the leading industrial nation in Africa. The appetite of mining and agriculture drew in migrant workers from as far north as the Belgian Congo with underdevelopment exported alongside the remittances of migrant workers. The use of migrant labor played its own part in compromising political, social, health and family relations in the labor-exporting countries.

The first conjecture is that Dependency Theory explains two critical factors driving the AIDS catastrophe: the political reaction to its onset, and continuing intensive labor migration. Underdevelopment at the hands of ‘the West’ would therefore constitute the background for the unfolding AIDS catastrophe. The dynamic of underdevelopment is a contributory factor to the spread of HIV/AIDS.

We turn next to the technology of health policy delivery, situating this in the national system of innovation.

The innovation system approach emerged in the 1980s from the realization that innovation involves a range of activities, interactions and learning, rather than being

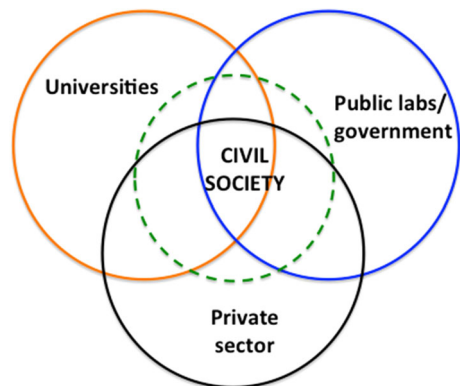
solely the result of research and experimental development (Lundvall 1985; Dosi et al. 1988). The multilateral Organization for Economic Cooperation and Development is the seat of the dominant paradigm of the firm-centric innovation system in which the state is largely restricted to ensuring an enabling environment for innovation (and investment) (OECD 2005).

The ‘Triple Helix’ is a refinement of the innovation systems approach that argues for the privileged role of universities among the interacting trio of government and its PROs, business and universities (Etzkowitz and Leydesdorff 2000). A number of scholars have taken the view that this is an insufficient tool for analysis and have argued that a Quadruple Helix allows for a more complete understanding of the innovation process. Leydesdorff (2011: 17), co-founder of the Triple Helix concept, has produced a robust defence of the original concept, arguing that such extension “would require substantive specification, operationalization in terms of potentially relevant data, and sometimes the further development of relevant indicators. Without such a perspective, parsimony itself may be a methodologically well-advised strategy.” Etzkowitz (2002) also defends the Triple Helix by arguing that it may be extended to include social development.

One group of Quadruple Helix proponents sees the fourth actor as the media (Carayannis and Campbell 2009). Another takes the view that the term is appropriate for the inclusion of any other actor in the innovation system proper (Fuzi 2013). A third formulation makes the leap into the now fashionable terrain of ‘user innovation’ (Arnkil et al. 2010).

Our interest lies in the social situation of the innovation system, firstly in its local context, and secondly in the larger world system. To this end we are interested in the often-neglected role of civil society in theorization of innovation systems. Cooper (2011: 354), for example, argues strongly for a fourth helix involving university-civil society linkages as part of “civic engaged scholarship.” It will be argued that the campaign against HIV/AIDS brought together a Quadruple Helix of actors comprising the Treatment Action Campaign, medical scientists, business, and public research organizations (Fig. 1). This schematic is a simplification of the more complex environment within which any national innovation system functions – it is, of course, part of the world system, and immersed in its own national financial,

**Fig. 1** The South African Quadruple Helix



economic, legal, cultural and regulatory environment. Arguing for such connection finds resonance in the extensive literature on the relationship between science and society that goes back to the days of Russell (1924), Bernal (1939) and later Polanyi (1962), with more recent contributions from Gibbons et al. (1994). In the case of South African science, the new government ministry made an explicit attempt to link science with social development (DACST 1996).

Turning next to social entrepreneurship, Dacin et al. (2010: 38) categorize this as the “ability to leverage resources that address social problems ... when government or nonprofit organizations operate using business principles.” For other commentators this includes corporate social responsibility, and commercial activities that produce social value (Sonne 2014). The Ashoka Foundation (2014), long active in identifying and celebrating social entrepreneurs, adopts a catholic definition: “Social entrepreneurs are individuals with innovative solutions to society’s most pressing social problems ... Rather than leaving societal needs to the government or business sectors, social entrepreneurs find what is not working and solve the problem by changing the system, spreading the solution, and persuading entire societies to move in different directions.” Social entrepreneurs may be juristic or natural persons, they may work alone, or with other actors of an innovation system, that they may complement. This paper takes the view that social entrepreneurs address social problems without seeking direct profit.

This leads to the second conjecture, that the inclusion of civil society to constitute the Quadruple Helix was a necessary condition for mitigating the AIDS crisis. Associated with this conjecture is a basic question: in what ways does the innovation system of the democratic era differ from that of the apartheid years, and how is it mitigating the AIDS catastrophe?

## The Rainbow Nation

Apartheid took shape as the political and economic fortunes of the settler communities evolved from mainly agricultural to mining-led industrialization. Over time the European settlers subjugated the indigenous peoples, and then created an overarching discriminatory system of control. The later process of capital formation and industrialization was accompanied by formalized discrimination that endured to 1994. Apartheid was both a product of and a contributor to these processes, and it survives into the present (Buhlungu 2001; Cooper and Subotzky 2001; Ntsebeza and Hall 2007).

The full codification of apartheid came after 1948. At its peak, so-called ‘grand apartheid’ had dismembered South Africa into eleven ‘national’ entities – a White metropole that held 87% of the surface area, and ten peripheral Black statelets. All aspects of daily life were segregated regardless of the damage to social fabric and economic efficiency.

The eventual response was armed struggle under the leadership of the African National Congress (ANC) coupled with civil disobedience that culminated in the formation of the United Democratic Front (UDF). The ending of the Cold War then propelled the apartheid government to begin formal talks with the African National

Congress (see e.g. De Klerk 1991; Ellis 2012). This ushered in a four-year transition to the first democratic elections of April 1994, and in 1996 newly democratic South Africa adopted its final Constitution grounded in a Bill of Rights. The Constitution upheld the separation of powers, guaranteed the rule of law, and offered redress to correct historic injustice.

An important decision of the transition period was the disbanding of the UDF. Its demise, alongside the withering of NGO activity as foreign donors channeled their development aid toward the new government, weakened the organs of civil society and social entrepreneurship.

Policy development in health, science and technology, education, labor and security blossomed as the ANC commenced planning for its role as the governing party. The ANC then entered into a Tripartite Alliance with the Confederation of South African Trade Unions and the South African Communist Party. There were promising signs that the challenge of HIV/AIDS would be met head-on, with the 1992 launch of the National AIDS Convention of South Africa (Schneider and Stein 2001). However, although the Mandela government accepted the AIDS Plan of the Convention, it failed to take this forward.

By the late 1990s it became evident that government could not, or would not fully meet its constitutional obligations regarding the general problem of service delivery. A gap between expectation and reality opened up, and popular protest re-emerged. Non-governmental organizations (NGOs) began to mount legal challenges in support of rights to shelter and other services. A body of case law that codified 'second order constitutional rights' was constructed as the justice system moved centre stage to adjudicate the boundaries between the responsibilities of government and the rights of citizens. This is perhaps the single most important institutional innovation of the democratic period.

With a fifth democratically elected government now in office, it is fair to say that there has been progress, with improvements in basic services and the provision of welfare. Elite formation is under way with the African middle class having increased nine fold, with new faces in boardrooms.<sup>2</sup>

Political power may be firmly in the hands of the majority, but the contest for position and resources has become increasingly fractious with a resumption of uncoordinated protest movements in areas subject to social and economic deprivation. In parallel the courts have become an important site of contestation between civil society and the state. The Constitutional Court acts to protect the weak, but is increasingly used by the wealthy to hold onto their gains, and in the process now finds itself under attack. Inequality persists, the economy under-performs, and the level of welfare grants is unsustainable.<sup>3</sup> The country remains a middle-income economy, with inequality now driven more by socio-economic status than ethnicity.

The sentinel socio-economic indicators of the twenty years of democracy (Table 1) show a static Human Development Index (HDI), rising unemployment, rising income inequality and modest growth in GDP/capita. These indicators mask a great deal. Firstly, the HDI collapsed in the mid-2000s as AIDS and tuberculosis

<sup>2</sup> <http://www.southafrica.info/business/economy/middle-class-300413.htm#.VA8VpWSSy3g>.

<sup>3</sup> <http://www.brookings.edu/blogs/africa-in-focus/posts/2014/01/27-south-africa-welfare-poverty-bhorat>.

**Table 1** Sentinel socio-economic indicators, 1991/2 and 2011/12

	1991/2	2011/2
Human Development Index	0.62	0.62
Unemployment rate (%)	20.1	24.2
Gini index	59.3	63.1
GDP (Constant 2005 US\$) billion	278	489
GDP compound growth	–	2.86
GDP/capita (constant US\$)	4700	5700

Sources: UNDP; Statistics South Africa. <http://www.econstats.com/weo/V027.htm>; <http://www.indexmundi.com/facts/south-africa/gdp>

reduced life expectancy. Second, the Gini index excludes the value of social grants that support one third of the population and lift millions out of absolute poverty. It is clear that slow GDP growth is insufficient radically to transform living standards.

In many respects metropole-periphery relationships continue, and the overarching challenges of poverty, inequality and unemployment persist. The Rainbow Nation offers political inclusion, but social and economic exclusion persist.

## The Innovation System Walks on Two Legs

The origins of the South African innovation system go back to the early days of gold mining (Pogue 2006). Following the expansion of industry during the First World War, efforts were made to support university R&D alongside public research organizations (PROs). The innovation system widened to include sectoral systems of innovation, some of which (viticulture; animal health; metallurgy) exhibit strong triple helix characteristics. Next the Second World War brought further industrial diversification. Thereafter political and technological isolation intensified, and self-sufficiency was advanced through new public enterprises, universities and polytechnics and PROs - the Medical Research Council and Human Sciences Research Council. A modest-sized innovation system emerged (Kaplan 2008).

The innovation system reflected the political imperatives of the times (Dubow 2006). On the one hand, it performed at the behest of its masters, supporting the goals of self-sufficiency through technological adaptation and innovation, so much so that South Africa was then forging ahead of Korea. On the other hand were Scientific achievements such as the first human heart transplant, nurture of the careers of four Nobel Laureates in science and physiology, and important work in plant sciences, animal science, paleontology, and metallurgy.

One might argue that this constituted a social contract for science that ‘walked on two legs’ – one leg allowed ‘own science’ in accord with free academic inquiry, the other leg developed technology for the apartheid war machine (Kahn 2013). Free academic inquiry is fundamental to the ‘Republic of Science’ where bureaucrats do not interfere in the direction of basic research (Polanyi 1962). The local ‘Republic of Science’ enjoyed considerable autonomy. Some of its members served the ideological needs of the state; others pursued free academic enquiry in the PROs and universities. The heart transplant is a case in point: it was an example of use-oriented basic research, not a mission-driven government initiative. Indeed the



successful transplant took the government by surprise and at first it hesitated to offer praise (Dubow 2006). Institutional autonomy enjoyed an uneasy relationship with an ideologically minded government.

In the transition to democracy, an external review of the innovation system found it to be fragmented, uncoordinated, underfunded, racially exclusive, and poorly aligned with national needs (IDRC 1993). These findings then provided the impetus for a White Paper on Science and Technology (DACST 1996) that called for the system of innovation to expand and re-orient its activities to serve the needs of the whole population rather than the White minority. It argued that a 'well-managed and properly functioning national system of innovation will make it possible for all South Africans to enjoy the economic, socio-political and intellectual benefits of science and technology' (idem: 8). Subsequent policy instruments were crafted to give substance to the White Paper.

Alongside these developments were major policy initiatives in the social, security and cultural domains. For health was the decision in 1997 to follow an agenda of essential national health research.

Meanwhile the HIV epidemic spread across the country yet the new National Research and Development Strategy (DST 2002) failed to highlight HIV/AIDS as a major concern. Instead, innovation policy focused on addressing the demographic imbalances in human resources. Attention shifted to Big Science projects such as a 4th generation nuclear reactor demonstrator, an electric vehicle prototype, and two large telescope projects.

In effect the national Department of Science and Technology maintained a low profile regarding HIV/AIDS research, providing limited support to the SA AIDS Vaccine Initiative of the Medical Research Council. Alongside came legislation to protect biodiversity and indigenous knowledge, partly driven by the Cartagena Protocol on Biosafety, but also intended to restore the dignity of indigenous knowledge. Its next policy thrust was the Ten Year Innovation Plan (DST 2008) that also said little about HIV/AIDS.

The eight science councils came under new leadership and their researcher demographics became more representative, but mostly it was business as usual. The exceptions were the Medical Research Council (MRC) and Human Sciences Research Council (HSRC) that undertook research on the etiology and social impact of HIV/AIDS respectively. The science councils were free to follow scientific inquiry and their only restriction was resources. Funding became available from foreign donors; researchers were not as easy to recruit.

The evolution of the innovation system may be tracked using the standard science, technology and innovation (STI) indicators of Table 2. The first two indicators indicate high-level educational development. Apartheid had restricted the upward mobility of Blacks and the data show that Black graduates have now increased sevenfold. Alongside is a 2.5 times increase in doctoral graduates, though this rate is too slow, the more so as one fifth are foreign students who are encouraged to return home upon graduation (UNESCO 2013). There has been success in employment equity, especially the government sector where Black researchers are now in the majority, rising from 3% in 1994. Herein lies a major problem: the innovation system

**Table 2** Main STI indicators, South Africa, 1991/2 and 2011/2

	1991/2	2011/2
Degrees awarded to Black students	8514	65487
Graduates in Engineering	1277	
PhD graduates	630	1576
GERD (2005 Rands) (billions)	9.208	14.507
GERD Compound annual growth (%)	–	2.40
GERD: GDP (%)	0.84	0.76
Basic Research (%)	19.6	24.5
Expenditure on R&D in Engineering (%)	37.7	24.0
Expenditure on R&D in Health (%)	6.9	17.2
Expenditure on R&D in Social Sciences & Humanities (%)	7.7	14.8
FTE Researchers (permanent staff)*	12102	11644
FTE Researchers/10,000 employed	1.1	1.5
Female Researchers (%)	–	42.3
Black Researchers in Government Sector (%)**	<3	>55
Web of Science publication counts	4144	11057
International co-publication rate (%)	15	50
Foreign university students (%)	<1	8

*Sources:* DNE (1993), NACI (2014), World Bank; OECD (2014), Backhouse (2009). Definitions and notes: Gross national expenditure of R&D (GERD); Full-time equivalent (FTE); \* Values for 1993 and 2009 respectively; \*\* estimate

is failing to produce high level skills fast enough, yet government amendments to immigration regulations have further restricted inflows.

The next set of input indicators shows a mix of stasis and success. Stasis in that GERD: GDP, after growing strongly in the mid-2000s has declined to below the 1991 level. The R&D Strategy target of GERD: GDP to reach 1% by 2008 was missed, largely because the stock of researchers did not grow.

One notes the shift toward basic research, and a swing from the engineering sciences and technology toward the health sciences, while the social sciences and humanities account for some 14.8% of R&D expenditure, a level above the global average (WSSR 2013). As the official report on the R&D Survey notes: “The share of GERD apportioned to basic research increased from 20.2% in 2008/09 to 25.3% in 2012/13, indicating sustained focus on areas of basic research” (DST 2014: 13). Measured by publication counts (a good indicator of efforts in basic research) the swing toward fields associated with the HIV and Tuberculosis epidemics is even more pronounced with a four-fold increase over the period 1990/4 to 2004/8 (Kahn 2011).

Like many other countries there has been a strong rise in journal publication counts, and of co-publication with foreign authors. The observed shift of funding toward the health sciences, the higher publication propensity of the health sciences, and very large donor-funded multi-country health projects partially explain the sharp rise in international co-publication. Participation in other international Big Science projects is an additional factor.

Research activity is strong in infectious diseases, immunology, virology, astronomy and astrophysics, mathematics, environmental, and social sciences though the cumulative impact of these outputs is below the world average. A country would be placed at the world average level if 10% of its papers were among the 10% most frequently cited, and similarly for the top 1% (Leydesdorff et al. 2014). According to these authors, South Africa stands at 7, and 0.7% respectively. When it comes to retaining the most highly-cited scientists the results are slightly better. Its tally of 11 of the most highly-cited scientists amounts to 0.34% of the world total as compared with its 0.26% share of world researchers. Five of these highly-cited scientists work on infectious diseases.

The social contract for science has also evolved over the twenty years of democracy. The 'own science' leg remains strong. The second leg may now be described as 'Big Science' as exemplified in projects such as the Southern African Large Telescope and the Square Kilometre Array (Kahn 2013). Science continues to walk on two legs: own science and Big Science.

In summary, the innovation system demonstrates strong institutional continuity with its predecessor. Measured by GERD: GDP it has not shown real growth, and is found wanting for international competitiveness. IDRC (1993) endorsed the importance of scientific freedom and advocated Polanyi's Republic of Science as a model for the future democratic South Africa. Its wish would appear to have been granted.

## The Making of a Quadruple Helix

The introductory paragraphs alleged AIDS denialism on the part of the South African government. Evidence for this allegation is patent: it was President Mbeki who in a 2003 BBC interview made the statement, "Personally, I don't know anybody who has died of AIDS," even while his official spokesperson was apparently succumbing to AIDS (Mbeki 2003). What lay behind Mbeki's dismissive riposte? To answer this question one must delve into the history and politics of HIV in South Africa.

The first occurrence of HIV was in 1982 among White homosexuals, but within five years the Southward movement of migrant workers had catalyzed an epidemic among heterosexuals and homosexuals across all groups alike.<sup>4</sup> The response of the apartheid government was muted, though after 1990, various attempts were made to develop coordinated, research-based interventions.<sup>5</sup> These attempts floundered on misinformation, sectional interests and sheer disbelief at the misfortune. Consider then Communist Party leader Chris Hani's remark that: "We cannot afford to allow the AIDS epidemic to ruin the realization of our dreams" (Avert 2014). Indeed, the Mandela Presidency (1994–1999) was party to the problem, displaying ambivalence, and encouraging quack remedies such as the notorious solvent-based 'Virodene' that caused scandal and damaged the credibility of the official Medicines Control Council.

<sup>4</sup> Recent evidence points to 1920s Kinshasa, DRC as the epicenter of HIV. See Faria et al. (2014).

<sup>5</sup> <http://www.hivsa.com/static/hiv-aids-in-south-africa#edays>.

Massive tasks faced the ANC-led government: high expectations; complex human relations issues; fear of failure; a poor history of governance on the African continent; unapologetic racism; financial constraints; demands from new rentiers. Apartheid ideology had not only marginalized Africans out of the economy, but had also ridiculed their heritage and culture. The mood of government became Afro-centric (Mangu 2011).

Late in 1999, President Mbeki, Mandela's former Deputy President, initiated the Presidential AIDS Advisory Panel of national and international experts to discuss the etiology of AIDS and the best response to the disease. By this time Mbeki was already convinced that the mainstream view of the causation of AIDS was flawed. The Panel comprised of leading AIDS denialists as well as mainstream medical researchers, including past and present heads of the Medical Research Council, the National Institute for Communicable Diseases, and many local and international researchers. These experts brought ideas on frontier research covering seroprevalence, the mechanism of mother-to-child transmission, and occurrence of needle-stick transmission, nutrition and nosocomial infections. Mbeki was unconvinced, and in a major public lecture using African-American scholar Woodson's terminology went on record to express concern with those who had become 'mis-educated Negroes or natives.' Mbeki was referring to Black South African scientists who dared to oppose his view on the disease. He derided foreign-trained scientists and intellectuals who allegedly saw Africans as 'natural-born, promiscuous carriers of germs' (Presidency 2001). For Mbeki there was a Western conspiracy against the South, and South Africa's poor in particular.

The Panel Report appeared in 2001 and revealed an unbridgeable chasm between the two camps: the denialists proclaimed that HIV was a myth, that the data on increased mortality were flawed, and that improved health status would arise as poverty was alleviated. The mainstream held that viral infection was the primary cause. One of the contentions of the mainstream experts was that 'the high genetic diversity in South Africa is suggestive of multiple introductions. The latter would confirm the importance of migration in fuelling the epidemic' (Presidency 2001: 43). This identified the metropole-periphery dynamic to be a strong factor in the spread of the disease.

The Panel provided the most direct means for the Republic of Science to assist government in rising to the challenge of the epidemic. In this it was spectacularly unsuccessful, and Mbeki emerged with an even stronger set of views, making common and public cause with the AIDS denialists. Mbeki then proceeded to claim that the global pharmaceutical industry was marketing expensive anti-retroviral (ARV) drugs that would poison and further impoverish the wretched of the earth. The official policy of the Mbeki Presidency (1999–2008) was AIDS denialism, with both of Mbeki's Ministers of Health endorsing his views, and blaming poverty and poor diet as the major causative factors. Encouragement was also given to traditional healers to find a traditional remedy for the disease. This produced hope but little else.

The nadir of Mbeki's administration came at the 2006 International AIDS Conference in Toronto when his Minister of Health, Dr. Tshabalala-Msimang, unveiled South Africa's display stand that advocated that the HIV positive should follow a diet rich in garlic, lemon juice, olive oil, the African potato and beetroot,

quite literally the ingredients of Russian *borscht*. The response of South African civil society and the labor movement was outrage, which contributed to Mbeki's subsequent removal as President.

This now allows for analysis of the institutional question. The President and a clique of Ministers advocated a rejectionist position and used the levers of state power to restrict access to ARVs. But the South African polity is simply too decentralized for monolithic control. Alongside the official denialism was a public health campaign that sought to change lifestyle behaviors, and that included free provision of condoms and testing of HIV status. If anything, government was speaking with many voices – there is no virus; develop a local vaccine (Virodene; traditional medicine); abstain, be faithful to one partner; 'be wise, condomise,' with billboards displaying the 'ABC' message. A further inconsistency was the Mandela government court challenge against thirty-nine pharmaceutical companies who sought to prevent the Ministry of Health from invoking compulsory licensing and the parallel importation of drugs to deal with the epidemic. Here the government of an emerging economy was taking on Big Pharma to provide cheaper medicines to fight AIDS and other diseases whilst simultaneously questioning the value of a drug-based intervention. The South African government opposed the suit, rallied political support from India and Brazil, and under international pressure, the pharmaceutical companies dropped their lawsuit.<sup>6</sup>

So what was the response of the 'Republic of Science?' Muted in public to say the least. Instead, medical scientists quietly accelerated research on the disease and its association with tuberculosis (TB). In the case of Virodene, open conflict had erupted between the Minister of Health and the Medicines Control Council (MCC) that refused to license the preparation on the grounds that it was not yet suitable for testing on humans. The outcome was the removal of the government-appointed Head of the MCC.<sup>7</sup>

While government interfered in the impartiality of the Medicines Control Council it did not challenge other institutions of the Republic of Science, most notably the Medical Research Council, whose head not only challenged Mbeki in public, but also served on the AIDS Panel.

The independence of the 'own science' agenda of the Republic of Science is illustrated in the way that the 1999 request of the Medical Research Council for additional funds to address HIV/AIDS was managed. Through a neutrally facilitated roundtable process each science council accepted a ten percent cut in baseline funding in favor of the MRC. Shortly thereafter the MRC launched the South African AIDS Vaccine Initiative.

The general increase in research on infectious diseases occurred despite government denial, not because of direct policy intervention. International donors played a pivotal role in providing funds for research on HIV and its mitigation.

Alongside these moves the newly promulgated Academy of Science of South Africa could have but did not raise a collective voice of protest at government denialism. Only much later did it launch a consensus study into the effect of

<sup>6</sup> [www.cptech.org/ip/health/sa/pharma-v-sa.html](http://www.cptech.org/ip/health/sa/pharma-v-sa.html).

<sup>7</sup> <http://www.politicsweb.co.za/politicsweb/view/politicsweb/en/page71619?oid=83213&sn=Detail>.

nutrition on HIV status, the results of which began to enter public discourse from 2005 onwards (Gevers 2007). It took the late 2006 intervention of the TAC to provide a channel for eighty leading scientists to petition Mbeki to fire his health minister (TAC 2007). This he did not do.

In fairness to the research community it was clear that basic research alone would not bring short-term alleviation of rising morbidity and mortality. The denial of antiretroviral (ARV) drug therapies was leading to runaway mortality of 16–55 year-olds. In a response to the change in mortality statistics, the new head of the MRC went on record to claim that the increase could not be attributed to HIV as the disease was not a notifiable disease.<sup>8</sup> A credibility gap opened up.

Large business corporations had already committed to corporate social responsibility through the adoption of the internationally renowned Report on Corporate Governance (King 2014). Business, recognizing the danger of staff attrition, and the huge cost of retaining ill staff, let alone their replacement, began to provide free ARV treatment for those infected, by using the extensive network of private health providers. In yet another surprising response to the epidemic, government introduced legislation to compel medical insurance schemes to accept applicants who were HIV positive.

## Growth of the Treatment Action Campaign

These steps on the part of medical scientists and business were insufficient and could not touch the unemployed. The problem lay in political market failure to address the epidemic as a national emergency. This political market failure was the space that the Treatment Action Campaign (TAC) came to fill, thus signaling the rebirth of large-scale social entrepreneurship in South Africa. The full story of the TAC cannot be told here and the interested reader is referred to TAC (2010), Geffen (2010) and Natrass (2012).

The TAC is without rival as an example of social activism and social entrepreneurship. Its work began in 1998 with the call for a programme of ARV treatment to prevent mother-to-child transmission. Shortly thereafter government-endorsed AIDS denialism became public and the TAC mobilized against the government by launching protest actions including a fast at a major state hospital. This was followed with TAC importing generic antibiotics in defiance of a patent infringement claim. The next action of TAC was to join government as a ‘friend of the court’ to resist the patent infringement claim by the pharmaceutical industry. TAC, assisted by the Legal Resources Centre at the University of the Witwatersrand, engineered an international campaign and after token legal argument the case was dropped, giving a first victory to the TAC.

This emboldened the TAC to lodge its second court action, this one to compel government to provide ARVs to pregnant mothers. That legal process took a year, proceeding through the High Court of Appeal and finally to the Constitutional Court that ruled for the TAC. With reduced pricing of ARVs, and the court order to

<sup>8</sup> <http://www.news24.com/SouthAfrica/News/MRC-head-slated-on-Aids-stats-20050210>.

provide treatment to pregnant and lactating women, government was reluctantly compelled to increase the scope and scale of ARV treatment. In parallel with the growth of activism on the part of TAC, former President Mandela shifted his attention to the ravages of HIV/AIDS. This change of heart took place very publicly at the International AIDS Conference of 2000 held in Durban, South Africa, where Mbeki reiterated his belief that poverty was the driver of AIDS and that there was a Big Pharma conspiracy against South Africa. In his closing address Mandela broke rank, stating that “This is the one event where every word uttered, every gesture made, had to be measured against the effect it can and will have on the lives of millions of concrete, real human beings all over the continent and planet ... [We have to ensure that people have access to] measures to reduce mother-to-child transmission” (Mandela 2013).

The legal victories of TAC eventually compelled government to intervene and implement the advice of medical scientists. The world health community, including the World Health Organization and donor community played an important role in supporting these efforts. Social entrepreneurs, supported by donor funding, used constitutionally guaranteed legal avenues to compel government to meet its obligations of meeting ‘second order human rights’ (Geffen 2010). These ‘second order human rights’ were established through the legal precedents that arose through the celebrated ‘Grootboom’ judgment of October 2000.<sup>9</sup>

Medical scientists embedded in the national system of innovation played an exemplary role in addressing the HIV/AIDS pandemic. Then in 2006, the TAC succeeded in its court plea that HIV-positive prisoners had the right to receive ARVs. Denialism was now under sustained challenge and in early 2008 the national government was obliged to adopt new protocols for the prevention of mother-to-child transmission. Even then some provincial health departments refused to comply, and in one case fired doctors who prescribed the treatment.

The mood within the ruling Tripartite Alliance of the ANC, organized labor, and the South African Communist Party had become increasingly fractious. Disagreement regarding fiscal and economic policy, alleged lack of consultation with labor, and the huge loss of life through the HIV/AIDS debacle saw a factional battle for control and in December 2008, six months before the next national elections, a palace coup removed Mbeki and his health minister from office.

This ushered in a sea change in government’s attitude to the epidemic, with a ramping up of ARV provision. This sea change flowed into the subsequent Zuma administration that with a new Minister of Health extended the availability of ARVs, so that today South Africa has the largest ARV programme in the world with more than 2.4 million people under treatment, and mother-to-child transmission virtually eliminated. The decline in life expectancy has turned around and shows unprecedented increase. The timeline of this activity is summarized in Fig. 2.

One of the tests for the existence of a functional *system* of innovation is that its component actors must articulate one with another. In a well-functioning system of

<sup>9</sup> The Grootboom judgment dealt with the rights of evictees, and had far-reaching consequences through the system of legal precedence that is characteristic of South African jurisprudence. See e.g. <http://www.saflii.org/za/journals/LDD/2002/6.pdf>.

Virodene Scandal	TAC launched	Presidential Panel on HIV/AIDS	Parallel importation of fluconazole	Constitutional Court orders provision of nevirapine to HIV+ pregnant women	Access to ARVs won for prisoners	President Mbeki stands down; doctors fired for prescribing ARVs for pregnant women	2.4 million people access ARV therapy
1995	1998	1999	2000	2002	2006	2008	2014

**Fig. 2** HIV, the TAC and large-scale provision of ARV therapy

innovation there must be evidence of interaction, networking and linkages. How then do the Quadruple Helix of the TAC and the traditional Triple Helix actors stand up to this test? At the time of the TAC launch a well-articulated health Triple Helix existed, involving the MRC, its university-based research units, academic teaching hospitals, university-based research institutes, other public research agencies in health, and the local pharmaceutical and medical products industry. The TAC commenced as an activist body, but very quickly realized that it required research-based evidence to counter denialism and inform its work. A study of Annual Reports on the TAC homepage [www.tac.org.za](http://www.tac.org.za) reveals the early commissioning of research from university-based groups. In addition, the TAC networked both nationally and internationally, not only with donors, but also with groups such as Médecins Sans Frontières. Despite limited internal resources, TAC was able to produce research-based materials for awareness building and field guides to assist health workers with testing and treatment (TAC 2007). The University of Cape Town was a key partner in much of this work. By 2009 TAC was reporting that its research was being used by government and being shared with and used by other countries in the region (TAC 2009). Bibliometric search shows that by 2012 TAC staff and associates were also active as co-authors with mainstream researchers including the universities, academic teaching hospitals, MRC and HSRC (see Venter et al. 2012). The above suggests that the linkages are in place, and are active. By the above observations it is reasonable to argue for the existence of the Quadruple Helix.

## Findings

Two conjectures were presented to explain the political market failure of health policy – that Dependency Theory would serve to explain the political market failure as well as aspects of the spread of HIV; and that a Quadruple Helix formulation would assist in understanding the civil society response to the political market failure.

As shown above, the denialist response saw South Africa and its peoples as victims of Western machination. This is precisely what a simple reading of Dependency Theory would encourage. Denialism is firmly anchored in this worldview: we are victims; our culture is negated; we must seek remedy in our own cultural heritage (see



e.g. Olivier 2003; Gevisser 2009). Nattrass (2008) lists a range of explanations for the denialism of the Mbeki era, but holds back from the above conclusion. To that list one might append the phenomenon of parallel sexual relationships where men maintain families at 'home' and at 'work' and whose economic power ensures the availability of sexual partners. Dependency Theory also offers a framework to understand continued labor migration, and its role as a vector of HIV, possibly from as far back as a century. The linkage of the mines and labor forces of the sub-equatorial region are part of the causation of HIV prevalence. Migrant labor was a technological solution to the need for a mass supply of manual workers in the early days of mining and agriculture, yet institutionalized migrant labor continues to jeopardize and retard South Africa's development. The movement of male workers from and to their remote homes now recycles infectious diseases.

Were one to seek a counterfactual to what happened in South Africa, one might turn to Brazil, a country with similar levels of inequality. Velho and de Souza (2007) detail the rationalist approach to the onset of HIV in Brazil. Its prevalence and mortality rates are a fraction of those in South Africa.

The second conjecture is confirmed: social entrepreneurs organized as the Treatment Action Campaign revived the methods of peaceful protest of the apartheid years, and collaborated with like-minded doctors, academics in the social sciences, health demographers, virologists and epidemiologists, the Medical Research Council and Human Sciences Research Council. The set of actors is summarized in Fig. 3.

Their campaign, as the fourth actor of the Quadruple Helix, resulted in correction of political market failure and the large-scale provision of ARV therapies, thanks also to donor support and local manufacturing capability. The outcome has been a dramatic upturn in life expectancy and a leveling off of the rate of HIV infection, including that of neonates. The coming together of government laboratories and science councils, the national teaching hospitals and university health science researchers, including well-endowed Research Chairs and Centres of Excellence, business, local pharmaceutical companies and pathology laboratories, the insurance industry, and the TAC provide an example of a socially-oriented Quadruple Helix in action.

The Helix was slow to take form, and its functioning has not always been smooth. Changed leadership at the MRC after 2005 led to a breakdown of trust with TAC that was only restored when the incumbent moved on. Today a leading mainstream infectious diseases researcher heads MRC and the Quadruple Helix is once again operating successfully.

The Quadruple Helix did not arise from a process of rational planning. Instead, it came about at a point when government was hopelessly divided on the issue of HIV/AIDS. Although the Mbeki cabinet wore a mask of collective responsibility through which dissenting voices were silenced, leading figures close to the ruling party were appalled at the damage being wrought. Cirone and Urpelainen (2013) argue that in industrialized countries government unity is a prerequisite for the adoption of technological solutions to meet extreme social needs. In South Africa that unity was singularly lacking, with the initially hegemonic Mbeki clique becoming increasingly isolated. Political market failure took hold, proving fatal to those denied treatment, and ultimately for the holders of high political office.

ACTORS	PROVIDERS	<b>BENEFICIARIES</b>
Universities <ul style="list-style-type: none"> <li>• Cape Town</li> <li>• Kwazulu-Natal</li> <li>• Pretoria</li> <li>• Stellenbosch</li> <li>• Witwatersrand</li> </ul>	Provincial health department structures – hospitals and clinics	
Public research organizations/Government <ul style="list-style-type: none"> <li>• Medical Research Council</li> <li>• Human Sciences Research Council</li> <li>• Medicines Control Council</li> <li>• Clinical trials registrar</li> <li>• Statistics South Africa</li> </ul>		
Private sector <ul style="list-style-type: none"> <li>• Pharmaceutical industry</li> <li>• Health insurance companies</li> </ul>	Private hospitals and private health practitioners	
Civil Society <ul style="list-style-type: none"> <li>• Treatment Action Campaign</li> <li>• Médecins Sans Frontières</li> <li>• Legal Resources Centre</li> </ul>		

**Fig. 3** Actors constituting the Quadruple Helix

### Concluding Remarks

The emergence of the HIV Quadruple Helix speaks to the importance of a functional system of innovation. It would have been nigh impossible for the ARV programme to have attained the scale and reach that it did without the support of the broader innovation system – its ability to support and disseminate research, to conduct clinical trials, to test efficacy, assure quality and provide laboratory services. Crucial too was the Republic of Science that held fast against the onslaught of articulate and well-prepared AIDS denialists who enjoyed patronage at the highest political level. Furthermore, the local pharmaceutical industry emerged as the largest producer of generic medicines in the Southern hemisphere. Crucial too was international support from donor agencies such as the Wellcome Trust, Bill and Melinda Gates Foundation, numerous foreign government development aid initiatives, notably the US Government ‘President’s Emergency Plan For AIDS Relief’ – PEPFAR.

The innovation system maintained robustness during the transition to democracy, and most critically has defended itself from state interference. Scientists remain an important community with a voice that offers assistance to government across a wide range of issues.

South Africa is now at the forefront of HIV/AIDS and tuberculosis research. The latter has long been a scourge in Southern Africa and is a lethal disease accompanying and worsening HIV infection. Three other noteworthy areas of successful and ongoing local research are the development of vaginal microbicide gels, demonstration of the value of male circumcision in the reduction of HIV infection, and work on extreme drug resistant TB. When faced with the AIDS catastrophe the system has delivered a wide range of innovative solutions.

Social entrepreneurs backed with donor funding were able to approach the courts for relief. The courts made rulings that bound government to comply with its constitutional obligations, thus demonstrating that the separation of powers, though under threat, has endured. The relief granted to the TAC is a victory for those requiring treatment, and for the public at large since it has demonstrated the strength of the 1996 Constitution and its associated institutions.

The case study serves to highlight the stresses in the unfolding polity of post-apartheid South Africa. The doorstep conditions for an 'open access state' (North et al. 2009) are in place but there is an ongoing contest with those whose interests are represented by the 'mature natural state' of yesteryear. The fast-moving battle of the township streets has moved to the slower pace of the courtroom.

Additional research is needed to investigate the detailed linkages of the TAC with the medical science community, and its internal and external network of advisors. Today the TAC has some eight thousand members and its activities extend beyond those of a pressure group. Its members and staff monitor the work of health clinics, conduct research, and are active in communities as counselors and trainers.

A second area for investigation is the co-publication network in infectious disease. Allied to this is the question of the funding network and its sustainability as international donors withdraw support in favor of low-income developing countries.

In an extraordinary twist of fate for the young democracy, its peoples have had to dig deep to find the resources to meet the challenges that HIV poses. As shown in this brief exposition, progress has been made through a combination of 'own science' and social entrepreneurship. The Treatment Action Campaign offers a notable example of social entrepreneurship in action. One is humbled by what the TAC achieved, often at great personal cost to its leadership.

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