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Time Consistency and the Development of Vaccines to Treat HIV/AIDS in Africa

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ABSTRACT

AIDS is perceived to represent an unprecedented medical, political and economic challenge to African and world leaders. This paper examines the economics of pricing and supplying drugs and vaccines in the context of AIDS and HIV. It addresses the time consistency and other economic issues associated with patented drugs and research into vaccines for diseases that are mainly prevalent in poor countries. The paper examines the financial implications of treating HIV/AIDS with the medical procedures currently used to treat patients in industrialised countries. The paper concludes first that the time consistency problem is not the main obstacle preventing research into developing an HIV vaccine and thus addressing AIDS in Africa. Second, it is impracticable, at present, to mobilise adequate financial and conventional medical resources to address the perceived HIV/AIDS problem in Africa. Third, the most practical and appropriate health policy to tackle the African problem is by health education.

1. INTRODUCTION: SETTING THE SCENE

IN SUB-SAHARAN AFRICA the World Health Organisation (WHO) estimates there are 40 million cases of HIV/AIDS of which 84 per cent are in East, Central and South Africa. AIDS in Africa appears to be spreading by heterosexual transmission and does not appear to be confined to specified risk behaviours as it is in the industrialised countries. This has resulted in calls for increased efforts and funding to find a vaccine and for 'combination therapy' drugs to be made ubiquitously available in affected African countries.

AIDS is a complex syndrome and there is need for some medical clarification in order that the appropriate policy context can be appreciated.[2] Tests for HIV sero-positivity do not distinguish between active and passive viral infection.[3] Many people, for example, test positively for tuberculosis antibodies without showing symptoms and without being infectious. AIDS is not a single disease but a collection of about 26 diseases, such as tuberculosis that exist independently, to which individuals, in the presence of HIV sero-positivity, are presumed to succumb eventually when their immune system becomes impaired. Thus an individual in Africa with tuberculosis testing sero-negative for HIV has tuberculosis[4] but AIDS if testing sero-positive. Furthermore an anomolous characteristic of the diagnostic process in Africa is that indi-

viduals, groups of individuals and even whole regions are often presumed to be infected with HIV with or without a formal HIV sero-positivity test. This is justified under clinical impression in the permissive classification agreed by WHO and the US CDC at Bangui in central Africa in 1985 (WHO 1985,1986). It was created by the WHO uniquely for developing countries and is fundamentally different from the definitions used in Europe and the US. This point is ignored by most health professionals. By the classification,[5] an African can be officially diagnosed and registered without a HIV sero-positivity test.

It is also important to recognise that AIDS in Africa does not affect all African countries more or less equally. Craven *et al* (2001) found that the only statistically significant difference between high and low incidence countries in various categories of socio-economic characteristics at the 95 per cent confidence level was for life expectancy. This difference might result from excess mortality in the age group 20 - 40 in males and 15 - 25 in females due to greater poverty or AIDS or a recurrence of endemic diseases such as tuberculosis, enteritis, and schistosomiasis which, have simply been renamed AIDS in some countries, but not in others.

It is commonly believed that a person testing HIV sero-positive will eventually and inexorably develop AIDS and die. But in the developed world there are many documented studies of people testing sero-positive for HIV who have led normal lives for more than 15 years with no physical symptoms of AIDS. These people have followed lifestyles that avoid AIDS inducing risk behaviour (intravenous drug use and receptive anal intercourse). There is also a remarkable absence of secondary transmission of HIV sero-positivity from sero-positive partners to tertiary partners and infants in the general population.

Finally in setting the scene it is worth noting that the medical profession with the agreement of the international health authorities has several times changed the definition of AIDS. This is well documented. The first definition was published in 1982. The first revision was published in 1985. In 1987 the USA Centers for Disease Control (CDC) and the WHO further redefined AIDS to include several additional illnesses which increased, immediately, the number of AIDS cases (Centers for Disease Control, 1987). In 1992/3, they again redefined AIDS to include invasive carcinoma of the cervix, tuberculosis and other prevalent conditions in sero-positive persons (International Classification of Diseases 1992). Also one single test showing a low CD4 count (a subgroup of white blood cells) in a HIV positive person was considered as AIDS from that time on in the US but not in Europe or any other country. The new definition immediately increased the incidence and cumulative prevalence since 1982 in the United States by more than 50 per cent from 250,000 to over 400,000 cases of AIDS. As a consequence AIDS ceased, overnight, to be a mainly male disease (Stewart 1992a). In 1998, in the face of declining cases of AIDS the definition was changed again to include as AIDS all persons who were sero-positive to HIV, irrespective of absence of symptoms. Hence HIV sero-positivity and AIDS are now considered synonymous and referred to as HIV/AIDS. All these points have particular relevance to first, vaccines and second prophylactic drugs in the context of AIDS in Africa.

There are potentially four interventions that could significantly lessen the incidence of HIV/AIDS in Africa. It is established that rising living standards resulting from economic growth are always accompanied by improving indicators of good health. Policies in Africa that delivered sustained high rates of economic growth would do much to reduce the incidence of diseases such as tuberculosis, malaria and recurrent diarrhoea which are all associated with

poverty. This is a long term strategy that will not give short term results in the current circumstances in many countries and even the future prospects for such growth are not good. Collier and Gunning (1999) argue that slow growth, in many African countries, over the past 30 years can be explained by polices of high export taxation and inefficient public service delivery coupled with 'destiny' explanations of tropical landlocked locations and deteriorating terms of trade. They conclude that the binding constraint in the future is likely to be poor public services). This conclusion has implications for the next two options.

The second intervention that could alleviate the HIV/AIDS problem is by supplying drugs, currently available in developed countries and shown to be beneficial in treating AIDS. The third intervention could be the implementation of health education policies that could result in an eventual elimination of the problem. The fourth intervention could involve developed countries providing funding to assist the development of an HIV vaccine. This paper assesses these latter three strategies.

2. EXTERNALITIES

To evaluate the extent of externalities associated with HIV/AIDS it is necessary to consider HIV and AIDS separately. In developed countries it is medically assumed that transmission of HIV is either via people, although only through intimate homosexual contact or contaminated body fluids or needles shared by drug users, or else by vertical transmission from mother to child.

Table 1: Estimated risk of infection of HIV

Partner never tested	*One sexual encounter*	*500 sexual encounters*
Not in high risk group.		
using condoms	1 in 50,000,000	1 in 110,000
not using condoms	1 in 5,000,000	1 in 16,000
High risk groups (H.R.G)		
using condoms	1 in 100,000/10,000	1 in 210/21
not using condoms	1 in 10,000/1,000	1 in 32/3
Partner tested negative		
No history of H.R.B (a)		
using condoms	1 in 5,000,000,000	1 in 11,000,000
not using condoms	1 in 500,000,000	
Continuing H.R.B.		
using condoms	1 in 500,000	
not using condoms	1 in 50,000	
Partner tested seropositive		
using condoms	1 in 5,000	
not using condoms	1 in 500	

Note: (a) H.R.B. - High risk behaviour. Source: Hearst and Hulley (1988)

This medical aspect of HIV probably explains why mathematical models based on the assumption of heterosexual transmission have repeatedly been shown to be highly erroneous whereas those based on trends of personal behaviour are accurate in the UK and the USA (Stewart 1992b, 1992c). It leads to the conclusion that a distinguishing characteristic of the mode of transmission of HIV is that there are no physical externalities associated with its transmission (Butler 1990). Decisions about the allocation of funds for prevention should not, therefore, be made on the usual conventional economic ground of externality. Whilst no spread of HIV in the heterosexual population could be observed in developed countries it appears to be easily transmissable heterosexually in developing countries. We will return to and address this important apparent difference in a later section.

There remains the issue of the extent to which there is a potential for externalities when a person has intimate contact with an HIV sero-positive individual whose health status is unknown. In the UK the chances of this sort of externality are lower than presumed. Table 1 shows the relatively low risk of HIV infection between different risk statuses and Barlow, Daker-White and Band (1997) confirmed that there is very little sexual mixing between risk groups. This result, surprisingly, also holds too for immigrants and long-term residents. Thus Barlow (2001) is able to explain why heterosexual transmission is so very rare. Whether the remaining risks constitute an economic externality is a moot point. By contrast an AIDS disease such as tuberculosis, which is endemic in Africa is infectious, clearly has much larger externalities.

3. Time inconsistency, patents, rules and discretion

Time inconsistency is the name given to the problem that arises when policymakers with discretion are able to set a policy today but, in the future, can renege upon it if convenient to do so. Policy discretion leads eventually to a diminution of credibility. One solution to this problem can be the adoption of rules and laws that enable credibility to be given to decisions made by policymakers. Kydland and Prescott (1977) addressed the issue of time inconsistency in the context of a rigorous new classical model in their critique of discretionary policy as advocated in optimal control theory. The conventional approach, drawing upon the work of Simons (1936) and Tinbergen (1952), consists of three steps. First, the targets or goals of policy (a welfare function) are set. Second, a set of instruments to achieve the target is chosen, and third, the policymaker uses an economic model so that the instrument may be set at its optimal value to achieve the target. Thus the approach is normative in specifying how policymakers should behave in the context of optimal control theory. Although Kydland and Prescott (*ibid*) addressed the unemployment and inflation trade-off issue they noted that the time inconsistency problem was widely applicable and cited patents and flood control as other examples where consistent policy procedures are not seriously considered. They argued that even if, first, economic agents are rational, second, there is a well defined welfare function and, third, policy makers know the timing and magnitude of the effects of their actions, the outcome will not result in the welfare function being maximised. In the case of patents the theory is used to predict the effects of alternative policy rules and one with good operating characteristics is selected. The application points to a hard rule in law that allows a company to extract monopoly rents for an 'optimal' patent period, at the cost of a reduced consumer surplus, and thus time consistency is maintained. It is this problem that is addressed by Kremer (2000) although Gallini

(2002) argued that in designing effective patent rules the simple trade-off between stimulating innovation at the cost of constraining innovative output may be unreliable and that patents might undermine the protection of patented inventions.

In Africa, tuberculosis, an AIDS defining disease, kills several millions annually. The disease has been endemic in many countries in Africa for over a hundred years. A partially protective and cheap vaccine (BCG) has been available since 1936 in Francophile Africa and since 1950 elsewhere; curative drugs are also available though weakened now by drug-resistant infections. The failure to tackle tuberculosis in Africa highlights the problems in organising comprehensive immunisation programmes and in implementing compliant programmes of treatment with antibiotics in developing countries. The principal problem preventing HIV/AIDS from being tackled there is perceived to be a lack of money (Attaran and Sachs 2001). African states are poor; many have per capita incomes of less than US$500 (see World Bank www.worldband.org). To understand the magnitude of the problem it is only necessary to appreciate that treatment of AIDS in the developed countries by one drug, AZT, amounts to around US$1,400 per person per year. The costs of delivery of treatment by a combination of drugs, currently favoured in the West, is in the order of ten times this amount. There are clear benefits to be gained from the development of a more effective vaccine for tuberculosis that can be administered to, and be complied with, to huge numbers of people within the poor medical infrastructure in most African countries. The same applies to other endemic, non AIDS defining diseases such as malaria.

Research into vaccines remains minimal because companies calculate that the research expenditures necessary to develop a vaccine could not be recovered. Kremer (2000) estimated that a malaria vaccine would be cost effective relative to other developing country programmes at $41 per person immunised. But in Africa, because of a lack of a basic public health infrastructure, even vaccines for *hepatitis b* and *haemophilus influenzae b* priced at US$ 2 do not reach the children in the poorest countries. Furthermore in permitting companies to charge the market price for the duration of a patent 'governments are tempted to use their powers as regulators, major purchasers, and arbiters of intellectual property rights to force drug and vaccine prices to levels which cover manufacturing costs, but not research costs' (Kremer 2000). As a result, companies do not have adequate incentives to pursue research into vaccines or drugs that would alleviate high incidence endemic diseases in poor countries.[6]

It is argued also on ethical as distinct from economic criteria that it is immoral to apply the same rules and duration of patent protection in poor countries as in rich ones and that governments everywhere have a clear moral obligation to put the health of their citizens before the profit margins of patent holders. The Commission on Macroeconomics and Health, Chaired by J D Sachs (WHO 2001) proposed, amongst others, a policy of differential pricing to supply a parallel market in poor countries at a much lower price.[7] Apart from the obvious problem of deciding where the discriminatory line is to be drawn the strategy provides a strong incentive for illegal but profitable re-export trade to the rich countries. The pharmaceutical industry originally offered donations of AIDS and HIV drugs to the South African government but it was opposed to a government wishing to pass legislation that undermined the principle of patents.

If governments renege on international patent law a much more important consequence could be a fundamental change in the behaviour of the drug companies. If governments disobey patent law then the rule is replaced by discretion and the time inconsistency problem

arises. Rational companies will realize that if patent laws are to be broken in some countries for some drugs they could be broken in other countries for other drugs; announced government policies become time inconsistent and will not be credible. Companies will be faced with taking the reaction of other agents into account in selecting its decision. Ideally, the best outcome for companies is where they innovate knowing that the strong rule of the international patent laws protects the monopoly profits for the duration of the patent. However, if some developing countries' governments cheat on the patents they become better off. If the companies decided as a consequence not to innovate then both companies and governments become worse off. The outcome is that it is still better for companies in Western countries to innovate at some level because it is likely to be accommodated by some form of collective corporate strategy or governmental response.

The South African Government proposed an amendment (clause 15c) to the *Medicines and Related Substances Control Amendment Act* (1997) which, if passed, would allow sweeping powers to avoid paying the industry's asking price for medicines by using cheaper so-called parallel imports and 'generic' or copied drugs for the treatment of HIV/AIDS and AIDS. The pharmaceutical companies objected that the clause contravened the World Trade Organisation's Agreement on Trade Related Intellectual Property Rights (trips). On 19 April 2001, 39 pharmaceutical companies collectively decided to drop their class action. On its face the decision to withdraw appeared to be a rare and unusual victory for supporters of good ethical business practices over the pursuit of profits. David Ebsworth, head of pharmaceuticals, Bayer, implicitly recognising the problem of time inconsistency, said

> The danger is that loss of patents in HIV alone could destroy the global HIV market. The bigger danger is that the broader loss of patents in South Africa could be the thin end of the wedge that smashes patent protection for the industry world-wide . And if that happens then frankly the entire economic base of the pharmaceutical industry is destroyed. (*Financial Times,* 18 April, 2001)

In summary the issue of time inconsistency needs to be addressed before significant research into drugs and vaccines for diseases that are especially prevalent in poor countries. The need for this is especially pressing given the decision of some poor countries to ignore international patent laws. Several solutions to this problem and the time inconsistency issue associated with research into vaccines against diseases mainly prevalent in the poor countries have been proposed by Kremer (*ibid*) and Sachs (2001). All are consistent with the perception that AIDS is a major threat to the public health and the economy in Africa and many other developing countries. Kremer (1988) has argued that the buyout of patents is not appropriate for vaccines because their efficacy can be ascertained relatively easily and advance purchase commitments by governments may be just as effective and not subject to the possibilities of collusion. He argues that the design of the purchase commitment is crucial if it is to be effective because drug developers must believe that sponsors of a purchase programme will not later cheat on the commitment. Kremer (2000) discusses 'push' (R&D tax credits or research grants) and 'pull' (incentives to reward the development of specific vaccines) programmes to encourage vaccine developments. He is sceptical of the former, first on the grounds of rent seeking by researchers exaggerating the importance of their work and secondly because of the difficulty of stopping the flow of public funds once bureaucratic momentum has been achieved. There is evidence of both in the field of AIDS research and policy (Craven, Stewart and Taghavi, 1993; Craven *et al.*

2001) in industrialised countries and even in Uganda by 1994 there were over 4,000 non government organisations registered and operating (Mirembe, Ssengooba and Lubanga 1998). A futher problem is that even if priorities are established, 'Despite ... efforts to honour national priorities, donors more or less dictate programs. The bargaining power of district decision-makers is minimal because of the inadequate funds at their disposal. Because they depend so heavily on donors for funds, they tend to accept projects as they arrive' (Mirembe, Ssengooba and Lubanga, 1998). The main recommendation of Kremer is for the setting up of a Government vaccine purchase scheme whereby taxpayers would only pay for an efficacious vaccine once it had been developed. Thus incentives for marketable research in these areas would be established and research would be encouraged into vaccines against malaria and for a effective immunisation against tuberculosis that could be administered to large numbers of people.

4. The role of vaccines

There is, understandably, confusion over what is meant by an AIDS vaccine.[9] Kremer (2000, p. 9), for example, states that 'formidable scientific and technological obstacles remain in the way of development of malaria, tuberculosis and HIV vaccines'. In Africa a common AIDS disease is tuberculosis (in the presence of HIV sero-positivity) . A vaccine that neutralises HIV would probably have little impact on the incidence of AIDS diseases in Africa because most are endemic and occur independently of HIV sero-positivity[10] and, as we have seen, AIDS in Africa is often presumed without HIV sero-positivity being medically established. Thus research should be targeted at more effective vaccines that can be administered effectively to millions of people for established endemic diseases such as tuberculosis rather than for vaccines to neutralise HIV. In this respect Kremer's contribution on the time consistency issue is important.

As a general rule, when an individual receives a vaccine he obtains personal protection against the specified infection. The individual also benefits others by helping to break the infectious cycle. Hence those who purchase and consume a vaccine are conferring benefits not only on themselves but also on those who have not bought and consumed, or been given the vaccine. Individuals, therefore, have inadequate incentives for consuming vaccines. Poor children, especially in the developing countries, are a main beneficiary of vaccines but cannot negotiate payment with future earnings should they remain healthy.[11] An HIV/AIDS vaccine would act rather like a drug that prevented the onset of a disease in a person at risk. Antimalarial drugs used prophylactically come to mind. Generally, the carriers of infectious diseases are people, air, animals, insects, foodstuffs and objects such as towels. The usual alternative, and the accessory, to vaccination is the treatment of the illness itself. Vaccines, however, are never one hundred per cent effective. They vary in their efficacy and safety. Estimates of the cost component of cost-benefit must take account of the cost of illness and life or death, no less than of the cost of the vaccines and administration of programmes. The health economist must therefore face a complicated calculation, including medical information, about relative risks of transmission, acquisition and consequences of infection.

As we have seen, HIV/AIDS in developed countries does not possess the typical characteristics of a medical externality presenting a public health problem. It could be argued then, in such situations, contributory but controllable behaviours qualify as externalities deserving attention as unique threats to maternal and child health if not to general public health. In this respect, it is important to realise that many infections subside in frequency and severity with improvement in housing, water purity, nutrition and general standard of living. In the United

States, for instance, tuberculosis — the white plague of the century 1850 to 1950 — diminished spectacularly without any vaccination. But, the prospect of substantially improved public health in Africa in the foreseeable future is remote.

5. Estimating the cost of treating HIV/AIDS in Africa

Pharmaceutical companies have obvious commercial interests in developing vaccines against HIV and drugs to slow the progression of HIV sero-positivity. Following clinical tests the USA Food and Drug Administration (FDA) in 1987 approved a drug, AZT (*zidovudine*), for sale and Burroughs Wellcome gained an exclusive license to market the drug under the brand name *retrovir*.[12] At the time AZT was the only drug with full marketing approval from the FDA.[13] AZT was originally retailed at $10,000 and wholesaled at $8,300 for one year's supply. The retail price subsequently fell to $3,000 by 1991. By 1999 the annual cost to the UK National Health Service of one year's supply of AZT for one patient was about US$1,400 (£1 = US$1.4) although in most countries such mono therapy has been discontinued (Tregoning and Craven 2001).[14] It should be noted that a combination of antimicrobial agents ('combination therapy') is now regarded as the optimal treatment given intermittently for long periods. This adds, in addition to the cost of the drugs, a considerable task of monitoring and administrating complex schedules involving several daily doses of different drugs manufactured by different companies. There are obvious and currently insurmountable resource and infra-structure constraints associated with implementing this policy in Africa. With the exception of Libya and some other northern countries, Africa lacks the medical infrastructure and personnel to even begin contemplating 'combination therapy' treatment. In one study of Nigeria (Baker, 2001) established that nearly half of all, relatively affordable, drugs offered for treatment of TB there were out-of-date, incorrectly prescribed or fake. Further pressures come from single issue interest groups (Craven *et al* 2001).

Attempting to assess the African AIDS problem in the context of funding is extremely difficult because of the doubts about the reliability of the available statistics. Table 2 gives an indication of the financial standing of 50 African countries.

Using a population estimate of 766m for Africa and the trimmed mean (excluding smallest and largest 5 per cent) GNP per capita a single GNP figure for the whole continent the figure for 1998 is in the order of US$509bn; a useful, if crude, figure to work around. It is well known that the African continent's economy is relatively stagnant and lacking in any significant capital markets. The consensus of economists and second, medical and relief workers is that the African economy is contracting severely because of the impact of AIDS. UNAIDS (2000a) claims that in 1988 200,000 Africans died in war but more than 2 million died of AIDS. The same report states that in Botswana over one third of the adult population is HIV sero-positive

Table 2: Descriptive Statistics: Africa, GNP per capita (US$) 1998

Mean	*Tr mean*	*Median*	*St.Dev.*	*Minimum*	*Maximum*
863	665	375	1181	110	5540

Source: www.unaids/hivaidsinfo/statistics/june98/fact_sheets/africa.html. The figures were incomplete for some years - for example, for South Africa. They were compiled from the UNAids website, January 2001.

and where, in 20 years, there will be more adults in their 60s and 70s than there will be in their 40s and 50s. In the most affected countries, AIDS is crippling national economies and undermining businesses (UNAIDS, 2000b). In South Africa, one of Africa's strongest economies, the epidemic is estimated to cut GDP by 17 per cent by 2010. In Bostwana, the African country with one of the highest GDP per capita and also the world's highest HIV sero-positive rate, it is estimated that the government budget will be cut by 20 per cent over the next decade because of AIDS and the poorest households will suffer a 13 per cent reduction in income. Companies are losing productivity and spending more on hiring and retraining as their workforces fall ill. Companies are also paying more for insurance and medical care (UNAIDS, 2000b). As an estimate of the GNP of Africa, the figure of US$500bn is, therefore, probably optimistic.

UNAIDS (2000b) estimates that a relatively modest contribution — US$3 billion — would do something to turn this situation around, at least in sub-Saharan Africa. Of this it is estimated that US$1.5 billion are needed for prevention efforts, and the other half for basic care of those already infected.

Currently the World Health Organisation (2000) states that 'the total spent on HIV prevention in sub-Saharan Africa (excluding South Africa) in 1999 was $165million from all sources'. Current estimates now suggest that sums in the order of $2.5billion are needed for prevention alone. Add the costs of care and the figure rises dramatically. In its press release UNAIDS (2000b) states there are 25.3 million people living with HIV in Sub-Saharan Africa. If applying Western standards the annual drug and drug administrative costs for combination therapies (where patients are treated with a combination of drugs) are US$14,000 (£10,000 at £1 = US$1.4) per patient then the treatment costs per annum would be US$350bn. Suppose,

Table 3: Africa, health care and HIV/AIDS care assumptions and estimates

GNP 1998.	US$ 509bn
Health care budget (assume 10% GNP)	US$ 51bn
AIDS budget (assume 50% Health budget)	US$ 26bn

however, that the drug companies agree to supply the medication and treatment for only US$1,400 per patient the annual treatment costs would be US$35bn — about a third more than the already probably rather optimistic estimates in Table 3. When estimates for prevention vary from US$ 1.5bn (UNAIDS) to US$ 2.5bn (WHO) and when combined therapy is recommended severe doubts arise about whether systems for monitoring side effects,[15] control of funds, administrative structures and care facilities in Africa are robust.

With the above figures in mind how is the pharmaceutical industry placed to provide assistance in either supplying drugs or donating a percentage of earnings on grounds of compassion? The figures in Table 4 show the ten largest pharmaceutical companies and their sales and global market share.

These sales figures suggest a global market worth US$317bn. Another, similar, calculation was made using information available from Datastream. The sum of sales from all companies whose sales exceeded one billion pounds sterling in 2000/2001 was £230.33bn (@£1:US$1.4 = $322.46bn). The gross profit rate on pharmaceuticals between 1982 and 1990 was about 28 per cent. Many pharmaceutical companies manufacture chemicals and consumer products (upon which the profit rates are much lower) as well as pharmaceuticals. The profit

rate on overall sales is about 17 per cent (McIntyre, 1999). Thus profits can be put crudely at about US$54bn. So in the context of presumed generous African health care budgets at about

Table 4: Sales and market share of largest pharmaceutical companies

	Sales, US$ bn.	*World market share %*
Pfizer	23.15	7.3
GlaxoSmithKline	22.04	6.9
Merck	16.49	5.2
AstraZeneca	14.29	4.5
Bristol-Myers Squibb	13.28	4.2
Novartis	12.41	3.9
Johnson & Johnson	12.36	3.9
Aventis	11.31	3.6
Pharmacia	10.25	3.2
American Home Products	9.57	3.0
Total	145.14	45.7

Source: Pilling and Hall, (2001) 'Combination Therapy', *Financial Times*, 8 May

10 per cent of African countries' GNP the total profits of the pharmaceutical industry are a rough match. If the pharmaceutical companies were to devote, on ethical/conscience grounds 0.5 per cent of their earnings the sum raised would be in the order of US$250m. Such a gesture would therefore cover the sum of $165m, estimated by WHO, spent in 1999 on HIV sero-positive prevention in sub-Saharan Africa (excluding South Africa) and deemed wholly inadequate. The sum only represents about 0.005 of the US$50bn estimated previously as necessary for effective treatment. Whether such monies would be distributed or spent cost effectively is another matter.

6. Reinterpreting Aids in Africa

In sub-Saharan Africa the WHO estimates there are 40 million cases of HIV/AIDS. Although these figures, taken at face value, represent an epidemic of tragic dimensions there are reasons to call into question some of the claims made about HIV/AIDS in Africa.

A diagnosis of AIDS in developing countries does not require the same diagnostic standards as used in the developed countries. Where a test is required less rigorous standards apply in Africa, where so called rapid tests are frequently used (i.e. Capillus™, Determine™). Tests that are compulsory for diagnosis of HIV sero-positivity in Australia, the USA and the UK are optional and not used in most situations to confirm diagnosis in Africa (Craven *et al*, 2001).[16] The dimension of error in management and estimates due to this anomaly is unmeasured but obviously enormous since, in the worst affected areas of Africa, facilities for laboratory-based diagnosis are lacking. Where tests are not required the diagnostic procedure is so general that false positives will be the rule rather than the exception.

The descriptive statistics for Africa (Table 2) indicate how poor African countries are. With poverty on the African scale, malnutrition, an unambiguous cause of compromised immu-

nity, is widespread. In tropical Africa, AIDS and HIV sero-positivity are virtually synonymous with regions where malaria is endemic (Root-Bernstein, 1993, p. 304) with a high mortality in the younger age groups. From data collected for the WHO over 1970-75 it was concluded, surprisingly that in Kenya and Nigeria, malaria was responsible for about 25 per cent of infant mortality. Those surviving malaria often develop anaemia which is frequently treated by blood transfusions, which may or may not be screened for HIV antibodies and other viral and bacterial contaminants. In the Democratic Republic of the Congo (formerly Zaire), between 1985 and 1986 70 per cent of 13,000 transfusions were given to children with malaria. There is also medical consensus that blood transfusions in themselves cause immune activation which stress and may deplete the body's immune defences. In some African medical practices unsterilised needles and shared syringes are used on a scale which would be intolerable in industrialised countries. Pathogenic and other contaminants are thereby transmitted in blood transfusions and inoculations with penicillin and other injected drugs and vaccines (see also Economist, 2001). To this can be added the officially unacknowledged but widely known drug abuse problem in many African countries. There is also a huge incidence of all forms of sexually transmitted diseases. Most of these are treated by an injection, facilitating transmission of several pathogens when done with a non-sterile equipment. All of this, combined with inadequate medical care, contamination and shortage of water and food, huge population movements and the diseases which accompany political revolution and war, contribute strongly to the increase of AIDS defining diseases in Africa.

AIDS in Africa is certainly very different from AIDS in the West in terms of standards of accuracy of identification and reporting. A good example of the unreliability of the AIDS data from Africa is found in the report of the Tanzanian health ministry in August 1990, 'Of the 1,987 new cases registered, only 667 (33.6 per cent) fulfilled the above mentioned criteria. [...] Although 1,320 cases would not strictly qualify to be called AIDS cases, we have taken them as cases assuming that those who reported them just made an omission at the stage of compiling the forms' (National Aids Control Programme, 1990). Another example was contained in a summary report of women attending public antenatal clinics: 'A standard national protocol was developed ... and has been phased-in over a three year period. ... Implementation of this protocol has been monitored closely and gradual phasing-in was adopted so as to ensure that expected prevalence trends are not disrupted' (Department of Health, 1999).

AIDS in Africa is associated with common diseases, whereas AIDS in the West is associated with rare ones. The main AIDS-defining disease in Africa is tuberculosis (UNAIDS, 2000). In industrialised countries the main disease afflicting drug users is an unusual form of pneumonia (*Pneumocystis carinii*) and, in some homosexual men, *Kaposi's sarcoma* (a form of skin cancer which is now attributable to *herpes viri* and probably unconnected to HIV). The usual explanation for this is that those people with compromised immune systems succumb to these infections. Thus those who are reported to have AIDS in Africa die generally of tuberculosis which has been a common cause of death in that continent for 100 years. However, this explanation is problematic in explaining AIDS in the West because *pneumocystis carinii* and *Kaposi's sarcoma* are not common infections and were extremely rare prior to AIDS. Thus there is a major difference between AIDS in Africa and AIDS in the West.[17] This should not be interpreted only as implying that all AIDS in Africa is a redefining of old established endemic diseases (as AIDS) — though it is precisely this which has been reported as the African AIDS

tragedy. However, it is clear from medical reports that some of the AIDS diseases of the industrialised countries are also present in the big African cities. Whether these AIDS diseases in African cities can also be explained as the consequences of high risk behaviour such as drug abuse or receptive anal sex seems unlikely but this is an important issue which demands investigation. Given the massive funding accorded on the basis of estimates of AIDS taken at face value, there is the possibility that other, more prevalent and equally dangerous diseases are being denied attention and funding. This mistake has been made already in the developed world where major errors in prediction led to entrenched over funding (Craven, Stewart and Taghavi 1993; Craven and Stewart, 1995; Craven, Stewart and Taghavi 1996). In short, the situation in Africa is sufficiently ambiguous to prevent us from being able to endorse a policy of adopting Western treatment regimes.

7. Conclusion

An important finding of this paper is that it is imperative there is critical investigation to support a new syndrome of AIDS in Africa where there is one, from a background incidence and exacerbation of endemic diseases. Second, the measures adopted against AIDS, and claimed to be successful, in industrialised countries are not relevant, and if adopted could be damaging in Africa. It would not be possible for African countries to administer conventional combination therapy drugs even if they were made affordable. Thus the main problem is not the time consistency problem or a patent system that prevents research into an HIV vaccine but barely functioning health systems. Third, it is unwise, both in industrialised and Third World countries, to project results from small local samples of indirect infectivity to large geographical regions or countries. Fourth, caution should be exercised when incomplete and inaccurate surveillance methods from Third World countries are used as a basis for legitimising and maintaining present and future funding. Fifth, and most important both medically and economically, vaccine research should be redirected from HIV vaccines towards more effective vaccines and treatments that can be administered to large numbers (millions) of people to control tuberculosis and malaria where the time consistency issue and the contributions from Kremer (1988, 2000) are important.

Given that the resources needed for distribution, control, administration and monitoring are simply unavailable what should be done? The solution is similar to that adopted in industrialised countries. The routine use of condoms and public health messages should be encouraged. Alimentary and respiratory infections should be treated with commonly available and relatively cheap antibiotics. It should be noted that the main killer, diarrhoeal diseases, can only be controlled if the delivery and quality of running water and food are ensured.

There is unanimity that poverty, contaminated or insufficient water and poor sanitation among other deprivations aggravate HIV/AIDS — and other diseases — in Africa. When South Africa's President Mbeki rightly suggested that these deprivations merit prior attention and might bring more benefit than imported drugs, he was and still is accused, in medical journals and hence in the international press, of depriving his people of the advances of western science which, even if affordable, do not include as yet a remotely curative drug or any vaccine.

ENDNOTES

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2. We will, somewhat pedantically, continue to refer to HIV 'sero-positivity' throughout, rather than the more commonly used expression HIV 'positive'. This is because the vast majority of tests for HIV, such as Elisa and Western blot, may not be entirely specific and are indirect in that they generally detect antibodies, not the virus itself. If the antibodies are detected the presence of the virus is assumed. Hence the term HIV sero-positive is strictly more accurate than the term HIV positive.

3. In the case of HIV, live virus from a person testing HIV sero-positive or with AIDS in Africa has not yet been isolated (Craven et al 1999).

4. Kremer (2000, p. 7), an economist at Harvard for example, states that '...of the 1.9 million people who die annually from tuberculosis, 400,000 are infected with HIV...' These people do not die of tuberculosis because that disease in the presence of HIV sero-positivity is AIDS. Similarly, ocular (eye infections), cutaneous (skin infections), alimentary, respiratory and mental signs occurring in sero-positive persons are liable to be regarded as AIDS instead of other forms of organic illness.

5. WHO AIDS Definition (1986) for adults in developing countries:

Major signs:
- weight loss >10%
- chronic diarrhoea > 1 month
- fever > 1 month (intermittent or constant)

Minor signs:
- cough for > 1 month
- generalised itching
- recurrent herpes zoster
- oro-pharyngeal candidiasis
- chronic progressive and disseminated herpes simplex infection
- generalised lymphadenopathy

Exclusion criteria:
- cancer
- severe malnutrition
- other recognised causes

AIDS is defined by the existence of:

- at least 2 major signs

and

- at least 1 minor sign

and

- in absence of any exclusion criteria

or

- in a patient with generalised *Kaposi's sarcoma*

or

- in a patient with cryptococcal meningitis