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AN EXPLORATORY ANALYSIS OF CROSS-COUNTRY ACCESS TO ANTIRETROVIRAL TREATMENT

Nicoli Nattrass

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An Exploratory Analysis of Cross-Country Access to Antiretroviral Treatment[1]

The past five years have seen a groundswell of public opinion and policy in favour of expanding access to highly active antiretroviral therapy (HAART) in developing countries. Important milestones in this regard have been the launch of the $15 billion United State's President's Emergency Plan for AIDS Relief (PEPFAR) and the announcement on World AIDS Day 2003 by the World Health Organisation and UNAIDS of a concrete plan to provide HAART to three million people by the end of 2005. Key elements of this 'three by five' strategy include developing country-level support and capacity building, harnessing additional donor funding and ensuring a cost-effective and reliable supply of medication.[2]

This unprecedented international effort has resulted in dramatic increases in the numbers of people accessing HAART in developing and transitional countries. Between June 2004 and December 2004, the number of people on HAART more than doubled in Sub-Saharan Africa and the developing and transitional country total rose from 400,000 to 700,000 (see Table One). But whilst recognising the centrality of this international mobilisation in favour of greater HAART coverage, UNAIDS and the World Health Organisation are at pains to stress that success will "ultimately depend on continued strong commitment and follow-through by governments".[3]

Governments clearly play a central role in determining country-level access to HAART. This is illustrated vividly by the contrasting cases of three high HIV prevalence neighbouring Southern African countries at similar levels of development: Botswana (adult HIV prevalence of 37 percent), Namibia (21 percent) and South Africa (22 percent). Whereas by the end of 2004, Botswana had succeeded in providing HAART to 50 percent of those estimated to need it,

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[1] I am grateful to Jim Levinsohn, Martin Wittenberg and Ali Tasiran for their comments on earlier drafts and to Tom Scott for his research assistance.

[2] Details of the 'three by five' initiative' can be found on http://www.who.int/3by5.

[3] Press release on the December 2004 progress report of the 3 by 5 initiative, available on http://www.who.int/3by5/progressreport05/en/.

and Namibia had reached 28 percent respectively, South Africa had provided HAART to a mere seven percent of those living with AIDS. AIDS prevention and treatment policies are political priorities in Botswana and Namibia, but are mired in confusion and political dissembling in South Africa (Nattrass, 2004; Phororo *et al*, 2004; WHO, 2005).

Table One: HAART coverage in Developing and Transitional Countries

Geographical Region	*Estimated number of people on HAART (December 2004)**	*Estimated number of people aged 15-49 needing HAART*	*HAART coverage as of December 2004 (%)*	*Estimated number of people on HAART (June 2004)*	*Average monthly growth in the numbers on HAART (June to December 2004)*
Sub-Saharan Africa	310,000	4,000,000	8%	150,000	12.9%
Latin America and the Caribbean	275,000	425,000	65%	220,000	3.9%
East, South and South-East Asia	100,000	1,200,000	8%	55,000	10.5%
Europe and Central Asia	15,000	150,000	10%	11,000	5.3%
North Africa and the Middle East	4,000	55,000	7%	4,000	0%
Total	700,000	5.8 million	12%	440,000	9.8%

Note: * Average of low and high estimate.
Source: WHO (2005: 11).

However, political commitment is far from the only reason why AIDS-affected developing countries are likely to differ in terms of HAART coverage. Factors such as resource availability, institutional characteristics and the scale of the epidemic are also likely to be relevant. It is thus instructive to examine the international data to see if empirical regularities exist which might help 'explain' the cross-country distribution of HAART coverage.

This paper investigates some possible determinants of HAART coverage through exploratory regression analysis using data from World Health Organisation (2005), UNAIDS and the World Bank.[4] Following UNAIDS and the World Health Organisation, HAART coverage is defined as the number of

[4] Data from the World Bank are available on www.worldbank.org. AIDS-related data are available from the World Health Organisation (www.who.int) and via links on the UNAIDS website (www.unaids.org).

adults on HAART expressed as a percentage of the number estimated to need it in each country. The bulk of the empirical work was conducted using HAART coverage as of December 2004. However, in order to highlight how the international effort to improve access to HAART has changed the situation, regression analysis on HAART coverage as of June 2004 is also included at key points in the paper for comparative purposes.

1. The Promise of HAART

AIDS is overwhelmingly concentrated in developing countries. Eighty-three low- and middle-income countries collectively account for 90 percent of the 37.5 million people estimated by UNAIDS to be living with HIV/AIDS worldwide at the end of 2004. Most of these are in poor countries, with Sub-Saharan Africa, China and India accounting for 75 percent of global HIV infections. One of the reasons for this pattern is that poverty is strongly implicated in HIV transmission (see e.g. Booysen 2002; Baylies and Burja, 2001; UNAIDS/WHO, 2004; Stillwaggon, 2002). The situation is aggravated by inadequate health care (itself a function of low levels of development) and weak or belated political responses to the AIDS crisis.

As can be seen in Figure One, life expectancy has been declining sharply in AIDS-affected countries – particularly those in Southern Africa. For those countries where HIV prevalence is in excess of five percent, life expectancy in 2002 is now lower than it was in the 1960s. No wonder then, that De Waal describes the AIDS pandemic as a "development processes run in reverse" (2003: 11).

As illustrated in Figure Two, a large-scale HAART programme together with a set of AIDS prevention interventions (voluntary counselling and testing, mother-to-child-transmission-prevention and the improved management of sexually transmitted diseases) can have a large positive impact on life expectancy. This projection for South Africa comes from the ASSA2000 Interventions Model's estimation of the likely demographic impact of different hypothetical large scale interventions designed to reach 90 percent of those who need them by 2006 (see Johnson and Dorrington, 2002; Geffen *et al*, 2003; Nattrass, 2004). The model draws on behavioural research from developed and developing countries (e.g. De Vincenzi, 1994; VTCESG, 2000) and medical research showing that people on HAART have lower viral loads and hence are less infectious (see e.g. Vernazza, *et al*, 2000; Hart *et al*, 1999). It predicts that adding a large-scale HAART 'rollout' to a set of AIDS prevention interventions has a significant positive impact on life expectancy – both by extending the lives of those living with AIDS and preventing new HIV infections.[5] Such a large beneficial impact of improved access to HAART on life expectancy is likely to materialise also in other high HIV prevalence Southern African countries. Countries with lower levels of HIV prevalence will also experience benefits in terms of longer life expectancy for AIDS patients and fewer new HIV infections, but as this comes off a lower base, the aggregate impact on life expectancy will be less dramatic.

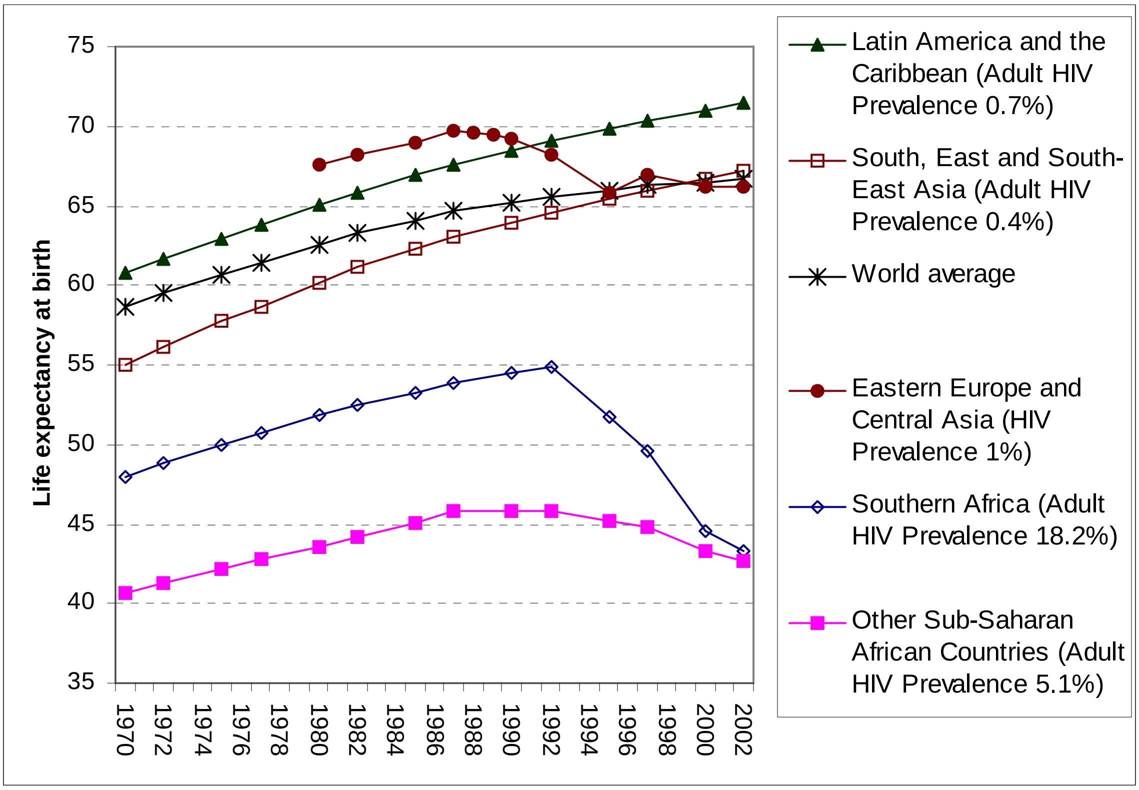

Figure One: Life Expectancy at Birth for AIDS-affected countries (population-weighted average by region)

[5] Marseille *et al* (2002), however, caution against concluding that HAART helps prevent new HIV infections. They warn that the preventative benefits of reduced viral load have to be balanced against longer life expectancy for people on HAART. The ASSA model addresses this concern by assuming that HAART patients remain sexually active throughout their extended lives. In other words, the model predicts that the positive effects of reduced infectivity on HIV incidence overwhelm the negative effects of longer life of sexually active HIV-positive people.

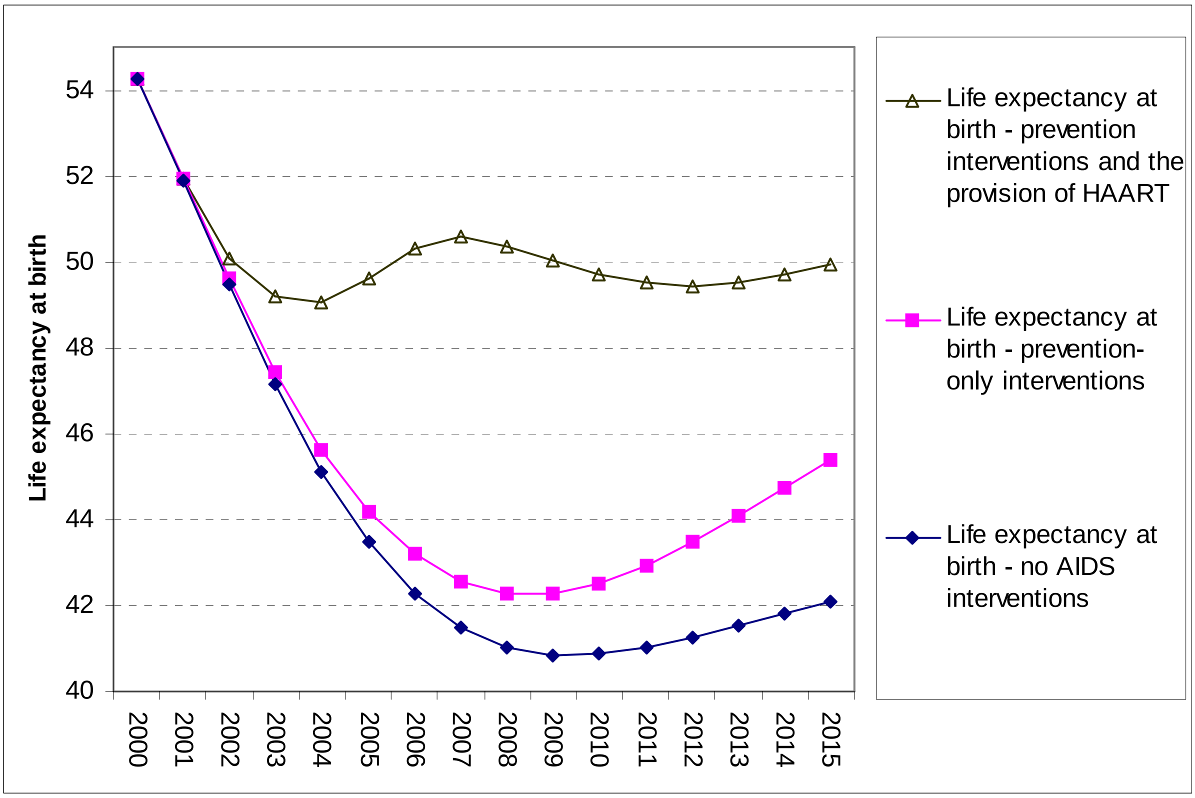

Figure Two: The Projected Impact of Large-Scale Prevention-only and Prevention and Treatment Interventions on Life Expectancy in South Africa (ASSA2000 Interventions Model).

It is now widely accepted that more people are likely to participate in voluntary counselling and testing if there is hope of treatment (see e.g. Harvard Consensus Statement, 2001; De Cock *et al*, 2002). This has proved to be the case in Haiti (Farmer *et al* 2001) and in Khayelitsha, Cape Town (Coetzee and Boulle, 2003). In other words, implementing a HAART programme is likely to have additional benefits beyond those reflected in the modelling exercise underpinning Figure Two by creating a social environment less conducive to the spread of HIV than would be the case in the absence of treatment possibilities.

According to the most recent estimates, only 12 percent of people living with AIDS in developing and transitional countries are actually receiving it (see Table One). However, as can be seen in Figure Three, there is a wide discrepancy in country-level achievement in this regard. The remainder of the paper explores possible determinants of this cross-country pattern using ordinary least squares regression.

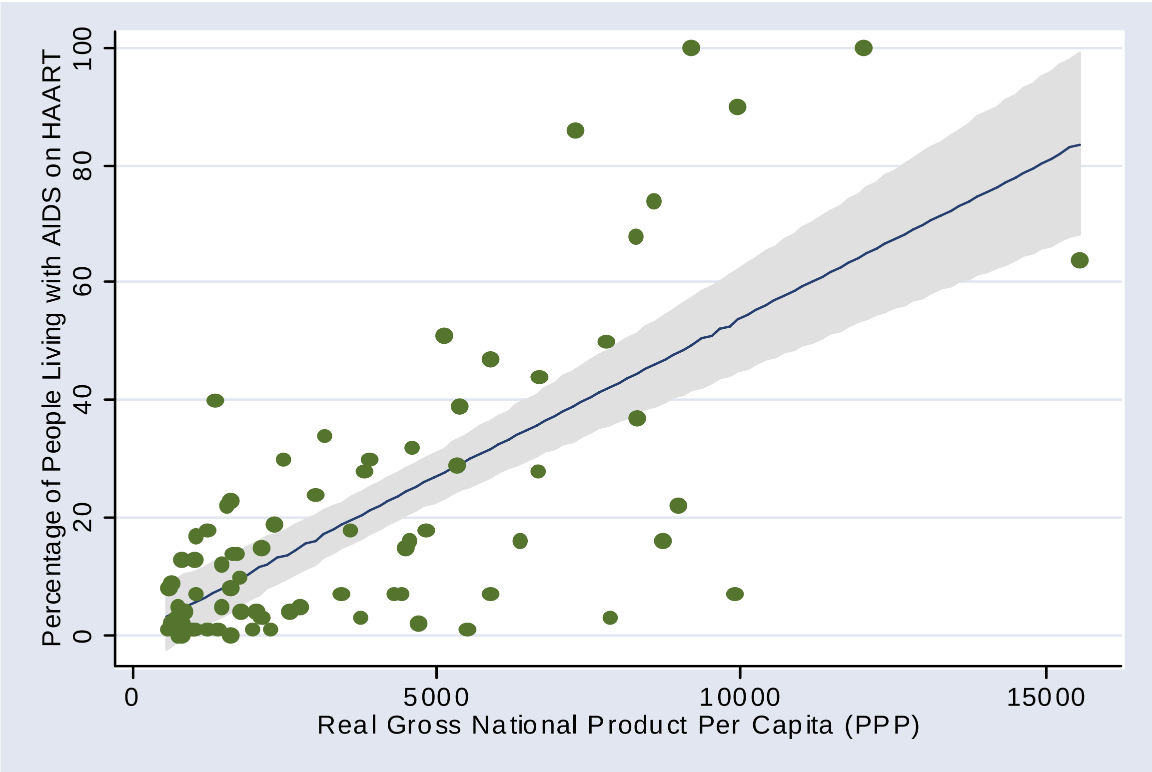

Figure Three. HAART Coverage (December 2004) and GNP Per Capita (2002)

2. What Determines HAART Coverage?

Given that per capita income is an obvious proxy for the level of social resources available for providing and facilitating access to HAART, one would expect, *ceteris paribus*, that the higher the level of per capita income, the greater will be the level of HAART coverage. This is borne out in Figure Three which shows a simple linear relationship between per capita income and HAART coverage for 77 transitional and developing countries.[6] The relationship is

[6] The World Health Organisation's (2005) best estimate of HAART coverage was available for the following countries: Angola, Argentina, Barbados, Belize Benin, Bolivia, Botswana, Brazil, Burkino Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chile, China, Columbia, Costa Rica, Cuba, Cote de'Ivoire, Democratic Republic of the Congo, Djibouti, Dominican Republic, Ecuador, El Salvador, Ethiopia, Gabon, Gambia, Ghana, Guatemala, Guinea, Guyana, Haiti, Honduras, India, Indonesia, Jamaica, Kazakhstan, Kenya, Latvia, Lesotho, Madagascar, Malawi, Mauritania, Mexico, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Nigeria, Paraguay, Peru, Russian Federation, Rwanda, South Africa, Sri Lanka, Suriname, Swaziland, Thailand, Togo, Trinidad and Tobago, Uganda, Ukraine, United Republic of Tanzania, Uruguay, Uzbekistan, Venezuela, Vietnam, Zambia, Zimbabwe. HAART coverage was estimated for the Malaysia and Senegal by expressing the average of the high and low estimate of the number of people on HAART as a percentage of

clearly affected by strong positive outliers (especially from Latin America and the Caribbean) and negative outliers (such as Russia and South Africa). Regression 2.1 in Table Two presents the simple relationship in logged form. It predicts that a 10 percent increase in per capita income will be associated with a 9.2 percent increase in HAART coverage.

Table Two: Resource Constraints and HAART Coverage

Dependent variable: Log of HAART coverage (December 2004)	*2.1*	*2.2*	*2.3*	*2.4*	*2.5*	*2.6*
Constant Coefficient (standard error) P>|t|	*** -4.945 (1.131) 0.000	*** -4.660 (1.094) 0.000	0.123 (0.407) 0.763	*** -5.368 (1.467) 0.000	0.790 (0.490) 0.112	** -4.766 (1.891) 0.014
Log of GNP per capita (PPP) in 2002 Coefficient (standard error) P>|t|	*** 0.916 (0.142) 0.000	*** 0.775 (0.148) 0.000		*** 0.883 (0.228) 0.000		*** 0.812 (0.268) 0.003
Share of per capita income on health Coefficient (standard error) P>|t|		** 0.162 (0.016) 0.010	*** 0.193 (0.068) 0.006	*** 0.166 (0.062) 0.009	*** 0.201 (0.066) 0.003	*** 0.170 (0.063) 0.009
Percentage of births attended to by skilled health personnel Coefficient (standard error) P>|t|			*** 0.019 (0.005) 0.001	-0.002 (0.007) 0.758	* 0.012 (0.006) 0.060	-0.002 (0.007) 0.748
Government Effectiveness (2002) Coefficient (standard error) P>|t|					** 0.588 (0.256) 0.025	0.144 (0.283) 0.613
Adjusted R-squared	0.3456	0.3937	0.2951	0.4124	0.3355	0.4060
Number of observations	77	77	73	73	73	73

Notes: * Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

the number estimated to be needing HAART – data obtained from WHO (2005). HAART coverage for the remaining countries were estimated by taking the UNAIDS estimate for the numbers needing HAART in 2004 (from the UNAIDS website: www.unaids.org) as a percentage of the World Health Organisation's (2005) estimate of the numbers needing HAART: Chad, Congo, Egypt, Eritrea, Iran, Liberia, Mali, Niger, Pakistan, Papua New Guinea and the Philippines.

One could also reasonably suppose that HAART coverage is likely to be a function of the allocation of national resources (both public and private) to health care. Regression 2.2 includes a variable that expresses the total amount spent per capita on health in each country as a percentage of per capita income. This increases the explanatory power of the model and reduces the impact of per capita income slightly. The regression predicts that, controlling for the level of development (as proxied by per capita income), an increase of one percent in the share of health spending per capita will be associated with a 16 percent increase in HAART coverage.

Access to health services is also likely to affect HAART coverage. Regressions 2.3 to 2.6 include a variable measuring the percentage of births attended to by health professionals as this could be thought to be a reasonable proxy for the reach of the health sector. But while it is indeed significant in specifications that do not control for per capita income (regressions 2.3 and 2.5), its significance falls away in specifications that do (regressions 2.4 and 2.6). This is because per capita income is strongly correlated with the percentage of births attended to by skilled medical personnel (correlation coefficient of 0.73). The same relationship is evident between per capita income and another potential proxy for government capacity that has been included in regressions 2.5 and 2.6: the World Bank's index of government effectiveness. This variable, which has a correlation coefficient of 0.78 with per capita income, has a statistically significant coefficient when per capita income is excluded (regression 2.5) but not when per capita income is included (regression 2.6). It would seem, then, that per capita income is capturing both the availability of resources as well as government capacity to provide and facilitate greater HAART coverage.

Although HAART has been widely available in the advanced capitalist countries since the mid-1990s, the very high initial price of HAART limited its early use in most developing countries (the notable exception being Brazil which opted to challenge existing patent rights by producing and importing generic medication). Although some countries were more proactive than others in seeking foreign assistance to provide HAART and negotiating discounts with pharmaceutical companies prior to the wide-spread price declines (e.g. Botswana), it is nevertheless to be expected that for the same amount of effort, a country with a relatively low level of HIV prevalence would have been able to achieve a much higher HAART coverage than a country starting a HAART initiative with a relatively high HIV prevalence. It thus seems appropriate to control for this timing issue by including the level of adult HIV prevalence into the regression.

However, since the early 2000s, competition from generic producers in India combined with public pressure on pharmaceutical companies and various high-level initiatives (including by ex-President Clinton) has resulted in sharp declines in the price of HAART in most countries (Lucchini *et al*, 2003; Nattrass and Geffen, 2005). This, together with substantial international support and assistance with regard to the provision of HAART in high HIV prevalence countries, is likely to have counteracted the initial disadvantage experienced by high prevalence countries. One would thus expect the negative impact of the scale of the HIV/AIDS epidemic to disappear over time.

Regressions 3.1 and 3.3 in Table Three explore this proposition. Regression 3.1 includes the (log of) adult HIV prevalence in a regression on HAART coverage as of June 2004, [7] and regression 3.3 runs the same model but this time on HAART coverage as of December 2004. Whereas adult HIV prevalence exercises a significant negative effect on coverage in June 2004, this effect had disappeared entirely by December 2004. This is consistent with the proposition that by December 2004, the initial disadvantage posed by high HIV prevalence had been offset by targeted international support. If so, then it would be unnecessary (and inappropriate) to control for the scale of the epidemic in regression models based on December 2004 data.

As suggested by Table One, there are good reasons to suspect that regional effects matter when determining the percentage on HAART. In their cross-country study of budgeting for HIV/AIDS, Guthrie and Lara conclude that governments in Latin America put more emphasis on HAART interventions than is the case in Africa (2005: 335-6). This is consistent with the pattern of country-level access to HAART. As can be seen in Table One, average HAART coverage is much higher in Latin America and the Caribbean than in any other region. In an attempt to capture regional effects, the regressions reported in Tables Three and Four include dummy variables for Sub Saharan Africa and Latin American and Caribbean countries. As expected, the results show that after controlling for other relevant variables, the effect of being a Latin American or Caribbean country significantly boosts the percentage on HAART. More surprising, perhaps, is the fact that the coefficient on the Sub Saharan African dummy is significant and positive. This implies that although HAART coverage is low in Sub-Saharan Africa, it is nevertheless higher than predicted once other relevant factors are controlled for. In other words, it would certainly be a mistake to attribute Sub-Saharan Africa's low mean HAART coverage relative to Latin America and the Caribbean as being a reflection of government prioritisation of prevention over treatment. Rather, it suggests that by December 2004, Sub-Saharan African countries had succeeded in getting more people on

[7] HAART coverage in June 2004 was estimated by expressing the UNAIDS estimate for the numbers of people on HAART as of June 2004 as a percentage of the number of people estimated to be needing HAART as of December 2003.

HAART than would be predicted given the institutional and economic characteristics controlled for in Tables Three and Four.

Note that the significance of the Sub-Saharan African dummy variable for the regression run on HAART coverage in June 2004 is dependent on controlling for the scale of the epidemic. When the (log of) adult HIV prevalence is left out of the model (regression 3.2), the Sub-Saharan African dummy becomes insignificant (and the sign changes direction). In other words, if as of June 2004 we did not take into account the disadvantages posed by already-existing high levels of HIV prevalence for Sub-Saharan African countries, then the fact of being located in Sub-Saharan Africa did not exercise a significant impact on HAART coverage. However, six months later, Sub-Saharan Africa appears to have overcome the disadvantages posed by their relatively high levels of HIV prevalence to such an extent that being located in Sub-Saharan Africa has a significant positive impact on HAART coverage even in the absence controlling for the scale of the epidemic.

The analysis so far has demonstrated the importance of the level of per capita income for HAART coverage. But while the level of per capita income gives an indication of the resources available, it says nothing *per se* about the distribution of resources within the country. Could it perhaps be the case, even after controlling for per capita income, that within-country inequality has an effect on the percentage on HAART? One might hypothesise that if HIV prevalence is concentrated amongst the poor, then elite groups in high inequality societies may, out of narrow self-interest, prefer social resources to be allocated to priorities other than HAART. This scenario has been argued to be the case in South Africa (Nattrass, 2004). Does this supposition hold more generally?

Table Three explores the relationship between HAART coverage and within-country inequality. Regression 3.3 serves as the base-line comparison. This regression does not try and control for inequality, but simply includes regional dummy variables for Sub-Saharan Africa and Latin America and the Caribbean, the log of per capita national income and the share of per capita income spent on health. The sign and significance of the economic variables (per capita income and share of expenditure on health) are as expected given our earlier analysis and both regional dummies are positive and significant.

Table Three: HAART Coverage and Inequality

	HAART coverage in June 2004		*HAART coverage in December 2004*				
Dependent variable: *Log of HAART coverage*	3.1	3.2	3.3	3.4. (only those countries with data on inequality)	3.5	3.6	3.7
Constant Coefficient (standard error) P>|t|	*** -4.368 (1.374) 0.002	*** -3.304 (1.374) 0.019	*** -6.107 (1.414) 0.000	** -4.160 (1.702) 0.018	** -4.068 (1.730) 0.023	** -4.734 (1.944) 0.019	** -4.603 (1.793) 0.013
Log of GNP per capita PPP Coefficient (standard error) P>|t|	*** 0.645 (0.161) 0.000	*** 0.570 (0.165) 0.001	*** 0.856 (0.166) 0.000	*** 0.652 (0.201) 0.002	*** 0.611 (0.226) 0.009	*** 0.646 (0.235) 0.009	** 0.702 (0.211) 0.002
Share of per capita income spent on health Coefficient (standard error) P>|t|	** 0.119 (0.056) 0.037	0.093 (0.058) 0.113	** 0.125 (0.058) 0.034	0.098 (0.064) 0.133	0.090 (0.068) 0.194	0.101 (0.072) 0.165	0.109 (0.066) 0.104
Log of Adult HIV Prevalence Coefficient (standard error) P>|t|	*** -0.285 (0.106) 0.009		-0.077 (0.107) 0.473				
Latest available Gini Coefficient (standard error) P>|t|					0.008 (0.018) 0.677	0.136 (0.021) 0.518	
*HIV prevalence*Gini* Coefficient (standard error) P>|t|						-0.001 (0.003) 0.417	
HIV prevalence >5% and amongst the 50% most unequal countries Coefficient (standard error) P>|t|							-0.320 (0.394) 0.421
Latin America and the Caribbean Coefficient (standard error) P>|t|	*** 1.267 (0.310) 0.000	*** 1.070 (0.314) 0.001	*** 1.453 (0.317) 0.000	*** 1.501 (0.337) 0.000	*** 1.144 (0.372) 0.000	*** 1.378 (0.406) 0.001	*** 1.452 (0.344) 0.000
Sub-Saharan Africa Coefficient (standard error) P>|t|	** 0.923 (0.449) 0.044	0.022 (0.313) 0.944	*** 1.313 (0.458) 0.005	** 0.935 (0.350) 0.010	* 0.827 (0.437) 0.064	* 1.115 (0.566) 0.055	** 1.112. (0.413) 0.010
Adjusted R-squared	0.5470	0.5064	0.5334	0.4652	0.4566	0.4431	0.4617
Number of observations	75	75	77	57	57	54	57

Notes: * Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Regressions 3.4 to 3.7 explore the relationship between country-level inequality and the percentage on HAART. One of the problems for cross-sectional analysis of this kind is that the available data on inequality are relatively limited – hence the number of observations falls when measures of inequality are included as explanatory variables. Regression 3.4 re-runs regression 3.3, but this time restricted to those countries for which we have data on inequality in order to provide an appropriate point of comparison for regressions 3.5 to 3.7.

As can be seen from regressions 3.5 and 3.6, neither the Gini coefficient nor an interaction term multiplying the Gini coefficient with the level of HIV prevalence, turned out to have statistically significant coefficients. Regression 3.7 tests whether those countries with relatively high levels of HIV prevalence (above five percent) and which are located within the 50 percent most unequal countries, have lower levels of HAART coverage. The coefficient on this variable also turned out to be statistically insignificant.

This insignificance of inequality in affecting access to HAART may seem surprising. However, the relationship between inequality and HAART coverage is likely to differ from country to country, thereby confounding any aggregate statistical relationship. A negative relationship between inequality and HAART coverage may be expected in highly unequal societies where HIV affects the poor disproportionately and where elite-dominated governments may be less motivated to divert resources towards HAART. Such countries might also have limited health facilities in poor parts of the country (thus limiting access even further). However, HAART coverage is probably positively associated with inequality in those countries where inequality is driven primarily by the gap between the incomes of the rich and the rest of society, and where the rich have access to private health insurance. Similarly, it is possible that in some unequal societies there are a significant number of HIV infections amongst the more politically powerful urban constituencies – and if these are not sufficiently covered by the private sector, then there will be pressure on government to ensure greater access to HAART. Ultimately, to test the relationship between within-country inequality and HAART coverage, we would need more disaggregated data – especially on the split between public and private provision of HAART, and on the social profile of HIV infections. Such data is, as yet, unavailable.

Table Four continues the exploratory regression analysis. In the five regressions reported there, all the economic variables and the regional dummies have statistically significant coefficients. One of the reasons for the high HAART coverage in Latin America and the Caribbean may have to do with the nature of the AIDS epidemic in that region. Whereas poverty has played a major role in Africa's heterosexual AIDS pandemic (as noted earlier), injecting drug use and gay sex was much more strongly implicated (at least in the initial stages of the epidemic) in Latin America (Parker, 2000). Thus, in the case of Brazil, people living with AIDS were more likely to be urban, and many of them middle-class and educated – and thus in a better position to fight for greater access to HAART than was the case in Africa. Regressions 4.2 to 4.4. probe whether urbanisation itself has any effect on HAART coverage.

Regression 4.2 includes a variable controlling for the degree of urbanisation. However the coefficient on this variable proved statistically insignificant, its inclusion in the equation reduced the size and significance of the other coefficients and lowered the adjusted R-squared. Regression 4.3 tries to capture the hypothesised urban effect in a different way – i.e. by including the differential between urban and rural HIV prevalence.[8] The coefficient on this variable is statistically significant, but the size effect is small (controlling for the other variables, a one percentage point increase in the urban-rural HIV prevalence differential results in a 0.1 percent increase in HAART coverage). Interestingly, including this variable increased the size effect of the Latin American and Caribbean dummy slightly.

Finally, regressions 4.4 and 4.5 attempt to capture the potential impact of the political environment on HAART coverage. One could hypothesise that the greater the 'space' for political pressure to be placed on governments, the greater the likely level of HAART coverage. Regression 4.4 includes the World Bank's measure of 'voice and accountability'. The sign is in the expected direction (the more voice and accountability, the greater the level of HAART coverage), but the coefficient is statistically insignificant. Regression 4.5 includes a dummy variable taking a value of one if the country is an established democracy, and zero if it is not.[9] The coefficient on this variable is statistically significant at the ten percent level. It predicts that controlling for the other variables, being an established democracy results in a 55 percent increase in HAART coverage.

Note that if the same regression (but including also the (log of) the level of adult HIV prevalence) is run on HAART coverage as of June 2004, then neither the urban-rural HIV differential nor the democracy dummy variable are statistically significant (see regression 4.6). This suggests that the international effort to expand HAART access between June and December 2004 has been concentrated in – or has been more successful in achieving its objectives in – established democracies.

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[8] This was estimated by taking the difference between the median HIV prevalence for pregnant women in urban and rural areas.

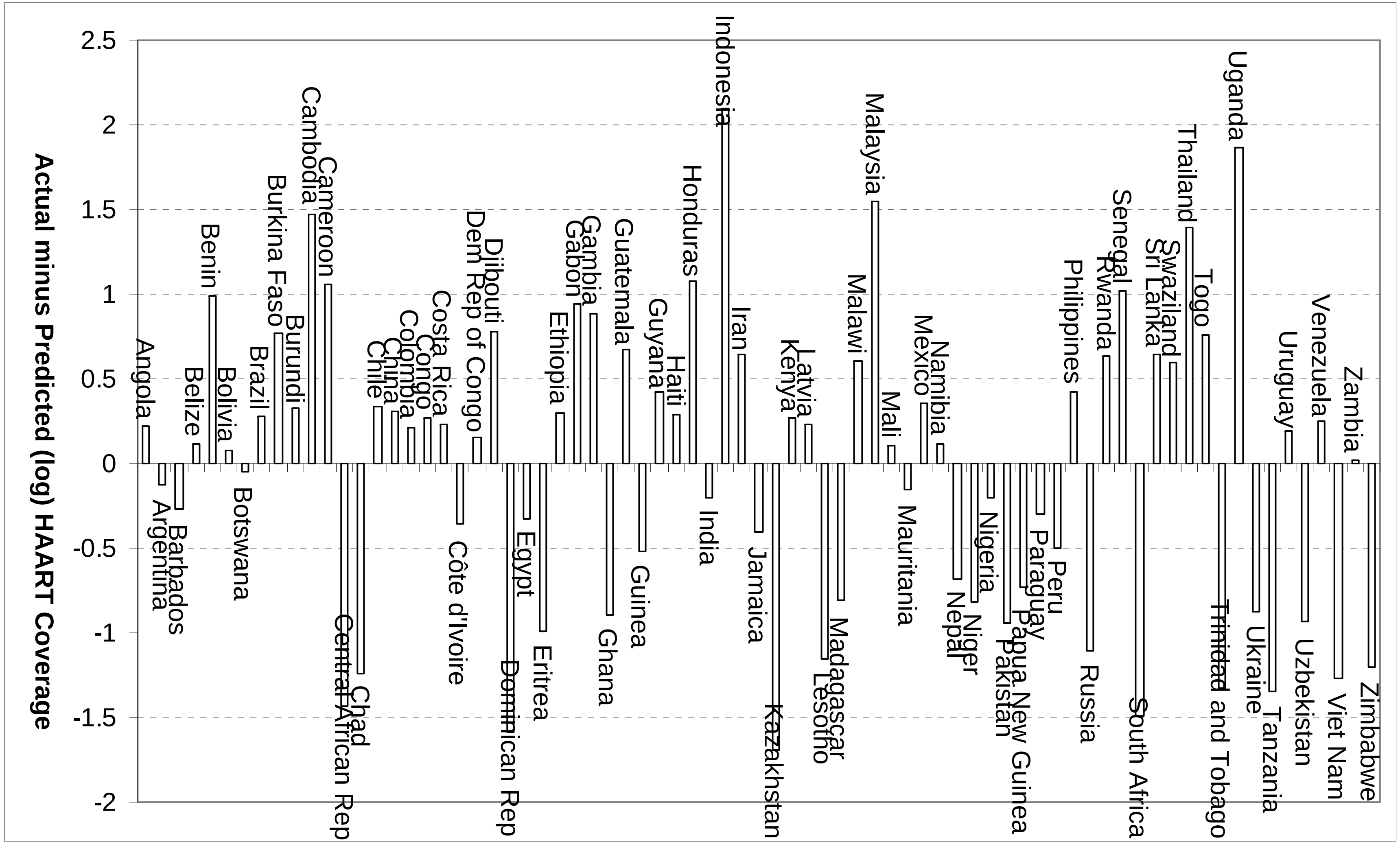
[9] The data for this variable were obtained from Smith (2003).

Table Four: Access to HAART: Final Model

	HAART coverage as of December 2004					*HAART coverage in June 2004*
Dependent variable: *Log of HAART coverage*	4.1	4.2	4.3	4.4	4.5	4.6
Constant	***	***	***	***	***	***
Coefficient	-5.788	-6.020	-6.101	-5.025	-5.526	-4.260
(standard error)	(1.338)	(1.465)	(1.36)	(1.517)	(1.337)	(1.447)
P>|t|	0.000	0.000	0.000	0.001	0.000	0.004
Log of GNP per capita PPP	***	***	***	***	***	***
Coefficient	0.833	0.875	0.875	0.761	0.791	0.621
(standard error)	(0.162)	(0.194)	(0.161)	(0.178)	(0.164)	(0.171)
P>|t|	0.000	0.000	0.000	0.000	0.000	0.001
Share of per capita income spent on health	**	**	*	*	*	**
Coefficient	0.118	0.120	0.111	0.109	0.110	0.118
(standard error)	(0.057)	(0.057)	(0.056)	(0.056)	(0.055)	(0.057)
P>|t|	0.042	0.040	0.053	0.056	0.051	0.043
Latin America and the Caribbean	***	***	***	***	***	***
Coefficient	1.400	1.444	1.360	1.214	1.066	1.148
(standard error)	(0.307)	(0.328)	(0.309)	(0.323)	(0.340)	(0.359)
P>|t|	0.000	0.000	0.000	0.000	0.003	0.002
Sub-Saharan Africa	***	***	***	**	***	*
Coefficient	1.065	1.008	0.858	0.799	0.828	0.863
(standard error)	(0.302)	(0.309)	(0.313)	(0.313)	(0.307)	(0.455)
P>|t|	0.001	0.001	0.008	0.013	0.009	0.062
Percent urban						
Coefficient		-0.003				
(standard error)		(0.007)				
P>|t|		0.689				
Differential between urban and rural HIV prevalence			**	**	**	
Coefficient			0.097	0.093	0.1003	0.059
(standard error)			(0.043)	(0.043)	(0.042)	(0.045)
P>|t|			0.027	0.033	0.021	0.217
Voice and Accountability						
Coefficient				0.255		
(standard error)				(0.179)		
P>|t|				0.158		
Established democracy					*	
Coefficient					0.559	0.315
(standard error)					(0.230)	(0.301)
P>|t|					0.063	0.299
Log of Adult HIV Prevalence						***
Coefficient						-2.85
(standard error)						(0.110)
P>|t|						0.006
Adjusted R-squared	0.5365	0.5310	0.5538	0.5604	0.5699	0.5457
Number of observations	77	77	75	75	75	73

Notes: * Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Figure 4. Actual minus predicted (log) HAART coverage



Using regression 4.5 (the final regression model using December 2004 HAART coverage), Figure Four plots the regression residuals, i.e. the actual percentage of people on HAART minus the predicted percentage on HAART for each country. Residuals provide a picture of the degree of unexplained variation in the model (a model which predicts the actual distribution of people on HAART perfectly would have all residuals equal to zero) and provides us with a measure of how the various countries perform relative to what one would predict given our best available regression model.

The countries with negative values (most notably the Central African Republic, Chad, the Dominican Republic, Kazakhstan, Lesotho, Russia, South Africa, Trinidad and Tobago, Tanzania, Vietnam and Zimbabwe) perform worse than predicted. The countries with positive values (most notably Benin, Cameroon, Cambodia, Honduras, Indonesia, Malaysia, Senegal, Thailand and Uganda) perform better than predicted. Detailed country-level case studies of these countries could potentially shed light on the historical, cultural, social, political and institutional conditions that support or hinder HAART coverage.

3. Conclusion

This exploratory statistical analysis has highlighted the importance of regional and economic factors in understanding the global distribution of country-level HAART coverage. Most notably, the analysis shows that controlling for per capita income and other relevant variables, Sub-Saharan African countries have better HAART coverage than predicted.

The analysis presented here has, by its very nature, been unable to account for the many historical, social and political factors that affect HAART coverage at country level. It is nevertheless interesting that the simple regression models were able to 'explain' over half of the variation in the global distribution of the percentage of people on HAART (the adjusted R-squared of the final regression was 0.57, which is high for cross-country analysis). This points to the continuing importance of underlying structural conditions and the level of development in shaping international patterns of HAART coverage. The significance of the economic variables suggest that ensuring greater access to HAART requires increased political commitment *and* sustained growth-enhancing economic policies.

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