Estimating the Economic Impact of HIV/AIDs on the Countries of the Former Soviet Union

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Acronyms

FSU	Former Soviet Union: Countries of the former USSR here excluding the Baltic States
IDU	Intravenous Drug Users
STDs	Sexually Transmitted Diseases
HAART	Highly Active Anti-Retroviral Therapy
ARV	Anti-Retroviral Therapy
MIC	Middle income country. The World Bank defines middle-income countries as having per capita GNP above $756
CIS	Commonwealth of Independent States, used interchangeably with FSU
CSWs	Commercial Sex Workers
CGE	Computable General Equilibrium: Type of macroeconomic model based on input-output tables and social accounting matrices.
STI	Sexually transmitted infections
VCT	Voluntary counselling and testing

Executive Summary

This report assesses the evidence on the extent and prospects of an HIV/AIDS epidemic in the countries of the former Soviet Union and the impact this will have on the economies of those countries. The main focus of the report is the Russian Federation.

The economic and demographic context against which the epidemic is developing is first discussed. All of the states of the FSU have suffered unprecedented falls in employment and output and a collapse in many of the state institutions that might determine or implement public health policy. Russia in particular is suffering from falling life expectancy and general declines in health that are untypical for countries with high HIV prevalence.

The epidemic is still largely confined to high-risk groups such as Intravenous Drug users (IDUs) in Russia and the Ukraine. Infectivity is high in such groups and concentration of HIV among IDUs is one of the reasons the disease is spreading so rapidly. There is evidence of high recruitment and casual drug use suggesting the lines between IDUs, Commercial Sex Workers (CSWs) and the general population are more blurred than in a western country. The epidemics in the other former Soviet republics are less developed than in Russia but they exhibit many of the same risk factors and the trade and migratory links between them and Russia suggest they will suffer epidemics of similar magnitude.

Chapter 1: Introduction

As recently as 1995 it was thought that the countries of the former Soviet Union had escaped serious epidemics of HIV and AIDS. Beginning in that year, evidence emerged of pockets of high prevalence in groups of Intravenous Drug Users (IDUs) in Kaliningrad (Russia) and Odessa and Nikolaev (Ukraine). The authorities did little to address these outbreaks and the region now finds itself with the fastest growing epidemic in the world (UNAIDS/WHO 2001). There were estimated to be about 1 million people living with HIV/AIDS in the Eastern Europe and Central Asia region at the end of 2001, and of those 250,000 had been infected in the previous 12 months. This is still a small epidemic when compared to those in sub-Saharan Africa, but the potential for a large and generalised epidemic exists. If appropriate policies can be put in place in the short term to prevent the spread of the disease amongst the high-risk groups and between the high-risk groups and the general population, the extent of the epidemic will be reduced.

One strand of the argument to support such policies is to show the likely impact on the region's economies if no action is taken. That is not to say that HIV prevention measures are only justified to avert economic losses, but that the argument to divert resources to these measures will be strengthened if the wider impact on development is understood and appreciated both by decision-makers in the countries themselves and among the donor community. This study will address some of the gaps in knowledge in this area. There are two particular points of interest:

- DFID is planning to spend £25 million on measures to combat the spread of HIV and AIDS in Russia over the next five to seven years. Part of this project will be advocacy of appropriate HIV policies to the Russian Government. The dialogue with the Russian Government over the proper policy actions to take on reducing HIV and AIDS would be greatly informed by an assessment of the impact of the epidemic on households, institutions and firms.
- The use of Highly Active Anti-Retroviral Therapy (HAART) to treat people with AIDS is a very controversial area. The debate has been fuelled by studies in Brazil indicating that HAART *is* cost-effective in a middle-income country (MIC), context. It is unclear if this finding is transferable to Russia. Russia is nominally a MIC but the weaknesses of the health sector, the lack of resources and the absence of central control may indicate that measures more appropriate to low-income countries should be adopted.[1]

This report will focus mainly on Russia which is where the most cases of HIV will be. In addition, Russia's central position in trade and migration will be important in driving the epidemic throughout the region. In other words, it is unlikely that measures to address the epidemic in the other FSU countries will be sustainable if the epidemic is not halted in Russia. The report will discuss the situation in the other countries of the FSU where data exist or other work has been done. In general, the characteristics of the epidemic are similar across the FSU.

Structure of the report

The next section discusses the economic and demographic context within which the epidemic is occurring. The following sections gather together the data on the nature of the epidemic across the region and discuss how they can be modelled and forecast. More technical material on epidemic modelling is relegated to an annex. The report then goes on to discuss the possible economic impacts of the likely epidemics, looking at the impact on households, on firms and on the government. Discussions of literature on these topics and preliminary work using the Russian Longitudinal Monitoring Survey (RLMS) will be relegated to annexes. It has been difficult to reach many firm conclusions in the time available but a final section on conclusions will draw out what can be said with any certainty. In any event this report helps outline the issues and the research

[1] These priorities were suggested in a meeting with Julian Lob-Levyt, Chief Health Adviser , DFID (1 May 2002)

agenda whilst producing useful evidence on the nature of the problem and the epidemic in the region and the degree of poverty and inequality in Russia as a baseline or 'pre-epidemic' state.

1.1 Economic context

In 'Transition: The first ten years' the World Bank recently summarised and analysed the large amount of research that had sought to explain the varying transition experience of the former centrally planned economies (World Bank 2002). In Central Europe and the Baltic States the early 1990s saw large falls in output and increases in unemployment. However, by the middle of the decade positive growth had returned and in particular employment was increasing in new and small firms. In contrast, in the former Soviet Union, east of the Baltics, not only was the fall in output of the order of 60-70%, unprecedented in economic history,[2] but also the Gini coefficient roughly doubled. This fall in output coupled with the increase in inequality has led to significant increases in poverty across the Commonwealth of Independent States. Output and employment continued to fall throughout the 1990s and 2002 the first year to see any significant economic growth across the entire region was 2000. This was largely driven by increased Russian demand following higher oil prices, and it is difficult to judge if there is yet any foundation for strong and sustained growth.

The World Bank argues that the lack of adjustment to market-oriented economies amongst the former Soviet Republics is due to factors that could be labelled 'political-economic', namely;

- Tradition of civil society: FSU states tend not to be representative or pluralistic democracies. Decisions are made by small political and economic elites without scrutiny by free media.
- Protection of inefficient firms: the governments often subsidise old state sector companies that would otherwise go bankrupt. In a bid to maintain employment and social protection systems. Schools, clinics and housing were often 'owned' and managed by companies under the Soviet system.
- Discouragement of new firms: Much of the economic growth in central Europe is coming from new, small firms. In FSU these have been discouraged by arbitrary taxation and regulation and the state authority's general suspicion of independent economic activity.

This relates to HIV and AIDS because of the collapse of the state institutions following the transition. Under the Soviet system the state was heavily involved in all aspects of an individual's life. Virtually all goods were supplied or provided by the state. Institutions of public health and education were not required to be efficient or take account of costs. Since 1990 throughout the former Soviet Union the new governments have struggled to define a role for themselves that is seen by the prevailing power structures as legitimate. The state has been rolled back, but there is no particular consensus on where to roll it back to, and no good solutions as to what will take over the functions that the state no longer fulfils. Most states have remained fairly authoritarian politically (Russia, Ukraine, Turkmenistan, Kazakhstan, Kyrgyzstan and Belarus), some have virtually collapsed through conflict (Georgia, Azerbaijan, Armenia and Tajikistan) and one has effectively maintained the Soviet system (Uzbekistan) and has been the most economically successful. In most of the states, systems of social protection, education and health care systems no longer function. This has weakened the ability of the state's institutions to adopt sensible policies to address HIV and AIDS. In addition, the trauma of transition, the ending of all the certainties that characterised Soviet life and the widespread increase in poverty have encouraged the sorts of high-risk behaviour that lead to high HIV infectivity.

The connection of economic performance with HIV and AIDS epidemics has often been made. HIV and AIDS lead to sickness and premature death among adults of working age, and this will affect productivity and output and lead to loss of income. However, the causality runs the other way as well. Those in poverty have less access to information or health care and are probably more

[2] The Great Depression in the US resulted in a fall of output of about 33%. See also Table 2.2.

susceptible to AIDS. Thus the economic crisis across the FSU is both a proximate cause of the epidemic, and will be exacerbated by it.

1.2 Demographic context

The early 1990s saw a demographic crisis that was most acute in Russia but was echoed across the whole western USSR. In Russia, this was characterised by:

- falling life expectancy of males from 64.2 years in 1989 to 57.5 years in 1994
- falling life expectancy of females by 3.4 years between 1990 and 1994 (from 74.4 to 71.0).
- declining fertility rates.

Natural population change has been negative since 1991 and now runs at about minus one million people a year. This has been largely offset by immigration, mainly of ethnic Russians from the other FSU states. What was unique about these increases in mortality was the way were concentrated in cohorts of working-age males; the death rates for men between 20 and 50 doubled between 1987 and 1994 and for 35-40-year-olds were about 2.5 times as high at the end of the period as at the beginning. For women the changes were less extreme but still significant, a doubling of mortality rates for the 40-50–year-old cohort. The consensus among epidemiologists and demographers is that the increase in mortality in Russia was largely due to alcohol consumption and in particular 'binge' drinking which is linked to deaths from alcohol poisoning, from accidents and violence and from cardiovascular disease (McKee et al., 2001). This also helps to explain the increased mortality rates in Kazakhstan, which had a high proportion of ethnic Russians. Table 1.1 shows age specific mortality rates for working age males across the whole region.

Demographers have estimated that the increases in mortality rates over the early years of transition resulted in about 2 million extra deaths. To some extent, then, the Russian Federation has *already* experienced a severe health crisis among working-age adults.[3] The later 1990s saw some reversal of these mortality rates, but this seems a reversion to the long-term trend of health decline, which now means that Russian men have a life expectancy some 14 years below their US counterparts.

There are several interesting things to note about the data. Firstly, these are age-specific mortality rates. They are not dependent on ageing population effects. Secondly, even in the regional context, the numbers for Russia are extremely bad. Both in the level and the increase of mortality Russia is in a league of its own. The contrast with the other western FSU states is quite striking. Thirdly, how badly the western FSU states do as compared with other parts of the FSU is also striking. The mortality rates increase between 1989 and 1999 across the western FSU, whereas they fall, or increase only slightly, in the south Caucasus and Central Asia. The exception to this pattern is Kazakhstan, which has death rates more similar to the western FSU than to the rest of Central Asia. Fourthly the increases in mortality are not correlated with the depth of the impact of transition, if measured by the fall in GDP (see Table 2.2). And finally, these demographic trends are prior to any AIDS epidemics – there were very few AIDS deaths in the period covered by this table.

[3] the main references for this section are De Vanzo and Grammich (2001) and Shkolnikov and Cornia (2001)

Table 2.1: Male Mortality 1990s

	Population 2000 (millions)	Male Mortality (numbers)									
		aged 25-39			% increase		aged 40-59			% increase	
		1989	1994	1999	94-89	99-89	1989	1994	1999	94-89	99-89
Belarus	10.4	323.4	468.3	551.1	45%	70%	1278.1	1621	1643.5	27%	29%
Moldova	4.4	333.3	427	386.8	28%	16%	1200.4	1546.4	1315.1	29%	10%
Russia	146	416.5	808.4	673.6	94%	62%	1387	2410.6	1806.2	74%	30%
Ukraine	49.2	343	510.7	509.8	49%	49%	1232.9	1738.3	1642.5	41%	33%
Armenia	3.3	193.9	304.8	130.4	57%	-33%	872.5	894.9	630.7	3%	-28%
Azerbaijan	7.7	198.6	425.6	213.7	114%	8%	485.5	503.9	374.8	4%	-23%
Georgia	5	256.7	281	201.9	9%	-21%	995.1	816.6	641.3	-18%	-36%
Kazakhstan	16.7	374.9	541.3	558.8	44%	49%	1320.8	1757	1584.8	33%	20%
Kyrgyzstan	4.7	352	443.5	376.3	26%	7%	1201.1	1546.1	1158.8	29%	-4%
Tajikistan	6.4	207.4	329.7		59%		840.4	1050		25%	
Turkmenistan	4.5	296.7	289.4	342.5	-2%	15%	1214	1285.9	1003.8	6%	-17%
Uzbekistan	24.8	244.8	260.8	259	7%	6%	1000.6	1067	842.3	7%	-16%

Source: Transmonee Database

Table 2.2: GDP as % 1989

	1994	1999
Belarus	70.0	80.5
Moldova	38.8	33.0
Russia	57.9	54.2
Ukraine	51.3	38.5
Armenia	45.7	59.3
Azerbaijan	41.9	46.8
Georgia	25.4	33.7
Kazakhstan	66.8	63.1
Kyrgyzstan	53.2	62.7
Tajikistan	46.8	43.5
Turkmenistan	68.5	64.1
Uzbekistan	84.1	94.3

Source: EBRD Transition Report Update

The female mortality rates follow a similar but less extreme pattern. Figures 1.1 and 1.2 contains population pyramids for Russia from the US Census Bureau. The projections are made without any assumptions about AIDS mortality, as overall prevalence is less than 2%. What is noticeable is that by 2020 there will be about half as many men and women in the 15-19 cohort as in 2000 and significant falls in all cohorts under 30, and this is before any possible deaths from AIDS are taken into account. This illustrates one of the unique features of the Russian HIV epidemic. It is against the background of a steeply declining population.

Figure 1.1: Russian population pyramid 2000+

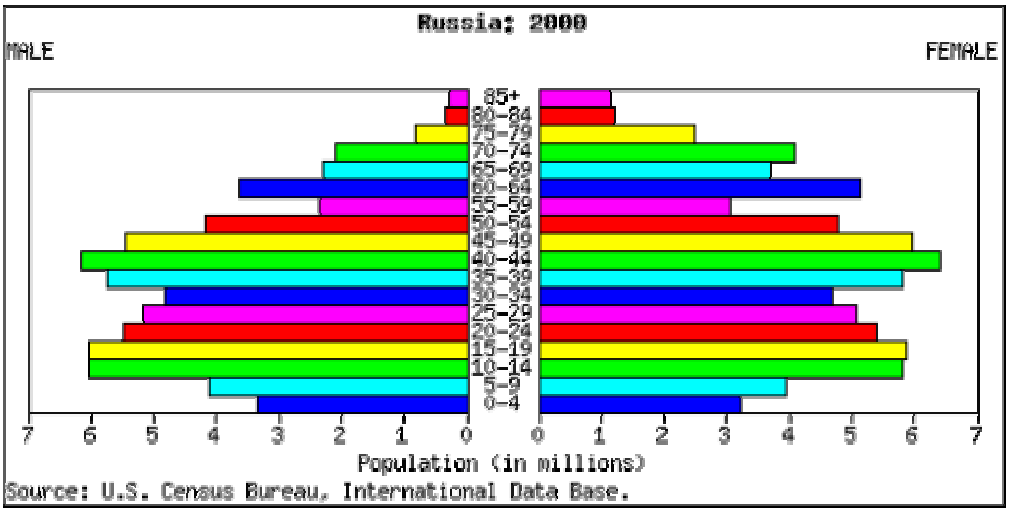
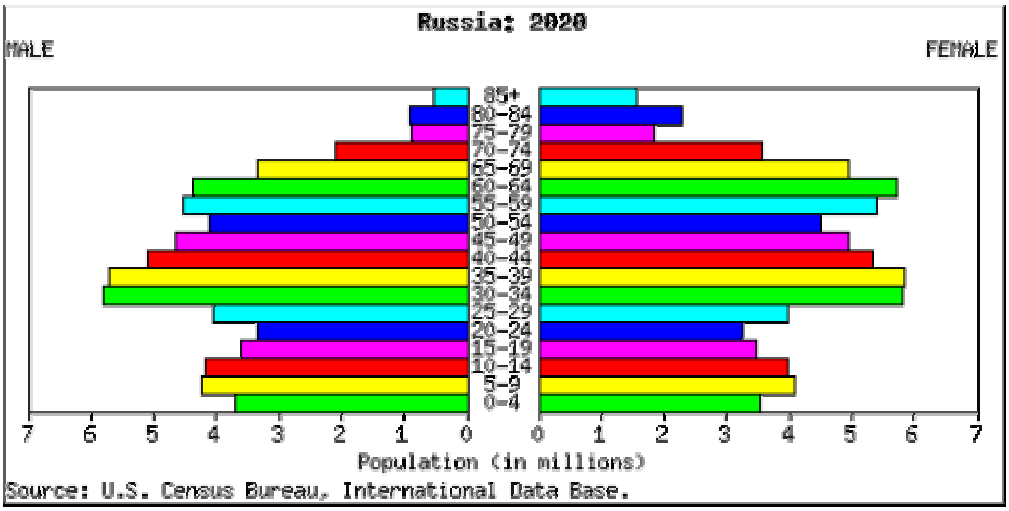


Figure 1.2: Russian population pyramid 2020



Chapter 2: Epidemiology

The following are some stylised facts about the HIV/AIDS epidemic in the FSU;

- Up to 1995 there were very few cases of HIV infection, far fewer even than in Western Europe. As recently as 1996 epidemiologists had discounted the possibility of a serious epidemic in the region. (Murray and Lopez, 1996 and Mann and Tarantola,1996 quoted in World Bank,1997, p.48.
- This low rate of infection could not be attributed to any denial of the problem by the authorities, as there was comprehensive testing of both low-risk and high-risk groups.
- Beginning in 1995, an epidemic emerged among IDUs, first in the Ukraine but spreading rapidly in Belarus, Moldova and Russia.
- An important co-factor of HIV infectivity is the existence of STDs, the prevalence of which has increased since 1991 across the FSU.[4] Since STDs spread in exactly the same way as heterosexually transmitted HIV, this is a key leading indicator of a generalised epidemic. Since 2000 there has been a decline in STD incidence, but it is unclear if this is indicative of changes in observation methods or of a real change in behaviour.
- There is a sharp contrast between the FSU and the Central European and Balkan states which have maintained much lower rates of prevalence and have far fewer IDUs.
- Many of the leading indicators of a generalised epidemic are present in Russia and Ukraine. Although the disease is still concentrated in IDUs there is an overlap between this group and CSWs.[5] The epidemic of STDs sharply increases the probability of transmitting HIV. At least one survey of a low-risk group has shown signs of increasing prevalence.
- This is all taking place within the context of a society where many institutions of state and society have broken down. There has been a large increase in the numbers of IDUs and CSWs. The disease is not spreading through a stable population but one where there is high recruitment to the high-risk groups.

Table 2.1 shows some of most recently available summary data for the region. For most of these countries the data are estimated by UNAIDS. For Russia the figures are for cases registered at the Federal AIDS centre. The final column contains reported new infections in the first six months of 2001. This sharply highlights the western bias of the disease in the region. It is noticeable that the pattern of the epidemic across the region is very similar to the demographic data from Table 2.1. The worst figures are in the western, industrial republics. Kazakhstan, the richest of the Central Asian states, again exhibits very similar characteristics to the western FSU rather than its immediate neighbours. In the demographic section this was attributed to the high number of ethnic Russians. If that were true here as well, this would indicate something unique to Russians about attitude to risk.

4 In Belarus, Ukraine, Moldova, Kazakhstan and Kyrgyzstan over 50 per 100,000 people have an STD. In Russia the figure is 172 per 100,000. In the west the rate is about 2 per 100,000. (Confalone, 2001)
5 There is very little information on this overlap. What there is for Russia is discussed below

Table 2.1: Estimates of HIV epidemic

	No. of Cases	Date of estimate	HIV prevalence (%)	Main mode of transmission	New cases Jan-Jun 2001
Belarus	14000	end 99	0.28	IDU	370
Moldova	4500	end 99	0.2		116
Russia	197000	June 02	0.14	IDU	43,863
Ukraine	240000	end 99	0.2		3,152
Armenia	<500		0.01		13
Azerbaijan	<500		0.01		67
Georgia	<500		0.01		46
Kazakhstan	3500	end 2001	0.04	IDU	579
Kyrgyzstan	168	end 2001	0.01		50
Tajikistan	45		0.01		Na
Turkmenistan	<100		0.01		Na
Uzbekistan	779	end 2001	0.01		Na

2.1 The epidemic in Russia

Table 2.2 shows data for a selection of regions and for Russia in total.[6] The total number of cases is registered at 197,497. The national prevalence is about 0.14%. In contrast to the regions where the disease first occured in the mid-1990s, the highest levels of prevalence are now found in the Siberian, Urals and Volga regions.

Table 2.2: HIV data Russia

	No. Cases	Prevalence	Region
Irkutskaya Oblast	12,691	0.465	Eastern Siberia
Khanty Mansi AO	6,264	0.447	Western Siberia
Samara Oblast	13,314	0.406	Volga
Kaliningrad Oblast	3,748	0.396	Northwest
Orenburg Oblast	8,528	0.385	Volga
Sverdlovsk Oblast	15,893	0.348	Urals
St Petersburg	15,753	0.34	Northwest
Ulyanovsk Oblast	4,581	0.315	Volga
Chelyabinsk oblast	9,838	0.269	Urals
Moscow Oblast	16,758	0.26	Central
Moscow	15,429	0.181	Central
Tyumen Oblast	5,114	0.157	Western Siberia
Russia	197,497	0.136	

Note: data from June 2002

The data in the table are registered cases of HIV. It is often stated that there are eight to ten times as many cases that are not registered.7 Part of the reason for this uncertainty is that the method of surveillance that is used, inherited from the Soviet public health and statistical systems, does not reflect current best practice. Although over 24 million tests are carried out each year, they are

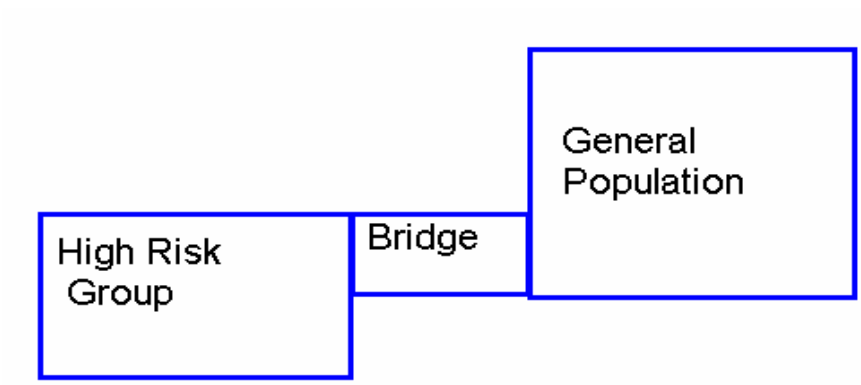
[6] Table A4.1 in Annex 4 contains complete data for Russia

[7] The head of the Russian AIDS programme, V Pokrovsky, estimates the multiplier as 6. The World Bank epidemiological model uses 6 for its 'pessimistic scenario and 4 for its 'optimistic'

targeted at occupational groups rather than the sentinel or high-risk groups that might better indicate the development of the epidemic. Therefore, although the infrastructure for testing is in place and effective – a united system of centralised AIDS centres, diagnostic laboratories and sites for voluntary counselling and testing (VCT) – the testing is inadequate for understanding the epidemic. The WHO and UNAIDS have made recommendations for improvement (UNAIDS, 2002), but at present the actual number of HIV cases in Russia is not known. In December 2001 78% of all registered cases were men, 62% of whom were aged between 20 and 30 and 21% between 15 and 20. For women, 57% were between 20 and 30 and 28% between 15 and 20.

Figure 2.1 shows a typical 'pattern 3' HIV epidemic. 'Pattern 3' epidemics are the type that occur outside sub-Saharan Africa.[8] The idea is that HIV occurs and spreads initially amongst a high-risk behaviour group. In Western Europe and parts of Latin America, this was homosexual men and in Eastern Europe and Asia it is usually thought to be intravenous drug users (IDUs). This group will have very high prevalence and high infectivity. There is then a 'bridge population' whose characteristics lead to their transmitting HIV to the 'general population'. In Russia the bridge population is often thought to be commercial sex workers (CSWs) who are also IDUs. The general population show low-risk behaviour with regard to HIV. Once HIV is widespread amongst the general population, as in parts of Africa, it spreads through heterosexual sex and the original and bridge populations are no longer driving the epidemic. This view of epidemic development is important because it suggests that, in the initial phase of the epidemic, policy should be targeted at the high-risk and bridge populations – or at points where they interact with the general population.

Figure 2.1: Schematic of an HIV epidemic



There seems to be a lot of anecdotal evidence to challenge this epidemic model in Russia.

- The high-risk group, IDUs, are not as marginalised from society as they would be in the West. Injecting drugs is common among students and teenagers and large numbers of recreational and irregular drug users also inject.
- Commercial sex work is also very heterogeneous. Some CSWs work regularly in Western-style hotels, some exchange sex for bread or a few roubles, some sell sex irregularly for economic survival or to buy luxuries.
- The general population exhibits signs of high-risk behaviour through high numbers of sexual partners. This is indicated by the very high rates of sexually transmitted infections. These peaked in the mid-1990s and, for currently unknown reasons, have declined in the last few years.

[8] It may be that the types of epidemics that occurred in sub-Saharan Africa had a similar pattern, but the initial phases were not observed.

The point is that claiming that IDUs are high-risk and vice versa misses the large amount of heterogeneity in risk behaviours within rather than between groups; perhaps defining groups by other characteristics e.g. homelessness, would be a better basis for targeting. A sociological explanation that is often suggested is that the collapse of the rigid Soviet structure and the high crime free-for-all of the early 1990s have changed the attitude towards risk and that Russians are now behaving in ways that are conducive to the rapid spread of HIV. This hypothesis is widely believed, but at present most of the evidence that might support it is more suggestive than conclusive.

Intravenous drug use in Russia

Rapid growth in numbers

2.3 shows the official figures for the number of registered drug addicts in Russia. The figures need to be inflated because not all drug addicts are registered, and deflated because not all drug addicts are IDUs. A small survey in Moscow suggested that multiplying the registered number by a factor of 8 would yield a good estimate of the true number. There is evidence to suggest that about 90% of drug addicts are IDUs. Carrying out both of these manipulations gives a figure of about 1.6-1.8 million IDUs in Russia in 2000. The growth in the number of registered addicts is so rapid that it must partly reflect a statistical artefact as well as an actual growth in this risk behaviour. UNAIDS has made a more conservative, but still worrying, estimate that drug use amongst young people is about three times more common than it was five years ago.

Table 2.3: Growth in registered drug addicts: Russia

1991	31,482
1992	32,692
1993	38,759
1994	47,901
1995	65,164
1996	88,976
1997	121,752
1998	161,553
1999	210,521
2000	271,268

Source: UN Drugs Control Programme

Very rapid growth in HIV prevalence

The experience of South and South-east Asia shows that HIV tends to 'explode' amongst IDUs.[9] Part of the reason for the rapid increase in the number of cases in Russia is the concentration of the epidemic amongst IDUs. Over 90% of the registered HIV cases are classed as being caused by intravenous drug use. There is some evidence, however, that the statistics on primary risk factors are biased towards classifying HIV+ cases as IDUs.[10]

[9] Rates among IDUs in Bangkok and Chiang Rai in Thailand, Mytkyina, Mandaly and Yangon in Myanmar, Ruili in China and Manipur in India all increased to over 40% within a year of first detection (see Rhodes et al. 2002)
[10] A phone conversation with Dr Aral of the US Center for Disease Control in Atlanta, GA, who claims that when an HIV case is found with multiple risk factors the statistical coding protocol records them as IDU.

Lack of clear evidence on characteristics of this group

It has been difficult to find evidence that IDUs are less marginalised than they would be in the West. There is evidence that drug use starts at a young age and that new drug users rapidly switch to injection. However, it is not possible to say much about the general IDU population, in particular whether the samples of IDUs that have been studied were representative of the whole IDU population. However, even if there is substantial variation in risk behaviours over the IDU population, once prevalence reaches 20% in any group even members of that group practising low-risk behaviour are likely to rapidly become infected. The evidence seems to suggest widespread high-risk behaviour among sampled IDUs; for 61 Russian cities the percentage of IDUs who reported sharing needles lay between 40 and 70%. The mean number of injecting partners per year was found to be 22 in Togliatti.

Relevance of 'mixing' data

There is much discussion of the epidemic breaking out into the 'general population' as a result of IDUs working as commercial sex workers or otherwise 'mixing' with the general population. There is little evidence even to guess as to the chances of this happening. What is clear is that Russia will suffer a serious epidemic *even* if it remains confined to IDUs and perhaps their immediate partners and therefore prevention should be aimed at those we know are at high risk rather than at unknown 'conduits' into the general population. This point is also made by Dehne, 2001.

Unique traditions of drug use

Work on harm reduction in Russia has shown that syringe exchange programmes do lead to reductions in risky behaviour among IDUs. However, it has also shown that drug use is a social phenomenon in Russia with group preparation and injecting of drugs. Thus some of the risk behaviours apparent in Russia, sharing of drug preparation equipment for example, are not seen elsewhere and are not addressed by harm reduction measures. (Grind et al., 2001).

Commercial sex work in Russia[11]

Even less is known about those who sell sex, though there is considerable anecdotal evidence of even greater heterogeneity amongst CSWs than among IDUs. The key parameter for the spread of HIV is the overlap of IDUs and sex workers. Some suggestive statistics are:

- 2% of women and 1% of men in Saratov reported receiving money for sex
- In Togliatti 43% of female IDUs have received money for sex
- In St. Petersburg 28% of female IDUs had sold sex
- In Kaliningrad 80% of female IDUs reported commercial sex as their main source of income
- In Saratov it was estimated that 40% of street sex workers were also IDUs
- There is little evidence that male IDUs sell sex.

What does seem to be true is that the number of women involved in sex work has increased significantly during the 1990s and this is correlated with the collapse of other options for economic survival. This would suggest that susceptibility to HIV is correlated with poverty. The evidence on the rapid spread of STDs during the early to mid-1990s suggests that sexual contacts were becoming more numerous and risky. STD infection rates have fallen since 1998 across the region

[11] The sources for this section are Aral et al .(2002a & b)

but it is not clear whether this is a genuine improvement in health or if those affected are seeking private treatment and hence avoiding the official statistics.12

Projecting the epidemic

The main conclusion to be drawn from the above is that it is impossible to predict the Russian epidemic with any certainty or even with any bounded uncertainty. The poor quality of the data on overall HIV prevalence and the lack of data on some of the behavioural parameters that will determine the path of the disease mean that the peak prevalence and the time of that peak cannot be determined. However, projections have been made, based on the experience of epidemics in other similar countries. The above discussion suggests that these projections have considerable margins of error.[13]

World Bank 2002

The Ruhl et al. (2002) paper[14] uses assumptions about the rate of growth of the IDU population to project the overall numbers of cases and deaths in Russia.

Table 2.4: World Bank epidemic projections

		2005	2010	2015	2020
HIV Cases	Optimistic	1.23	2.32	3.64	5.36
(Millions)	Pessimistic	2.24	5.25	9.61	14.53
Monthly Mortality	Optimistic	.5	6	14	21
(Thousands)	Pessimistic	.76	10	29	54
Prevalence (%)	Optimistic	1	2	3	4
	Pessimistic	2	4	7	10

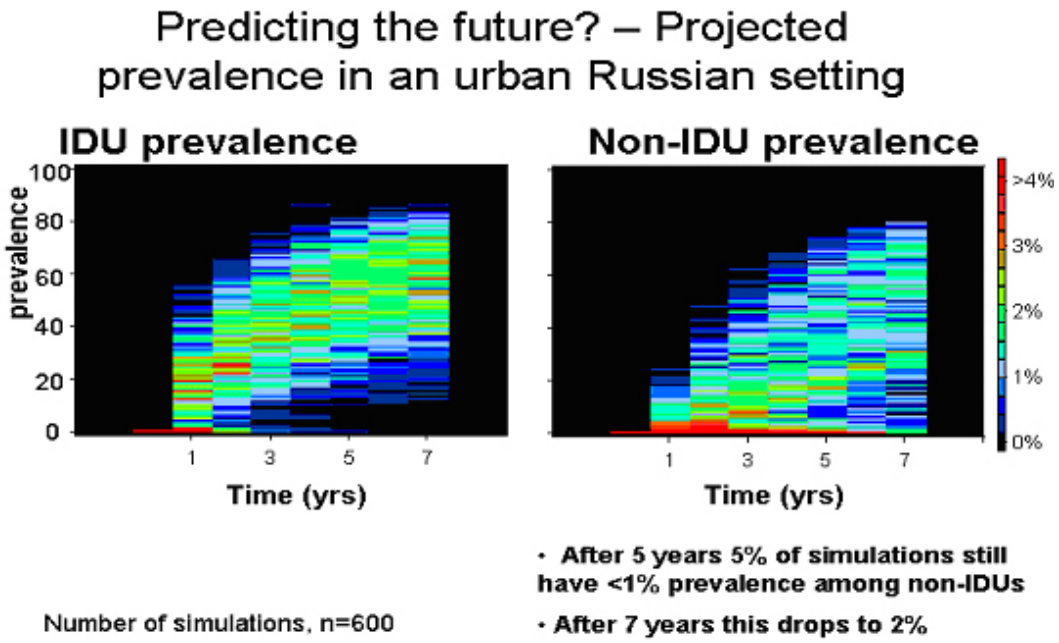
The epidemic is still increasing at the end of the forecast period, so the overall peak is not given. The numbers look 'reasonable' but it is difficult to ascribe any likelihood to them (i.e. we cannot say that there is 95% probability that the Russian epidemic will lie between the optimistic and pessimistic).

Imperial College 2002

Using the models of Garnett and Anderson as augmented by Grassly, discussed in Annex 1, a probabalistic assessment is made of the epidemic. The results are presented in Figure 4. As is discussed in Annex 1, the model of HIV transmission is deterministic. What has been done here is to run Monte Carlo simulations of the model using assumed distributions for the parameters, which is after all, where the uncertainty lies. The shades show the distribution of outcomes over these 600 simulations. The first chart shows that prevalence for IDUs climbs steadily until, after 7 years, the median simulation seems to suggest 60% prevalence. For non-IDUs, the prevalence remains low even after 5 years; after 7 years the distribution over outcomes is far more diffuse, reflecting the degree of uncertainty about the spread of the disease in this group.

[12] Neonatal syphilis has recently shown a decline in incidence. This is unlikely to be because sufferers are seeking private treatment as it is the most serious form of the disease requiring hospitalisation.
[13] Confidence intervals in forecasting should come from the underlying process driving the forecast variable. In the case of a medical epidemic, the underlying process is exponential ;forecast errors would therefore tend to widen as the forecast period increases. This is reflected in the Imperial College work explicitly but not as clearly in the World Bank projections.
[14] This is referred to here as 'World Bank' even though the work was mainly funded by DFID, because Ruhl is the World Bank economist for Russia and the Bank initiated the work.

Figure 2.2: Monte-Carlo simulations of Russian HIV epidemic



One of the key milestones in the path of the epidemic will be when heterosexual transmission overtakes IDU transmission as the main vector. If and when this happens determines the epidemic path quite closely, i.e. a 10% prevalent epidemic peaking in 2010 will be *qualitatively* different from a 5% epidemic in 2015.

Because of the uncertainty surrounding the path of the epidemic, work on the economic impact will need to focus on the qualitative difference between the types of epidemics that could be experienced in Russia. This would involve 'back casting' – that is, answering the question 'if Russia's prevalence peaks at 10%/5%/2% in 2010/12/15, what does this imply for the prevalence in the various population groups?' This is not covered in this report, but would be a priority for any further research.

This report brings together as much as exists on the characteristics of the IDU and CSW populations in Russia. There is a large amount of behavioural research going on precisely to inform the epidemiological modelling. However, a clear gap would appear to have emerged in this work. It has tended to focus on the 'standard' conception of IDUs and CSWs as being marginalised from society, and the samples used are self-selected, for example the IDUs that are studied are those that arrive at syringe exchange programmes. Further research needs to be done on the characteristics of the IDU and CSW populations as a whole and the degree of integration they have with wider society.

2.2 The epidemic in Ukraine

The epidemic in Ukraine is perhaps more advanced than that in Russia an indication of this being the fall both in the percentage of new HIV cases attributable to IDUs from 90% (as in Russia) to about 60% and in the male to female ratio of HIV cases. These figures are indicative of greater heterosexual transmission. DFID and the British Council have funded a study of the social and economic impact of HIV and AIDS in Ukraine (British Council/Ukrainian Institute for Social Research, 2002). This forecasts the number of cases of HIV as between 580,000 and 1.4 million in 2010 under the optimistic and pessimistic scenarios. Unfortunately the study does not put any figures on the size of the potential impact, its main purpose being to stress the need for a policy response.

2.3 Epidemics in Moldova, Belarus, the South Caucasus and Central Asia

As was shown in Table 2.1, the epidemic is much more advanced in the western republics of the former USSR than in either the South Caucasus or Central Asia. That being said, there are indications of a very rapid growth in cases in Kyrgyzstan. The World Bank was sufficiently concerned with the situation to issue a paper recently arguing for more resources to be devoted to prevention of HIV epidemics in Central Asia (World Bank, 2002). UNAIDS has also prepared a report on a meeting held earlier 2002 on projecting the epidemic across the region.(UNAIDS, 2002a). The main conclusions appear to be that the important facts pertaining to Russia and Ukraine – IDU driven epidemics, high levels of risk behaviour among the young, and lack of knowledge about HIV – apply equally to the other republics. What seems to be important is to treat HIV and AIDS as a regional problem. Many of the republics have large numbers of migrant workers in Russia and more trade takes place between Russia and each of the other republics than amongst themselves. HIV tends to follow migration and trade, and this suggests that the epidemic in the region will be driven largely by what happens in Russia. This is true even though many of the Central Asian Republics, such as Uzbekistan, have far better policies on HIV and AIDS than Russia itself.

Chapter 3: Macroeconomic Impacts

There is increasing interest in estimating the macroeconomic impact of AIDS in the FSU in general and Russia in particular. It is felt that the Russian authorities will only devote sufficient resources to preventing the spread of HIV if they can be convinced that the disease will threaten economic growth.

Work on estimating the economic impact of AIDS in Africa has been published since the early 1990s (discussion of this literature is in Annex 2). This has usually been focused on the countries with the highest prevalence of HIV, as these are assumed to have sufficient cases of AIDS mortality and morbidity to produce a measurable effect. Even so, the long incubation period of the disease, the delays associated with economic statistics, particularly in poor countries, and the need for sufficient data points, either time series or cross section, to carry out statistical inference all militate against finding an impact. The highest predicted impact in the African context has been found using a CGE model[15] that imposes a good deal of *a priori* structure on the economic responses (Arndt and Leis, 2000).

The conclusion of the World Bank's book *Confronting Aids*, summarising the development challenges of HIV *Confronting AIDS* was that '… the impact of AIDS [on economic output and population], although varying across countries, will generally be small relative to other factors' (World Bank, 1997:32),. There are four reasons for this:

- One of the main channels through which AIDS is posited to reduce economic growth is through reduced human capital. Because AIDS strikes mainly at adults of working age, this will reduce productivity and hence output. Although there is undoubtedly a link between health and economic growth and productivity, many developing countries are characterised by unskilled workers and high unemployment. Sick workers are relatively easily replaced. In middle-income countries this might be more of a problem because the economy is more technologically oriented and workers tend to be more specialised. However, studies on MICs such as South Africa and Botswana have shown little impact through this channel, and it may be that higher skilled workers, with better education and access to health care, experience lower AIDS prevalence.[16] The consensus is emerging that HIV and AIDS strike disproportionately at the poor.
- One of the other main channels of impact is thought to be through reduced investment, because households stop saving or dis-save to finance medical care and funerals. This reduces the funds available for investment, and reduced capital accumulation leads to lower economic growth. The problem with this is that, in low-income countries, and some middle-income, the structure of financial intermediation is usually very poor at converting savings into investment. Reduction in domestic saving is therefore unlikely to constrain investment. In addition, some countries are able to attract foreign investment that will overcome any shortfall in domestic saving. In middle-income countries the government might do the dis-saving as AIDS patients are hospitalised rather than cared for at home. What effect this has depends on what part of government expenditure has been drawn on to meet this extra health expenditure.
- GDP growth per capita is so commonly used as a headline indicator of development that its weaknesses are sometimes overlooked. In the case of this kind of epidemic it is not very helpful and often yields perverse results. For example, the death of someone who is less productive than average increases GDP per capita; expenditure on health care and funerals financed from funds that would otherwise be saved increases GDP. The Black Death, which killed between 30 and 50% of Europe's population in the fourteenth Century, is thought to have had little impact on GDP growth per capita.

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[15] Arndt & Lewis (2000)

[16] Alan Whiteside of the University of Natal presented some evidence at a recent DFID seminar that HIV prevalence in a South African firm fell as employment grade or status increased. Some early evidence in the 1993 *World Development Report* for a firm in Tanzania showed exactly the opposite.

- A final reason is discussed further in Annex 2. The framework in which AIDS and other epidemics is modelled is the standard Solow growth model augmented to include demographic and human capital effects by Mankiw et al.(1992). It can be shown that AIDS, which reduces both population growth and human capital, has an ambiguous theoretical result. In other words, an increase in AIDS might theoretically either increase or reduce GDP or growth.

Annex 2 discusses the global literature on measuring the impact of HIV on the macroeconomy. Here those papers specifically looking at Russia are discussed. Bloom and Malaney (1998) try to measure the macroeconomic impact of the excess mortality in Russia during the early 1990s. They estimate that during this period there were about 1.6 million 'excess' deaths,mainly of working-age males. They first use the 'cost of illness' approach to give an estimate of the loss. This is basically the human capital approach used by health economists. For each death they estimate some loss of income based on the pre-crisis wage rate for that age and gender. This is then discounted over the future years of life that that person could have expected, based on pre-crisis survival probabilities. They do the calculation for two different discount rates – 4% and 10%. Depending on the discount rate used, they estimate the loss as between 1.8 and 2.7% of 1990 GDP. This is quite small, especially in view of the fact that this type of calculation tends to overestimate the loss. A second approach is to estimate a growth model for a cross-section of 77 countries that specifically includes demographic variables such as the growth in the economically active population and life expectancy. Putting Russian data into their estimated equation Bloom and Malaney calculate that Russian GDP growth was reduced by 0.31% as a result of the 1990-4 mortality crisis. This is fairly insignificant since during the early 1990s Russian growth was (negative) -9% p.a.[17]

The World Bank (Ruhl et al. 2002) epidemiological projections of 14.3 million cases of HIV and subsequent AIDS deaths is well above the 1.6 million excess deaths assumed here. If the effects are seven times worse, then Russian GDP would grow 2% more slowly than under a no-AIDS scenario. To do this calculation properly would require that the World Bank projections be integrated with the demographic models so that the implications for life expectancy and growth (or decline) in the economically active population can be seen.

The World Bank projections referred to above were produced specifically to look at the economic impact of HIV/AIDS on Russia. Much of the workings of the model are hidden,[18] so it is difficult to judge what assumptions have been made. The overall impact is expected to be quite small. Under the 'optimistic' scenario GDP will be 1.2% lower in 2020 than in the no-AIDS case; under the pessimistic scenario (with 648,000 AIDS deaths a year) GDP will be 10.7% lower. The main problem with the model is that it assumes that the AIDS epidemic is occurring in some sort of steady-state, functioning economy. This is not the situation in Russia. Much of Russian GDP comes from natural resources, particularly gas. There is very high unemployment and underemployment. If the epidemic remains concentrated amongst IDUs and CSWs – who might be marginalised from the economy anyway – the macroeconomic impacts might be even smaller than are assessed by the paper.

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[17] To put these numbers in some sort of context, if we assume that Russian growth was weakly positive at 1.5% p.a and the Russian population grew at its long-term trend of 0.25%, then the effects of the mortality crisis would be to reduce growth in actual GDP over a 5-year period from 7.7 to 6.1% and in per capita GDP from 6.4 to 4.8%. If we put in the actual population growth rate over the 1990-4 period of 0.08%, then per capita GDP grows 7.3% if the mortality crisis has no macroeconomic effect and 5.7% if it has the Bloom-Malaney value. Putting actual Russian GDP growth of –9% in then the mortality crisis causes the economy to shrink by an extra 1.1% from the 37.6% it shrinks without any macroeconomic effect. Per capita GDP shrinks by 38.9% with a macroeconomic effect and 37.8% without. The per capita figures are similar to the aggregate because the Russian population was effectively constant over this period. The extra impact of the mortality crisis on GDP is insignificant in the context of the meltdown that did take place.

[18] The authors have recently forwarded a background paper on this model to me.

The bottom line of this section is that health crises, even of the magnitude of AIDS, tend not to show up at the macro level. This is not to say that they will not have economic effects, but that these will impact more at a microeconomic level.

Chapter 4: Microeconomic Impacts

4.1 On firms

Firms will be impacted through increased absenteeism, increased turnover of staff and reduced productivity because of loss of key skills. This might have a bigger impact on the small and medium-sized enterprise sector where the loss of a single worker might be more difficult to cope with, than onr a large industrial firm. The Russian economy can be thought of as being divided into 'old enterprises', 'privatised state enterprises' and 'new', usually 'small enterprises'. 'Old enterprises' are the unrestructured state plants, usually value-reducing. They continue to be supported by the state since a form of social protection as they provide employment, housing, health care and other benefits to their workers. If they were forced to face hard budget constraints, many would go out of business; this keeps many resources of labour, capital and money locked up in unproductive sectors.[19]

The 'privatised state enterprises' are former state enterprises which were sold off during the early stages of transition. These were once thought to be the dynamic drivers of reform in Russia. However, the privatisation process aimed at quantity and speed rather than quality and transparency, and most of the valuable companies have ended up in the hands of a small group of 'oligarchs'. These oligarchs have effectively stalled reform at a stage where they can continue to earn rents in the distorted current market. They have nothing to gain from a fully competitive market. New and small firms are now considered to be the key to wealth creation and development in Russia; however, they have to operate in an environment that is hostile to the private sector. There is an excess burden of regulation and inspection, and the legal framework in which they operate is ill defined and sometimes inconsistent.

To research into the impact of AIDS on the firm sector requires some information on the skills of the labour force and some information about how the labour market works. There is some evidence that the Russian labour market is becoming more westernised in that there are positive returns to education (Clark, 2000) and accumulation of human capital is more highly rewarded in the private sector than in the old state sector. There is also some evidence that, even in companies that existed pre-transition, wages are becoming more linked to marginal productivity (Konings and Lehmann, 2001).

The papers referred to in the previous chapter are from the main institute studying the Russian labour market, the Centre for Economics of Reform and Transition at Heriott-Watt University, Edinburgh. It has a number of datasets that might be useful for examining the above issues.

- The Russian Longitudinal Monitoring Survey (discussed below)
- The Goskomstat industrial registry underpins the census of production and covers about 80% of employment. However, all the firms are in the state or former state sector, and there are no firms with fewer than 100 employees
- The Labour Force Survey.

Most of the work undertaken to examine the impact of HIV/AIDS on firms has been done for Southern Africa and has used data specifically collected for that purpose. It has looked mainly at the increased labour costs associated with high rates of disease, because of increased sickness benefits and recruitment and training costs. No specific data exists on this for Russia but the above datasets might be useful to indicate the magnitude of such effects.

[19] This is basically the view of the World Bank (2002a). However, it iis not obvious that the resources of the old state sector will flow seamlessly into new productive enterprises, but the current system certainly encourages the survival of unproductive firms.

Time available for research on which this report is based was insufficient to permit further exploration of firm data, but there are fairly clear priorities for further investigation. One hypothesis that might be testable using the current data is 'are smaller firms characterised by more highly skilled workers?' This would be testable on a dataset with some workforce characteristics and firm size. The RLMS contains both of these variables. If the assumption is made that wages reflect productivity, then wage differentials across firm size could be examined. The first stage of such an investigation would be to get general information on the SME sector in Russia. The impression of SMEs in the UK is of high-tech niche companies but in Russia they may well be mainly small traders.

Another possible path for study would examine the relative incidence of AIDS on the different skill groups in the labour force. If the incidence varies across skill groups shortages could develop and this might lead to higher wages for certain groups. The actual wage variation will depend on the relative elasticities of supply and demand for those groups. It might be possible to specify wage equations that could predict wage changes under a variety of assumptions about the AIDS/skill mix.[20]

4.2 On households

The Soviet state was in effect a member of every Soviet household. The concept of 'breadwinner' was not relevant to the Soviet household, as a single adult wage would have been insufficient to support a family. In most households there would have been multiple income earners. In addition, many goods, housing, education, health care and leisure were not marketed but were provided directly by the state. The state also provided income in terms of pensions and other benefits. The tradition in Russia is therefore of fairly formal economic relationships, with the household-state being the most important.

This system broke down in the early 1990s. There has been some recovery in state functioning since then; for example, wage arrears for state employees and unpaid pensions are no longer as common. However, the central role of the state in the economic lives of the household has largely disappeared. Poverty and inequality have increased and many households have been unable to adapt to the new circumstances. However, many families still rely on formal sector wages and pensions to survive.

How will AIDS affect a household?

It is likely that most AIDS patients will be adults in their thirties. If an adult becomes sick the household will lose that person's income and will incur the extra costs associated with health care. A household with an AIDS case will therefore be more vulnerable to poverty. A healthy household may well benefit from increased employment opportunities and higher wages as a result of AIDS deaths. The divergent outcomes suggest that inequality might increase.

There are two main ways this can be investigated:

- The demographic crisis of the early 1990s led to about 2 million extra deaths, mainly of working-age males, the highest increases in mortality occurring in the 45-59 age group. An AIDS epidemic will be quite similar in that it will also affect adults of working-age. The age group most affected will probably be younger. It appears to be possible but not very easy to use Russian household datasets to investigate the impacts of the demographic crisis on the economy, Firstly, the Russian economy was collapsing during this period. It would be difficult

[20] This would follow the work of Trotter (1993), who assumed fixed costs of AIDS deaths for each skill group. The obvious extension to this is to have some labour market adjustment. Deaths of grade 2 people, for example, would result in a loss of income for those people who died but greater lifetime income for those who survive because the wage for that group would increase.

to disentangle the effects of increased mortality from other effects. For example, household data could be used to compare the incomes of households that had suffered a premature death from those that had not. However, low-income households may have suffered an economic shock that had helped to cause the premature death. There is thus a degree of endogeneity. Secondly the datasets are not of high quality. The two main ones are the Goskomstat household budget survey and the Russian Longitudinal Monitoring Survey. The first covers 48,000 households surveyed every month and forms the basis for the Russian Government's estimates of poverty. However, it is technically weak, as it is unrepresentative of the Russian population and the raw data are not available. The second is much smaller, covering initially 7,000 households and now about 4,000, but it is technically far superior. This superiority, however, was only achieved in the second phase, after 1994.[21] This dataset is available to all via the web. The RLMS's small size also makes it difficult to find enough premature deaths for any inference to be drawn.

- A second approach is to use a methodology of BIDPA (2000b), which *simulated* the effects of an epidemic. It took household data for Botswana from 1994 and HIV prevalence data from 1998. It then assigned HIV cases to individuals in the household sample, so that HIV prevalence in the sample corresponded by age group, gender and region to the 1998 prevalence data. It then assumed that, over the course of ten years, all of the people assigned HIV became sick and died. For each family type and size there is a basket of basic needs – the poverty datum line. An AIDS case in a household will increase the likelihood of that family falling below this line as it loses the income of that family member and incurs extra costs of medicine and health care. The BIDPA study had to make assumptions about sensible levels forthese costs. Once the person dies the family's expenditure will fall and this will increase itsr chance of escaping from poverty. The higher wages and the lower unemployment because of the macroeconomic impact of the disease will also increase household welfare and the BIDPA study assigns the extra jobs at random to complete its simulation. For this reason the impact on inequality might be small. The distribution shifts around with AIDS-affected households dropping down the income and consumption distribution and non-affected families moving up.
- A third approach is related to the idea of equivalence scale as referred to in Lanjouw, Milanovic and Petranosto (1999). The idea is that household composition affects poverty. A three-adult household may be in poverty at levels of consumption that would be adequate for a two-adult plus-child household. This concept can be relatively straightforwardly extended to a one-adult-one AIDS-patient household, given data on costs and incomes.

Some work on developing approaches two and three using the RLMS is reported in Annex 5. The work so far has focused on the 'counterfactual' or 'baseline' scenario, that is, the situation that Russian households face without AIDS. An interesting follow-up to this work would exploit the panel data dimension of the RLMS; the same households are sampled over several rounds. This is important because one of the impacts of AIDS will be on household formation and dissolution, which cannot be observed in a cross-section, (The BIDPA simulation showed almost 7% of households disappearing altogether as a result of AIDS.) There is a problem of 'attrition bias' in that the households that stay around to be observed show only a subset of behaviours, for example they have not moved to find work. There is also the problem that as much as 10% of the Russian population lives in institutions or dormitories. These might be the most susceptible to HIV and yet are not included, as they are not in 'households'.

Barnett *et al* (2000) reviewed studies of the economic impact at household level and found that few had been undertaken and all of these were for rural Africa. The only study done for a non-African epidemic is by Pitayanon et al. (1997), who looked at Thailand, though again at rural areas. They specifically surveyed households with AIDS and non-AIDS deaths to try and examine the effects of AIDS morbidity and mortality, apart from the normal health problems of the population. The results are difficult to interpret because of the problems of causality inherent in cross-sectional data. Households which experienced an AIDS death had income more than $1000 a year less than

[21] An example of the data quality: an early round of the RLMS reported 28 pregnant males.

the average, and lower levels of education. Were these factors a result of AIDS or did they make these households more susceptible to AIDS?

Some preliminary work has been done using the RLMS in the limited time available. This is reported in Annex 5.

The main conclusion of this study is that Russian households are still much more typical of those in developed countries rather than those in middle-income countries in other parts of the world. The main share of income comes from the wage earner or old age pension. There is very little evidence of entrepreneurial activity or of informal sector work (although there may be a tendency to under-report the latter). Although very few households grow food for market, there is evidence that the majority of Russian households do supplement their consumption by home-produced food. Almost 25% of the sample receive transfers from friends or relatives, which seems to suggest a growth in informal financial arrangements. Inequality is quite marked; the Gini coefficient is about 0.5 based on household data. Using data unadjusted for economies of scale in consumption, there is a higher than average incidence of poverty in households with children or female-headed households and a lower incidence in pensioner households. Annex 5 goes through the data in detail. Again time constraints have prevented further work on simulating an AIDS epidemic using these data. It is important to get a fully defined 'no-AIDS' scenario looking at incomes, inequality and poverty before embarking on changes.

4.3 On the state

In middle-income countries the majority of the burden of extra health costs falls on the state. This makes the policy decisions about what to do about HIV and AIDS very different from in the low-income countries where there are large HIV epidemics. In a low-income country an AIDS patient will receive minimal hospitalisation and will usually be cared for at home by a spouse or a child. One of the channels through which AIDS affects the economy is this multiplier effect; one sick person not only drops out of the labour force but also causes their spouse to cease work or their children to drop out of school to care for them.

In terms of health care infrastructure the countries of the FSU are middle-income. A complex overlapping system of clinics, hospitals and sanatoria exists and the numbers of doctors per capita is about twice the Western European average. However, the system was extremely inefficient at delivering health care even under the Soviets, and this has been coupled with the fall in resources devoted to health since 1990. Although official spending on health in the Russian Federation amounts to 3-4% of GDP, surveys of private payments for health care show that overall spending, in 1998 was about 7% of GDP. This is more or less the average for middle-income countries and is not far below European levels (Centre for International Health, 2001). About a third of this is now 'under the table' as patients pay doctors directly and also supply their own drugs. There is also evidence that sick people are not obtaining health care because they cannot afford the costs of staying in hospital or of drugs. Thus, although there is the infrastructure, trained personnel and a reasonable share of GDP in the sector, the system is organised very poorly and has not responded appropriately to the STI, HIV or TB epidemics.

In Brazil the authorities claim that highly active anti-retroviral therapy (HAART) is cost-effective when compared with the alternative hospital-provided palliative care regime. This issue will also be important in Russia, and given estimates of the severity of the epidemic, the overall cost of providing these drugs can be calculated. Russian health care systems do not take cost-effectiveness considerations into account at present. It is clear, given the large challenges to public health that exist and the limited resources available to tackle them, that an appropriate response to TB, HIV and STIs requires cost-effectiveness analysis. A priority for further research is to calculate the cost-effectiveness of the various options facing the Russian authorities to address

AIDS. Time considerations have prevented the acquisition of cost data that could be used to provide any results in this report.

Chapter 5: Conclusions

Estimating the likely economic impact of AIDS on the Russian Federation and the other independent republics of the former USSR requires an appreciation of the uncertainty associated with the epidemic and the lack of precision in assigning magnitudes to the various channels through which the epidemic affects the wider economy. That being said, a number of main conclusions can be offered.

- There is already a major epidemic of HIV and AIDS amongst high-risk populations in Russia and Ukraine.
- The high-risk populations themselves are very dynamic, heterogeneous and numerous. Intravenous drug use is relatively common as is commercial sex work. Thus an epidemic confined to high-risk groups will still cause several million deaths.
- Much more uncertainty surrounds the spreading of the epidemic to the low-risk population. Much of the evidence suggests more of a continuum of risk behaviours among the Russian population and hence a blurring between high- and low-risk groups. All the potential exists for a generalised epidemic and in Ukraine there are clear signs that one is developing.
- The macroeconomic effects of an AIDS epidemic of any reasonable severity are likely to be small.
- The effects of an AIDS epidemic on firms and in particular the development of the important new, entrepreneurial sector might be quite substantial.
- The effects of AIDS on households might also be substantial. Russian households still receive the majority of their income from a main income earner. They do not have the portfolio of survival strategies characteristic of low-income economies. This makes them vulnerable to the illness or death of a working-age adult.
- The effects of AIDS on the state institutions and the budgets depend on the policy response to the epidemic. Russia and Ukraine are middle-income countries with developed, though very inefficient, health sectors. Further research here into the costs of drug treatment or palliative care of AIDS patients would be a priority in this area.

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Annex 1: Review of Epidemiological Models

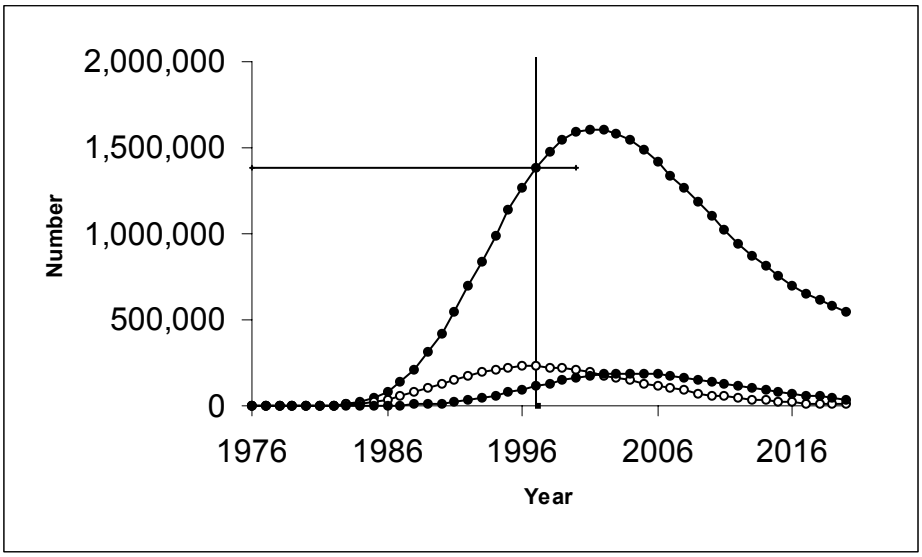
The biology of HIV and AIDS is relatively well understood. HIV spreads through heterosexual or homosexual sex or through contact with infected blood on used needles or other medical equipment or through transfusion. However, modelling this is difficult because of the heterogeneity of behaviours across populations. Thus, the disease itself spreads in a deterministic fashion. The probabalistic element is in human behaviour.

An early model of the disease is EPIMODEL which was developed by UNAIDS, among others. This assumes that new infections follow a gamma distribution.

$$f(x;\alpha,\beta) = \frac{1}{\beta^{\alpha}\Gamma(\alpha)} x^{\alpha-1} e^{-\frac{x}{\beta}}$$

The first term on the right-hand side of the equation simply normalises the distribution to 1. The variable x represents the number of years since the start of the epidemic. The two parameters of the distribution α and β are fitted to ensure the number of new cases in the model accurately reflects the true number.[22] The model predicts new infections and calculates their cumulative number and then 'ages' the epidemic by making some assumption about the proportion dying at each duration of the infection. In the Feeney version of EPIMODEL the median duration from infection to death is seven years. It would be relatively simple to make the survival probabilities time-dependent. Figure A1.1. shows a simulated EPIMODEL epidemic with the top series showing the cumulative number of cases, the second series showing new cases and the lower series showing the number of deaths in the year. The distribution is fitted (in this case) to the actual data for 1996.

Figure A1.1 : An Epimodel AIDS epidemic



The main problem with this model is the underlying assumption that new infections are a random variable. New infections are determined by a large number of factors, and the difficulty of explicitly modelling these has made the option of assuming they are random a useful one. However, this is very similar to the economist's debate about the benefits of specifying full structural economic

[22] This is drawn from Feeney (1999) who has produced a spreadsheet version of EPIMODEL. As yet, I have not managed to track down the model itself.

models as opposed to reduced form or even time series models. The latter types of models tend to be much better at forecasting but the former are essential for policy simulation or understanding linkages in the economy. With regard to modelling HIV, the exact means by which the disease is spread needs to be understood in order to design cost-effective interventions to address it. This is particularly the case in the FSU where the observed pattern of infection is somewhat unique. Another problem is that the FSU epidemic is still in an early stage, where a statistical error might well be a large percentage of the overall figure. In terms of Figure A1.1 this would be equivalent to fitting the model to 1986 rather than 1996 data. At such low values the signal-to-noise ratio would be very low.

The structural approach is typified by the models developed by Garnett and Anderson (1993, 1994). They specify a full mathematical model, which 'unpacks' the determinants of infectivity. The key equation is shown below:

$$\lambda_{kl}(a,t) = \int_{\tau}^{\varphi} \sum_{m=1}^{n} \left[c_{klm}(a,a',t)\rho_{klm}(a,a') \frac{\sum_{s=1}^{3}(\beta_{sk} Y_{sk'm}(a',t))}{N_{k'm}(a',t) - A_{k'm}(a',t)} \right] da'$$

The model breaks the population down into groups indexed by gender (k or k'), sexual activity class, (l, m, ...), to represent differences in risk behaviour and age a or a'. HIV positive people are further indexed by s, their infectivity class. This time-specific equation represents the chance of a person of sex k, class l and age a catching HIV at time t, as a function of:

$c_{klm}(a,a',t)$, the rate at which someone of age a, group l and sex k acquires new partners of age a' and group m;

$\rho_{klm}(a,a')$ the probability that someone of gender k, class l and age a has a sexual partnership with someone of group m and age a' (this parameter controls the 'mixing', that is, the supply of k'ma' partners must equal the demand for such partners to 'close' the model);

$Y_{sk'm}(a',t)$ the number of people of gender k', age a' and group m who are HIV positive in infection class s at time t;

$N_{k'm}(a',t)$, the total number of people in the population with k'ma' characteristics at time t.

The number of people in that triple with AIDS; $A_{k'm}(a',t)$ is subtracted as they are assumed not to be sexually active. β_{sk} is the fixed transmission probability of HIV *per partnership*.

As can be seen, the model works at quite a micro level. The most complex part of the modelling is defining the mix matrix. This determines the probability of partnerships between different age and risk-behaviour groups. When partners are always of the same group, it is called *assortative mixing* with a=a' and l=m. The opposite, with a≠a' and l≠m, is called *disassortative mixing*. The closure rule is also important, as this enters the model non-linearly and the overall forecast is highly dependent on what is assumed. In their 1993 paper, referenced Garnett and Anderson assume that one gender always acquiesces in the preferences of the other. In the 1994 paper more work was done on modelling the actual closure rules used in a community.

The advantage of this sort of model is that it is true almost by definition. How HIV spreads and progresses to AIDS is well known and must happen along the lines represented in this model. The

disadvantages can be compared to those of having a map that is 1:1 scale; because *everything* is in the model, it has not abstracted from reality in a useful way. Note that the model is fully deterministic; there are no error terms. The model also requires a lot of very specific data to work. Data on sexual behaviour are often sparse and unreliable and thus the uncertainty is imparted to the model through its parameters rather than in the process.

Other authors share these concerns. 'Complex models that embody detailed demographic and epidemiological structure are potentially superior representations of HIV/AIDS epidemics (than EPIMODEL) but their application is limited by the difficulty of understanding and applying them and by the difficulty of finding adequate statistics for the many parameters they incorporate'(Feeney and Zabec, 1999).

The Garnett-Anderson model can model the type of epidemic that spreads mainly through heterosexual sex. In the epidemic in Russia the main mode of transmission is currently IDU and the main co-factor in sexual transmission is the presence of sexually transmitted infections (STIs).

Nicholas Grassly has adapted the above model to take account of these overlapping factors. Grassly adds to the Garrett-Anderson model to cover the spread of STIs and the number of needle exchange activities among IDUs as well. The model requires that drug using behaviour as well as sexual activity is modelled and in addition to the balancing equation in the G-A model. there is an IDU balancing equation for drug using 'partnerships':

$$D_{ij} = \frac{\tau_{ji} \sum_{u=1}^{2} \kappa_{uj} H_{u\bullet j}^{\bullet\bullet}}{\tau_{ij} \sum_{u=1}^{2} \kappa_{ui} H_{u\bullet i}^{\bullet\bullet}}$$

where τ_{ij} is the probability that someone of drug-using status i will have a needle sharing relationship with someone of status j (i=1 means not a drug user), H_{kli}^{sb} is the number of people in each of these groups, S indices their HIV status, b indices their STI status, k is gender, l is sexual activity class and i is IDU activity class, The • means that the group is aggregated over that field so that $H_{\bullet\bullet\bullet}^{01}$ indicates all individuals who are HIV negative and STI positive summed over gender, sexual activity class and drug activity class. In the equation above $H_{u\bullet i}^{\bullet\bullet}$ indicates all individuals of gender u and drug activity class i summed over HIV and STI status and sexual activity class. κ_{ki} is the rate of acquisition of new drug partners. If the demand from is for js exceeds the supply of js for is then this parameter is altered. As can be seen the data requirements on such a model are extremely large.

Simulations from this model were presented in Figure 2.2.

Annex 2: Models of Macroeconomic Impact

Macroeconomic effects of AIDS are expected to operate through:

- reduced human capital as a result of AIDS morbidity and mortality;.
- reduced saving and investment as a result of money being spent on health care; and possibly
- reduced investment through the increasing rate of time preference as life expectancy falls.

Cuddington (1993) and Cuddington and Hancock (1994) published the earliest work in this field. They built on an approach due to Mankiw et al. (1992). This augmented the classic Solow growth model to include human capital.

$$Y_t = \alpha \gamma^t E_t^{\beta} K_t^{1-\beta}$$

This is a standard Solow type growth equation except for the variable Et, which represents 'efficiency' units of labour. This is defined by

$$E_t = \sum_{i=15}^{64} (1 - za_{it}) \rho_i L_{it}$$

where L_{it} reflects the number of workers of age i at time t, ρ_i is their productivity and a_{it} is the number of age i at time t with AIDS. The parameter z reflects the loss in productivity as a result of AIDS and, for example, will take a value of 2 if both the infected worker and their spouse are forced to stop work because of AIDS. The capital accumulation equation is given by:

$$\Delta k = [s(a) + s^*] f(k,a) - n(a)k - \theta k$$

where k=K/L, f(k,a) is labour productivity, n(a) is population growth, θ is depreciation. The first term sums domestic savings, which are a function of AIDS, s(a), and foreign savings, which are exogenous. When solved for steady-state values the model gives

$$\Delta k \equiv 0 -$$

$$y^* \equiv f(k^*, a^*) = \frac{n(a^*) + \theta}{s(a^*) + s^*} k^*$$

Where the asterisk superscript indicates the variable is at its long-run steady-state value. An increase in AIDS will therefore have an ambiguous effect. The denominator will decrease as AIDS reduces savings, but so will the numerator as higher AIDS reduces population growth. Thus theoretically the impact of AIDS is unclear. This demonstrates one of the problems of assessing the impact of AIDS on growth. The effect depends on the empirical values of the parameters. Cuddington applies this model to data for Malawi and Tanzania. Although he found significant negative impacts on overall economic growth in terms of GDP per capita, the impact of AIDS was quite small.

The summary results for a number of studies are reproduced in A2.1. The main result seems to be fairly small impacts. Most of the studies are carried out in sub-Saharan Africa for the reason that prevalence rates are highest there and therefore it should be easiest to find an economic impact. Bloom and Mahal (1994), however, did a global cross-sectional analysis. Unfortunately the econometrics of this is poor, as is also the case with the work of Bonnel (2000).

Table A2.1: Macro-effect of AIDS

Study	Scope	Effect on GDP	Effect on GDP/cap.
Cuddington, and Hancock (1994)	Malawi	-0.2/-0.3% p.a. over 1985-2010	
Cuddington (1993)	Tanzania	-16% total	-2.7% total
Bloom, and Mahal (1997)	51 countries worldwide		-.21% p.a. in Tanzania
Bonnel (2000)	Africa		-0.7% p.a. on average (@8.7% prevalence)
BIDPA (2000A)	Botswana	-1.5% p.a. on average	Insignificant
Dixon et al. (2001)	41 African countries	-2~-4% p.a.	
Arndt and Lewis (2000)	South Africa	-18% by 2010	-8% by 2010
World Bank (2001)	Swaziland	-1.5% p.a.	
Ruhl et al.	Russia		

Note: figures are percentage changes between AIDS and non-AIDS scenarios.

There is a trend for more recent work to find a more significant impact. Dixon *et al* once again use the augmented Solow model and estimate a growth equation using a panel of 41 African countries. Their innovation is to specify two types of human capital: health and educational. They have to make a few heroic assumptions to make this approach operational. In the end their equations break down precisely for the countries with the highest prevalence. They argue that this indicates that normal economic relationships cease to prevail at such high rates of prevalence.

Arndt and Lewis (2000) use a Computable General Equilibrium model of South Africa to estimate the macroeconomic impact. This has the advantages of being able to disaggregate into 14 economic sectors and various skill levels in the labour force. It also uses translog production technology, which allows for different rates of substitution amongst factors in different sectors. This has the disadvantage that the CGE model is not presented and it is therefore difficult to challenge or judge the importance of the various structures that have been assumed. As can be seem in Table A2.1, Arndt and Lewis find one of the largest macroeconomic impacts of AIDS, showing a fall in GDP by 18% by 2010 when compared with the 'no-AIDS' scenario. Even so, GDP per capita only falls by 8%. Their results are very different from the Botswana Institute for Development Policy Analysis (BIDPA study), which showed a negligible fall in GDP and GDP per capita. Arndt and Lewis argue that the difference is due mainly to the constraint on foreign investment in South Africa. That is, the main impact on GDP is because domestic resources are diverted from investment into health care and foreign resources will not take up the slack. Botswana, with its large current account surplus does not face this problem. This is a general finding of these studies. The impact of AIDS on GDP growth is through reduced capital accumulation, *not* reduced human capital.

The final paper considered is by Ruhl et al. and assesses the economic impact on Russia. This is discussed in the main text.

Annex 3: Cost Effectiveness of Anti-retroviral Therapy

The papers produced for DFID (Compernolle, 2002, Forsythe, 2002) provide the context for this discussion.

Cost-benefit analysis is a comparison of discounted costs and benefits associated with any particular policy option. A positive cost-benefit ratio justifies proceeding with that project. In health economics, ethical considerations mean that, in middle and high-income countries at least, cost-benefit analysis is not used to direct resources in health care. The discounted (monetary) benefits, for example, of treating heart disease in a 65-year-old man would be unlikely to outweigh the costs.

Cost-effectiveness avoids the awkwardness of giving monetary values to health outcomes. It answers the question, given that society has decided that we will treat heart disease in 65-year-old men, what is the cheapest way of giving this treatment. In this interpretation, strict cost-effectiveness can only be used to compare competing interventions for identical health outcomes. The question 'is HAART cost-effective to treat HIV and AIDS?' is difficult to answer in this framework, as there is no competing treatment. Hospitalisation and palliative care will not significantly delay death. *Cost-effectiveness is a method of ranking options; whether society should pursue the option at all is a political decision*

Because of the weakness of cost-effectiveness analysis in comparing treatments with different health outcomes, an alternative metric, the DALY or disability adjusted life year, is used. Various treatments are compared in terms of the cost of one DALY. In the developed world, health authorities will fund operations that will give 1 DALY for £30,000. In low-income countries health interventions exist that would deliver DALYs for less than £1. (World Development Report, 1993).

A further problem exists in that cost-effectiveness analysis is usually used only to direct resources *within* the health sector. In other words, a health manager is given money to buy drugs and pay doctors and is given a set of health outcomes to achieve. Limiting the perspective to that of the health provider is often unduly restrictive. In many low-income country settings health outcomes are cost-effectively achieved outside the health sector. DFID has a project in Kyrgyzstan, for example, which is aimed at improving health through better sanitation and better hygiene information. In the New Zealand performance budgeting system, they have made a deliberate attempt to get away from using functional ministries to deliver all outcomes under their defined function. The minister for health is responsible for achieving health outcomes through the best means possible; this may not include using the health ministry to achieve those outcomes.

Collection of data and the economic evaluation of health care options should have the following features (adapted from Walker and Fox-Rushby, 2000):

- perspective: this should be explicitly stated; in most traditional health economics papers the health provider is the perspective. Government or societal perspective might be more useful when making decisions about public resources at a macro level.
- costs: the data on the costs of an intervention should be as comprehensive as possible and should reflect economic valuation. In Russia the opportunity cost of many health care facilities and even staff is quite low, whereas it is thought that pharmaceuticals are undervalued by the state.
- outcome measures: use of DALYs is more helpful than a disease-specific outcome as it facilitates comparison with other interventions. Cost-benefit analysis requires a monetary valuation of outcomes, but this is controversial and difficult to measure
- time: costs must be discounted over the full treatment period. For example. HAART might be cost-effective when compared with palliative care for one year, but AIDS patients who receive only hospitalisation will die whereas provision of HAART is much more long-term.

- sensitivity analysis: this is crucial as it shows how robust the results are.
- Affordability: if the most cost-effective intervention is beyond the resources of the health care system then the analysis does not help policy-makers.

Annex 4: Data

Table A4.1: Russian data by region: 3 June 2002

#	Name of Territory	Population , 2000	First Case	Prevalence	# Cases
	Russian Federation	144,819,100	1987	136	197,497
1	Irkutsk oblast	2,728,800		465	12,691
2	Khanty-Mansi AO	1,401,900		447	6264
3	Samara oblast	3,279,300	1987*	406	13,314
4	Kaliningrad oblast	946,700	1988*	396	3,748
5	Orenburg oblast	2,212,700	1996	385	8,528
6	Sverdlovsk oblast	4,572,800	1991*	348	15,893
7	St Petersburg	4,627,800	1987*	340	15,753
8	Ulyanovsk oblast	1,453,400		315	4,581
9	Chelyabinsk oblast	3,651,000	1990*	269	9,838
10	Moscow oblast	6,435,800		260	16,758
	Average in these 10 regions			363	107,368
11	Leningrad oblast	1,659,100		238	3,953
12	Tver oblast	1,575,000		195	3,068
13	Moscow	8,546,100		181	15,429
14	Saratov oblast	2,696,300	1996*	176	4757
15	Primorsky krai	2,155,400	1989*	167	3,605
16	Tyumen oblast	3,253,700	1996*	157	5,114
17	Republic Buryatia	1,026,300	1990*	153	1,569
18	Kemerovo oblast	2,962,100	1992*	141	4,183
19	Ivanovo oblast	1,205,100		138	1,658
20	Tula oblast	1,716,200		130	2,230
21	Krasnoyarsk krai	3,032,000	1989*	127	3,837
22	Perm oblast	2,940,700	(1998*)	126	3,718
23	Yamalo-Nenetsky AO	505,400		118	597
24	Republic Tatarstan	3,776,800	1989*	117	4,432
25	Ryazan oblast	1,271,000	1991*	101	1,280
26	Udmurt Republic	1,623,800	1998	97	1,576
27	Altai krai	2,642,600	1990*	96	2,527
28	Volgograd oblast	2,658,200	1987*	93	2480
29	Murmansk oblast	988,500	1990*	89	883
30	Taimyr AO	43,700		78	34
31	Kurgan oblast	1,087,100	1997	77	832
32	Krasnodar krai	4,998,700	1989*	72	3,581
33	Chita oblast	1,246,700	1996	68	853
34	Republic Ingushetia	460,100	1999	67	309
35	Kaluga oblast	1,068,800	1989*	62	660
36	Nizhegorodsky oblast	3,632,900		60	2,167
37	Vladimir oblast	1,589,100		59	932
38	Orel oblast	890,700	1987*	57	512
39	Rostov oblast	4,317,400	1989*	55	2,360
40	Republic Bashkortostan	4,101,700		55	2,239
41	Tomsk oblast	1,064,800	1996	53	562
42	Kostroma oblast	774,500		51	394
43	Novgorod oblast	719,400		49	349
44	Republic Kalmykia	314,300	1988*	43	135
45	Ust Ordynsky Buryatsky AO	143,000		41	59
46	Yaroslavl oblast	1,400,700		41	572

#	Name of Territory	Population , 2000	First Case	Prevalence	# Cases
47	Vologda oblast	1,311,300	1995*	36	473
48	Republic Mary El	755,200	1997	36	269
49	Bryansk oblast	1,424,500	1989*	34	480
50	Penza oblast	1,517,600	1989*	33	508
51	Republic Sakha (Yakutia)	986,000	1997	31	310
52	Chechnya	609,500		31	191
53	Republic North Ossetia	677,000	1997	31	209
54	Republic Komi	1,126,100		26	288
55	Khabarovsk krai	1,495,900	1992*	23	337
56	Chuvash republic	1,353,400	1992*	22	301
57	Republic Mordovia	919,700	1997	21	195
58	Smolensk oblast	1,113,700		20	225
59	Republic Karelia	760,600	1994*	19	147
60	Kabardino-Balkar republic	783,900		17	135
61	Republic Adygea	446,000	1996	17	76
62	Pskov oblast	789,500		17	132
63	Tambov oblast	1,256,600		16	207
64	Novosibirsk oblast	2,730,500	1989*	15	407
65	Republic Khakassia	578,300	1997	13	76
66	Astrakhan oblast	1,012,800		12	125
67	Republic Dagestan	2,160,300		12	259
68	Belgorod oblast	1,498,800		12	177
69	Republic Altai	204,800	1996	12	24
70	Kursk oblast	1,298,900	1997	10	135
71	Magadan oblast	233,500		10	23
72	Kamchatka oblast	384,200	1996	8	32
73	Sakhalin oblast	591,200	1993*	8	49
74	Stavropol krai	2,654,200	1987*	8	219
75	Omsk oblast	2,147,500	1996	7	152
76	Kirovsk oblast	1,576,000		7	111
77	Voronezh oblast	2,437,600		6	157
78	Amursk oblast	989,900		6	63
79	Jewish AO	195,600	1999	6	11
80	Karachaevo-Cherkes Republic	430,700	1999	6	24
81	Evenki AO	18,500	2001	5	1
82	Arkhangelsk oblast	1,442,700	1992*	5	77
83	Republic Tyva	310,700		5	15
84	Lipetsk oblast	1,235,000	1993*	5	58
85	Koryak AO	29,100		3	1
86	Komi-Permyak AO	149,100	2000	3	4
87	Chukotsky AO	75,300	1998	3	2
	Total:	144,819,100		136	197,497

Annex 5: The Russian Longitudinal Monitoring Survey 9th Round: Preliminary Results on Demographics, Incomes, Inequality and Poverty

This annex covers the preliminary work on the main representative household survey for Russia, the RLMS. This can be used to simulate the HIV/AIDS epidemic. Due to time considerations this annex mainly looks at the baseline situation in Russia to indicate how and where such an epidemic will have an impact. The annex is quite technical as it is intended to be as informative as possible to anyone wanting to follow up this work.

The 9th round of the RLMS has data on 4006 households containing 11265 individuals. The interviews were carried out in October/November 2000. The variable *hhnum* contains the number of people in the household. It is distributed as shown in Table A5.1.

Table A5.1: Household size

hhnum	Freq.	Percent	Cum.
1	716	17.87	17.87
2	1135	28.33	46.21
3	1020	25.46	71.67
4	724	18.07	89.74
5	248	6.19	95.93
6	108	2.7	98.63
7	32	0.8	99.43
8	10	0.25	99.68
9	6	0.15	99.83
10	3	0.07	99.9
11	2	0.05	99.95
12	1	0.02	99.98
13	1	0.02	100
Total	4006	100	

The lack of young children in Russia is clear; 82% of the sample households have no children under the age of 6 and only 2% have more than one. With regard to older children, 53% of the sample households have no member under the age of 18 and only 16% have more than one. This demographic characteristic is reflected in the population pyramids shown in Chapter 1.

The sampling strategy of the RLMS is aimed at getting a correct regional and urban/rural representation. Because of differing non-response rates the final sample data are weighted. Most descriptive statistics have to be weighted for them to be unbiased estimates of the population values. This document will largely talk about the sample characteristics. The weights are discussed further below. Another problem is that the sampling frame is based on the last but one census, which was carried out in 1989.[23] Thus the large changes that are believed to have occurred in Russia since the transition are not reflected.

The RLMS compilers themselves define a variable called hhtype, which summarises some of the demographic data to indicate if the household is 'headed' by working or retired, males or females. The vast majority of children are in male-headed households, 77% of households with one child are male-headed, as are 88% of two-child households. There are some female-headed households with children (19% with one child and 11% with two children) but the numbers are quite small. Those households headed by a male or female of retirement age have almost no children. Over

[23] The last census was held in October 2002.

25% of the sample households have no male or female of working age, 51% of the sample have one working age male, the most common situation is the 38% of the sample with one working-age male; and one working-age female. 43% of the households in the sample have at least one elderly member; for households in this group the most common situation is the single elderly female.

The age data in the sample are complicated because people retain their roster number from the previous survey, if they were on it. Therefore, someone in a one-person household might be listed as third on the roster for round 9, if the two people ahead of him/her in round 8 have since left home or died. I have defined the variable *age-head* and *age-deputy* to give the ages of the first and second persons in the household, no matter where they are on the roster.

The breakdown of the sample by age of first and second household person is as shown in A5.2.

Table A5.2: Household size by age of head

Hhnum	age head	age deputy
1	63	
2	55	52
3	43	41
4	44	41
5	47	44
6	51	47
7	54	51

Weights

The weights in the RLMS are contained in the variable *hhwgt-9* and they are what is called 'analysis weights'; that is, for each household the weight indicates the number of households in the population it 'stands for'. The non-zero sample weights do not vary much, as the sampling frame was designed to make the final sample representative. The only reason for weights differing from unity is the different non-response rates in different areas. Muscovites and urban dwellers in general have low response rates, whereas in the rural areas the response is very high. A confusing item in the sample is that 651 households or 17% of the sample are given a zero weight. Thus any weighted statistic is calculated ignoring data on these households. This seems to throw away a great deal of data. The reason for this is that the RLMS sample design is based on a survey of dwelling places, not households. The 651 zero-weighted households have moved from sampled dwelling places. However, because of the powerful results that can be obtained using panel data analysis and because of attrition bias[24] in any fixed sample, these households have been retained in the survey. They have to be zero-weighted in any cross-sectional statistics because they no longer live in the sample dwellings.

Individual data

Every individual in every household is supposed to fill in either the adult or child questionnaire. The adult questionnaire is 73 pages long and must therefore require a good deal of work to complete. There are 9,074 adults in this round; 1,901 children (<=16) are covered by the child

[24] Attrition bias: If the sample is restricted to households that stay in the same house over a long period. it is likely they will only have a subset of economic behaviour. For example, they may be richer than average as they do not have to move to find work. This 'attrition bias', the fact that inclusion in the sample is correlated with variables of interest, will tend to bias any analysis carried out on such data. An econometric correction for this was suggested by Heckman (1979).

questionnaire. The adult ages range from 17 to 102 with a mean of 44. Males make up 43% of the sample.

Employment

Of the sample 47% are working, 54% of the men and 42% of the women. Of those working 92% say they are working for an enterprise or organisation, 4,501 report a 4-digit occupation code for what they do and 3,906 report the number of people in their enterprise. The mean number of people in the enterprises where sampled individuals worked was 956. This is a very high average, but when we look at the breakdown it is clear that this is affected by a few individuals in very large firms, as 54% of the sample work in firms with less than 100 employees.

Table A5.3 : Employment by firm size

Firm size			
Job 1	Freq.	%	Cum.
<10	376	12.14	12.14
11-100	1300	41.99	54.13
101-500	777	25.1	79.23
510-1000	256	8.27	87.5
1001-10,000	358	11.56	99.06
>10,000	29	0.94	100
Total	3096	100	

Of the sample that replied 72% worked in government enterprises, 5% in foreign-owned enterprises, 36% in Russian private enterprises (the proportions sum to more than 100% because the question refers to 'owned or co-owned'), and 11% own or co-own the enterprise where they work. Of those who did have some ownership in the enterprise, 82% owned less that 5%. 68% of the sample were in the same profession and job as in 1998, 17% had changed job and place of work. Only 5% had a second job in the formal sector. Also only 8% of the whole sample were involved in any informal economic activity for which they were paid.

Education

The sample reflects the high level of education in Russia. 66% had received a high school diploma and 74% were studying or had studied other than at school. 28% studied 'professional' courses – which in the Russian system covers courses ranging from tractor-driving to accountancy. This particular survey question can be unpacked a bit more as the ILO codes are given. 20% attended PTUs, which are vocational schools of higher education, 35% went to technical, medical, art. etc. schools, 28% went to universities or institutes and 1.4% went on to post graduate level study. In technical colleges the average stay was about 2 years, in universities 4.2 years, and professional courses were only for 6 months or so. Thus there is a great deal of information about the educational experience of the sample, but it requires some interpretation because of the unfamiliar features of the Soviet education system.

Incomes

Almost a third, 32% or 2,940 people, receive some kind of pension, 75% of them a retirement pension. The mean age of those receiving a pension is 64, whilst the mean age of those without a pension is 35. The mean age of those receiving a retirement pension is 69, of a disability pension 51, of a loss of provider pension, 34, and of a years of service pension, 57.

The variable *tincm-n9* is a variable constructed by the RLMS compilers containing total household income over the previous thirty days. This contains the sum of all individual earnings, including wages and non-cash benefits from enterprises and pensions and unemployment benefit. They then add in all family benefits; child benefit, fuel benefit, stipend, sums from animal raising and wild gathering, net proceeds from selling agricultural production, the imputed proceeds of home production consumed or given away, property sales, rental income, investment growth, insurance benefits, alimony received, transfers from friends and family, transfers from other sources and apartment subsidies. It is useful to look at exactly how important these various income-earning channels are to the typical Russian household. The income is expressed in Russian roubles (RAR) which at the time of the survey were at £1=40RAR.

Table A5.4: Total household income by household type (unweighted)

hhtype	mean	N	sd	p25	p50	p75	Iqr
1	4751.8	2295	6197.0	1953.0	3431.1	5824.6	3871.5
2	2837.4	528	3173.3	1189.6	2188.6	3432.2	2242.6
3	2606.9	474	1755.2	1600.0	2155.6	3140.0	1540.0
4	1451.4	478	3004.4	812.0	1000.1	1371.7	559.7
5	1340.0	2	763.7	800.0	1340.0	1880.0	1080.0
Total	3795.5	3777	5274.7	1380.0	2540.5	4618.8	3238.8

Note: The statistics reported in this table are the mean, the number of cases over which this mean is calculated (N), the standard deviation (sd), the 25th, 50th and 75th percentiles (p25, p50=median and p75) and the interquartile range (iqr=p75-p25)

Table A5.5: Total household income by household type (weighted)

hhtype	mean	N	sd	p25	p50	p75	Iqr
1	4945.3	1804	6574.4	2032.5	3500.0	6000.0	3967.5
2	2885.8	440	3372.2	1200.0	2200.0	3432.5	2232.5
3	2627.4	441	1791.5	1600.0	2157.3	3227.2	1627.2
4	1335.7	439	1265.3	812.5	1008.0	1379.7	567.2
Total	3837.9	3126	5426.1	1348.7	2553.0	4700.0	3351.3

Table A5.4 shows total family income by household type, and some measure of dispersion. Male headed households have *hhtype=1* and *hhtype=2* are female-headed. Mean and median income is much higher for male-headed households, but so is the dispersion (measured by the standard deviation and the interquartile range). Households headed by a retired male are coded as *hhtype=3*; they get slightly less on average and on median than the female-headed household but the dispersion is much less, perhaps relying on a pension leads to less variance. This hypothesis is difficult to equate with the data on retired female-headed households (*hhtype=4*) which have a high standard deviation but a very low interquartile range. indicating bunching of observations about the median but also a lot of weight in the ends of the distribution.

Weighted results are given in Table A5.5. Mean and median income increase significantly for male-headed households and marginally for other groups, except for retired female-headed households where it falls significantly. This would suggest at least one high-income household of this type has been dropped.

Table A5.6: Total household income by numbers in household

hhnum	mean	N	sd	p25	p50	p75	iqr
1	1617.4	716	2945.6	800.0	1014.7	1503.3	703.3
2	3345.1	1077	6207.1	1549.6	2280.2	3600.0	2050.5
3	4226.4	947	5403.3	1883.0	3170.5	5049.0	3166.0
4	4738.3	666	3764.3	2280.8	3744.3	6097.3	3816.5
5	6145.0	219	6230.1	2597.6	4648.6	7036.0	4438.4
6	6922.3	99	5767.3	3174.7	5839.9	8280.0	5105.4
Total	3795.5	3777	5274.7	1380.0	2540.5	4618.8	3238.8

The same data here are presented here broken down by numbers in the household (observations for hhnum>6 have been deleted as there are too few in each class). Here the average income increases as family size increases. The mean is much higher than the median in all cases exhibiting the usual feature of income distributions, that of being skewed to the left. To examine the importance of household type and number on income a simple regression was run.

```
tincm_n9 |     Coef. Std. Err.    t   P>|t|    [95% Conf. Interval]
-------------+----------------------------------------------------------------
   hhnum |  661.6515   73.29358    9.03  0.000    517.9526   805.3504
  type_9 | -593.9748   95.06804   -6.25  0.000   -780.3645  -407.5851
   _cons |  3011.797   343.6661    8.76  0.000    2338.008   3685.586
```

This shows that an extra person in the household adds to income by 661 roubles, whilst falling from one household type to another (whilst staying in the same hhnum) reduces income by 594 roubles. The equation is poorly specified in any case and is unweighted.

What are the main sources of income?

Table A5.7: Cash wages by household type

hhtype_9	mean	N	sd	p25	p50	p75	iqr
1	2831	2295	3586	550	1800	4000	3450
2	1456	528	2091	0	900	1900	1900
3	334	474	939	0	0	0	0
4	59	478	230	0	0	0	0
5	150	2	212	0	150	300	300
Total	1973	3777	3135	0	900	2750	2750

Table A5.4 contains wages from formal employment. There is a big fall from male to female-headed households and over 25% of female-headed households receive no wages at all.

Table A5.8Share of cash wages in total hh income

hhtype_9	mean	N	sd	p25	p50	p75	iqr
1	57%	2268	36%	24%	65%	91%	66%
2	46%	517	35%	5%	47%	74%	69%
3	8%	472	18%	0	0%	0%	0%
4	3%	477	12%	0	0%	0%	0%
5	19%	2	27%	0	19%	38%	38%
Total	42%	3736	39%	0	39%	80%	80%

Cash wages provide 42% of total income on average; the median is 39%. This is quite high for both male- and female-headed households, though of course it drops for retired-headed households.

Calculations broken down by household numbers indicate cash wages providing over 50% of total income for 3-, 4- or 5-person households, though they are less important for 1- and 2- person households.

- Non-cash wages: Only just over 8% of the households receive any non-cash remuneration from their place of work. For those that do receive it the average is over 1000 roubles a month. This is about 10% of *these* households, total income.
- Pensions: Pensions also amounted on average to over 1000 roubles a month for those who received them. The average is highest for a two-person household or one headed by a retired male – which is not surprising. Households with a retired head depend for over 70% of their income on a pension. Non-retired male- and female-headed households depend 9% and 20% respectively on pension income, though in both cases over 50% of such households receive no pension income at all.
- Unemployment benefits: Less than 1% of households receive any unemployment benefits. The mean for those that do is 500 roubles.
- Child Benefit: Only 12% of the sample receive child benefit and, for those that do, it accounts for only 10% of income.
- Fuel benefits: Only 1.5% of the sample receive these and for those that do the amounts are quite small. Only 20 households received more than 100 roubles.
- Stipends:These are provided for students. Only 5% of the sample receive them and for only 115 households are they above 100 roubles a month.
- Money from animal raising; Just over 2% of the sample get any money at all from this. Those that do make quite a lot of money, the mean is 4,193 and the median 3,000 roubles a month. For those with non-zero livestock earnings the mean share of total income is 44%. This would suggest that these households are farmers rather than earning this money on the side.
- Money from wild gathering: This covers money from selling products 'gathered', e.g. mushrooms, nuts or fish. Less than 1% of the sample claim to make anything from this.
- Sales of home produced agricultural goods
- 14% of the sample (N=544) engage in agricultural activity to produce and sell goods. Most of them make money, but for 27 households the net earnings are negative. The average earnings from home production are 953 roubles a month, making upand they are 14% of total household income, which indicates that these families have a total income about twice the sample average. There is considerable skewness in the distribution as the median amount and share are 317 roubles and 8% to total income.
- Imputed value of home produced agricultural goods: Almost 60% of the sample grow food or produce other goods from crops that they themselves consume. For 3% of the sample, they are still losing money but for the remainder this contributes greatly to their income. The mean is 665 roubles a month and the mean share is 20% of total income. This is very significant, considering that almost two-thirds of the sample benefit from this. There is also little variation across household types. That is, there is no sign that pensioner households get a greater portion of their income from home-produced goods than households with non-retired heads.
- Income from sales of personal property: Although this is often classed as a survival strategy, only 2.6% of the sample sold any personal property during the sample period.
- Rental income: Hardly anybody (0.6%) received any money from rent.
- Investment growth: Again this was relevant to only a tiny proportion of the sample, 1.2%.
- Insurance benefits: Only 3 households received these during the period
- Alimony: 2.3% of the households received alimony payments. For those that receive them they are quite substantial. Female-headed households that receive alimony get on average 26% of their income from this source.
- Transfers from family and friends: Over 25% of the sample received help from parents, children, other relatives or friends during this period. The average sum was 1,016 roubles and the median 400. For those who received transfers, they contribute 26% of total income on average and the median is 16%. Single-person households who receive transfers get 33% of

their income this way and (non-retired) female-headed households 40%. Pensioner-headed households receive less than non-pensioners.

- Transfers from firms, churches and other institutions: About 3% (N=111) of the sample received this type of assistance. The average sum received was 922 roubles.
- Apartment subsidies: 20% of the sample (N=721) received something via this channel. It is not entirely clear what this covers, as the questionnaire refers to 'subsidies' or 'benefits' from apartment renting, *not* rental income. The mean amount received by these 721 households is 105 roubles and the median is 80.

The broad picture coming from the RLMS is indicative of the situation in a fairly conventional developed country. The main source of income for non-pensioner households is cash wages and for pensioner households is pensions. There is not much evidence either of non-cash wages or informal sector economic activity. There is evidence that a significant number of families are supplementing their consumption by growing their own food but they are not marketing it. There is also considerable evidence of informal financial arrangements to tide people over.

There are numerous ways this data could be further explored. The urban and rural differences could be looked at and the other characteristics of those with income from agriculture examined. This section has also focused more on describing the dataset rather than estimating the population values for these quantities. This is mainly because the weighted dataset drops over 600 households. Any realistic projection of an AIDS epidemic in Russia will only have low prevalence. It is important not to drop cases to reduce the sample size below a level that can be useful.

Inequality in income, expenditure and savings.

The subject of inequality is at the forefront of the debate on the impact of the transition on Russia. Before exploring the complex approaches of inequality measurement some cruder and more robust indicators of inequality will be looked at.

Table A5.9 presents a weighted distribution of savings. The savings variable is constructed by the RLMS compilers to be non-negative. The deciles themselves are based on sample weight rather than observations, i.e. 10% of the weighted sample is in each decile, rather than 10% of the observations.[25] Mean saving is much more highly correlated with expenditure than it is with income.

Table A5.9: Weighted distribution of savings across income deciles

Decile	Obs	Mean	Std. Dev.	Min	Max
1	311	49.3	284.9	0	3000
2	314	23.0	139.6	0	2000
3	316	70.7	418.0	0	6000
4	317	33.7	209.5	0	3000
5	316	45.9	194.7	0	2000
6	315	133.2	704.1	0	10000
7	313	101.2	423.7	0	5000
8	308	166.0	503.2	0	3000
9	306	250.5	1326.9	0	15000
10	310	1066.9	3973.6	0	40000
Total	3126	194.1	1402.9	0	40000

Table A5.10 Weighted income deciles

Decile	Obs	Mean	Std. Dev.	Min	Max

[25] This section uses an approach and an adapted STATA programme of Deaton (1997)

1	311	447.7	292.7	-1080.0	796.2
2	314	954.4	88.1	796.7	1108.0
3	316	1340.5	136.7	1110.0	1576.0
4	317	1807.8	138.3	1577.0	2045.6
5	316	2277.6	142.5	2048.8	2550.0
6	315	2877.7	199.6	2553.0	3241.5
7	313	3618.4	241.6	3243.9	4065.4
8	308	4718.3	382.9	4079.0	5443.3
9	306	6399.2	609.0	5448.6	7617.0
10	310	13925.1	12300.1	7633.1	155224.4
Total	3126	3837.9	5426.1	-1080.0	155224.4

Table A5.11 : Savings by weighted expenditure decile

Decile	Obs	mean	sd	max	min
1	314	4.8	27.4	200	0
2	316	10.9	59.6	500	0
3	316	18.8	93.8	1000	0
4	316	33.2	135.3	1000	0
5	315	24.5	105.5	1000	0
6	313	96.1	345.9	3000	0
7	312	87.3	318.5	2500	0
8	307	129.2	418.5	4000	0
9	310	296.3	781.9	6000	0
10	307	1237.9	4168.2	40000	0
Total	3126	194.1	1402.9	40000	0

Table A5.12: Weighted expenditure deciles

decile	N	mean	sd	p25	p50	p75	max	min
1	314	629.5	238.1	445.5	699.7	822.2	964.1	0.0
2	316	1216.4	139.3	1095.9	1224.0	1328.6	1455.3	964.2
3	316	1712.5	148.5	1582.5	1720.3	1840.2	1971.9	1455.7
4	316	2232.7	158.6	2095.0	2233.2	2372.8	2509.2	1972.3
5	315	2828.3	202.1	2652.4	2805.5	3021.1	3171.9	2510.9
6	313	3515.8	223.2	3307.4	3513.6	3697.8	3951.2	3172.2
7	312	4492.3	324.5	4203.6	4468.2	4762.7	5080.0	3953.5
8	307	5774.4	423.1	5417.6	5770.8	6146.1	6568.8	5080.1
9	310	7884.4	798.6	7221.2	7800.2	8501.0	9477.1	6569.0
10	307	19098.0	17522.0	11321.7	13957.8	18357.1	148760.6	9491.1
Total	3126	4941.5	7582.1	1720.3	3172.2	5774.1	148760.6	0.0

Tables A5.9-12 basically replicate the analysis of Deaton (1997), demonstrating some of the problems with income measures in household surveys. Russian data will be less problematic than (say) Ghanaian data because, as shown in the previous section, most households still rely on an employed person's wage for the majority of their income. One thing that is missing from the income calculation is the depreciation of assets. This is not surprising, as it is very difficult to work out to what extent households consume their fixed assets, such as houses, during a year. The above tables show that high-income households are not necessarily high savers, whilst high-consumption households are. This is a justification for using expenditure as a measure of household welfare rather than income.

Table A5.13: Unweighted inequality measures

All	GE(-1)	GE(0)	GE(1)	GE(2)	Gini

0.78284	0.45664	0.50631	1.13654	0.49933

Table A5.13 contains calculations of expenditure inequality. The familiar Gini coefficient is provided as are three 'general entropy' indices, GE(α).[26] The parameter α indicates the degree of sensitivity to inequality in different parts of the distribution. The lower is α, the higher is the sensitivity to inequality at the lower end of the distribution. When α=1 we have the Thiel index. The levels of inequality in Russia, and in several other parts of the former Soviet Union, have more than doubled since 1990 and a Gini coefficient of .49 is in line with other estimates. The advantage of using GE measures over the Gini is that they can be decomposed over groups.

Tables A5.14-18 are produced by 'ineqdeco' a STATA program written by Simon Jenkins.

Table A5.14 shows how the indicators vary across household size groups. Once hhnum>=8 the sample size is too small to make the statistics reliable. There appears to be no particular trend in these figures. The inequality measures are slightly lower because the aggregate inequality measure is also measuring the impact of different family size.

Table A5.14 Inequality indicators by household number subgroup

Hhnum	GE (-1)	GE (0)	GE (1)	GE (2)	Gini
1	0.53	0.36	0.39	0.73	0.45
2	0.57	0.36	0.40	0.71	0.45
3	0.57	0.41	0.51	1.27	0.48
4	0.55	0.34	0.39	0.80	0.44
5	0.51	0.30	0.33	0.57	0.41
6	0.42	0.28	0.27	0.35	0.39
7	0.42	0.37	0.46	0.83	0.46
8	1.23	0.82	0.88	1.48	0.65

Decomposing inequality rural-urban

As an example of decomposition of indices, the differences in inequality in urban and rural settlements were looked at. Of the sample, 65% live in urban areas, 27% in rural and 7% in PGTs, which are large villages or towns. There is higher expenditure in the urban areas but what about inequality between these groups?

Table A5.15 : Unweighted expenditure shares: urban-rural

SETT_TYP |	Pop. share	Mean	Rel.mean	expenditure share	log(mean)
Urban	0.65748	5154.434	1.04345	0.68605	8.54761
PGT	0.06675	6456.392	1.30702	0.08725	8.77283
Rural	0.27576	4060.868	0.82207	0.2267	8.30915

As can be seen in Table A5.16 there is not a great deal of difference in inequality for each of the two main groups. The PGT classification seems to have significantly higher inequality but there are few observations in this class.

[26] A reference for this section would be http://insight/econ/Econgrp/Amk01.pdf or the World Bank PovertyNet website

Table: A5.16: Inequality by settlement type

SETT_TYP	GE(-1)	GE(0)	GE(1)	GE(2)	Gini
Urban	0.75	0.45	0.51	1.14	0.50
PGT	1.25	0.58	0.61	1.28	0.55
Rural	0.72	0.41	0.42	0.89	0.47

Table A5.17decomposes the overall inequality indicators into within- and between-group figures. As can be seen, the vast majority of inequality is within-group. This suggests that rural or urban dwelling will not help 'explain' a household's position in, in this case, the expenditure distribution. These are calculated from unweighted observations but the weighted numbers are very similar.

Table A5.17: Decomposition of inequality: Urban rural

All obs	GE(-1)	GE(0)	GE(1)	GE(2)
Within group	0.77453	0.44845	0.49819	1.12841
Between group	0.00831	0.00819	0.00813	0.00813

Poverty in the RLMS

There are other problems with measuring inequality. For a start, we are not controlling for household size. In a world where everyone was perfectly equal, larger households would still consume more than smaller ones and the GE and Gini coefficients would be basically measuring inequality in household size. In the case of inequality measurement, working with consumption per capita will control for this.

Measuring poverty also faces this problem, but working with per capita consumption or income will not solve it. The per capita cost of reaching a certain level of household welfare falls as household size increases. This is because many goods consumed by the household are 'public'. To control for this requires some assumption about what these 'economies of size' are. There are also composition effects. A two-adult household will require more consumption than an adult-child household to reach the same level of welfare.

Poverty measurement faces an additional problem in this case because it is difficult to define what 'poverty' means in a country like Russia. Households do not receive all their goods and services through the market even now, and the levels of infrastructure that exist, in terms of both housing and health and education, continue to yield services even though the state or household sectors are not maintaining them. The RLMS itself uses nutritional definitions of poverty lines. Its poverty line calculates an individual's subsistence food basket and controls for prices, both the fof whch are calculated at both a regional and a national level.[27] The household poverty line makes an assumption about economies of size in income; two people are assumed to be able to achieve the same level of welfare as one person with 90% of the per capita income, three people with 82%, four people with 76% and so on. They provide measures of household poverty based on this definition. However they do not adjust for compositional effects.

Relative poverty

The RLMS nutritional definition looks at absolute poverty. Measures of relative poverty were examined to see if they shed any light on the characteristics of the poor in Russia. The weighted deciles of expenditure were calculated.. If we define the lowest quintile as 'poor' how does the incidence of poverty vary across household types?

[27] The methodology is described more fully in Popkin et al. (1991)

Table A5.18: Characteristics of the relative poor

Overall Poverty	20%
Female Headed household	22%
Retired male headed household	18%
Retired female headed household	19%
One child <6	23%
Two children<6	31%
One child<18	19%
Two children<18	26%
Average size of poor households	3.06
‘ ‘ ‘ ‘ Non-poor ‘ ‘	2.7

This is per capita expenditure, i.e. household expenditure divided by the number of persons in the household. The message here is that larger households are more likely to be in the bottom 20% and that elderly-headed households are less likely than average. This is assuming no economies of scale in consumption. This result reiterates that found by Lanjouw, Milanovic and Paternostro (1999) (LMP). There are very few families with more than two children in the sample but the results in RLMS9 also reflect LMP’s finding that the incidence of poverty is much higher for such groups. This correlation of poverty with family size and the low incidence of poverty amongst pensioners are found across the transition economies. To see what this implies for real poverty this needs to be unpacked into economies of *size* (i.e. that larger families can reach the same level of welfare as smaller families at lower *per capita* cost) and *equivalence scales* (i.e. that the costs of a given family reaching a certain level of welfare will also depend on its composition). The poverty measurement should therefore control both for household size and for the number of children and perhaps elderly people.

The key element in the economies of size is the costs of public goods like housing, which all members of the household consume relatively evenly. Since 1989 the costs of such goods have increased by a large factor. LMP show that an *increase* in the relative price of a quasi-public good such as housing will lead to an *increase* in the economies of size, i.e. the cost advantage of large households will *increase*. The key element in analysing equivalence effects, i.e. the relative consumption needs of one child as compared with one adult, is the relative prices of goods that are consumed mainly by children. The main one of these is education. Again, the costs of education have increased significantly in most of the transition countries. This will tend to act against large, child-intensive households and in favour of smaller child-free ones.

As has already been discussed, the RLMS imposes an economy of size adjustment but not an equivalence scale. A further avenue for research on the impact of AIDS will be to extend the equivalence scale concept to look at poverty in households where there are AIDS sufferers

Unfortunately time constraints on the overall study have prevented further analysis. It is hoped that the above has shown the degree of information that the RLMS can provide on households and their economic behaviour. To simulate the AIDS epidemic, AIDS cases can be assigned at random amongst individuals in each demographic category. For example, an epidemic with 10% prevalence will be much higher amongst 20-30-year-olds than among older cohorts. The affected households will then lose the associated income associated with that individual and the extra costs involved. The extra costs and the split in the burden of those costs between the state and the household is quite a substantial question in their own right, but initial results can be based on reasonable assumptions. The tables generated in this annex present the baseline situation; following the AIDS simulation, the same tables can be generated on the affected sample. The idea of equivalence scales for AIDS cases is, I believe, original and makes the link between AIDS and poverty very clearly.