Research and policy analysis

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International Labour Office
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SVETLANA MISIKHINA • VADIM POKROVSKY
NIKOLAI MASHKILLEYSON • DMITRI POMAZKIN

A model of social policy costs of HIV/AIDS in the Russian Federation

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S. Misikhina, V. Pokrovsky, N. Mashkilleyson, D. Pomazkin

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Acknowledgements

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Svetlana Misikhina, Project Coordinator	Social Protection and Labour Market Statistics Consultant, ILO Subregional Office for Eastern Europe and Central Asia, Leading Researcher, Institute of Economics of Russian Academy of Sciences
Vadim Pokrovsky	Russian Academy of Medical Science, Director, Russian Federal AIDS Centre
Nikolai Mashkilleyson	Senior Researcher, National Public Health Institute, Helsinki, Finland
Dmitri Pomazkin	Head of Department, NPF "REGIONFOND"

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[1] See "The Economic Consequences of the HIV in Russia" by Christof Rühl, Vadim Pokrovsky, and Viatcheslav Vinogradov, at http://www.worldbank.org.ru/ECA/Russia.nsf/ECADocByUnid/56435B1EA108E164C3256CD1003FBE54

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Executive summary

The ILO’s Subregional Office for Eastern Europe and Central Asia, based in Moscow, commissioned a research team to conduct a study initiated and funded by ILO/AIDS to assess the social and economic repercussions of HIV/AIDS in the Russian Federation. The model developed can be applied to other Commonwealth of Independent States (CIS) countries with similar social protection systems. As it is, the model may need revision after the pension reform currently under way in the Russian Federation and other countries.

In recent years, the Russian Federation has experienced an exceptionally steep rise in reported HIV transmission. The total number of reported HIV cases rose sharply between the end of 1998, when 11,000 cases were reported, and mid-2002, when over 200,000 cases were reported. Up to 90 per cent of the reported cases are attributed to injecting drug use (IDU). Although the number of persons reported as HIV-positive is small relative to many other countries, the growth rate of HIV transmission in the Russian Federation is now one of the world’s highest.

Taking into account discussions with a tripartite working group on HIV/AIDS, the research team developed a model to assess the impact of HIV/AIDS in the Russian Federation on:

- the general population and the economically active population
- the financial sustainability of the pension fund
- the costs of short-term disability benefits
- health-care expenditures for diagnosing and treating people living with
- HIV/AIDS
- productivity and, hence, on the national output (GDP)

The team developed estimates of probabilities of infection by age and sex on the basis of data for 2000–2002 from the Russian Federal AIDS Centre. The resulting distribution was adjusted for under-reported cases and the model to estimate the social and economic costs was based on the following observations and assumptions:

- the numbers of recognized HIV and AIDS cases by 2003
- the probabilities of being HIV-positive for men and women, by age
- the probability of death after onset of symptomatic AIDS in untreated cases
- the annual cost of antiretroviral therapy
- the costs of medical examinations at different stages of HIV/AIDS
- the average number of paid days in the case of short-term disability
- the reduction in the level of ability to work
- projected numbers of pensioners, persons on long-term disability benefits (the model allows for granting disability status after a person develops symptomatic AIDS), and numbers of orphans on survivor benefits

Three basic scenarios were drawn up to illustrate costs if the probability of being HIV-positive by sex and age were projected to remain constant, to rise, or to decline. A fourth scenario was based on the assumption that transmission would occur at older ages, reflecting a shift from transmission through injecting drug use to heterosexual transmission. A fifth scenario projected saturation of the high-risk group of injecting drug users, assumed to number 1 million, and looked at the consequences. A projection to 2050, which ignored HIV/AIDS, was compared with a projection taking into account the effects of HIV/AIDS, and the resulting model yielded the following findings:

- In the first four scenarios, the number of HIV cases is anticipated to peak at 640,000-700,000 between 2006 and 2008, whereas, in the saturation scenario, the number of cases would rise to nearly 1.2 million by 2008.
- The numbers of AIDS cases would then peak at 255-259,000 in 2011-2012 in the first four scenarios. In the fifth scenario, the number of AIDS cases would peak at 385,000 in 2010.
- In the first four scenarios, expected health-care costs would peak at 0.25- 0.26 per cent of GDP in 2010-2012, whereas, in the last scenario, the health-care costs would peak at 0.43 per cent of GDP in 2011.
- By 2050, the labour force is anticipated to shrink by 1.4-3.0 per cent in the first scenarios, but by 5.4 per cent in the last one.
- The numbers of pensioners would fall by 1.4-4 per cent by 2050.
- The affordable replacement rate for the pay-as-you-go pension system would similarly decrease by 1.4-4 per cent.
- By 2010-2015, the number of persons receiving disability pensions and survivor benefits is projected to be greater by over 4 per cent in the first four scenarios, and by 7-8 per cent in the fifth.
- The maximum growth in short-term disability benefit costs is projected to be about 7 per cent in 2005-2010 in the first four scenarios, but reaches 11-12 per cent in 2005-2015 in the fifth.

Although it is difficult to foresee the course of the HIV epidemic, given the numerous factors involved, it will be important to constantly track emerging trends and new factors that can affect the epidemic's development. These include changes in the risk-group structure, implementation of vigorous anti-epidemic measures, and the ease or difficulty of accessing treatment. The model can be updated accordingly and its applications will continue to be relevant. The results of such monitoring are already available to specialists in HIV/AIDS and to governments, trade unions, employer organizations, and nongovernmental organizations. In this way, the model can help create a consensus on the necessity to make appropriate decisions and course corrections. It can also serve to evaluate the effectiveness of prevention interventions, of broad-based campaigns designed to change youth behaviour, and advocacy for the use of condoms and for treatment. As the above-mentioned projections are not exhaustive, the model can be expanded with additional modules, as required.

HIV/AIDS in the Russian Federation: the official record at a glance

Table 1: Total number of registered cases of HIV infection, 1987-2002

Year	New Cases Registered by December 31	Cumulative Number of Cases from start of Registration	Notes
1987	23	23	
1988	47	70	
1989	268	338	Includes cases of nosocomial infection in the Republic of Kalmykia, Volgogradskaya and Rostovskaya Oblasts, and Stavropol Territory
1990	130	468	
1991	82	550	
1992	86	636	
1993	108	744	
1994	158	902	
1995	189	1,091	Includes the first recorded case in injecting drug users (IDUs)
1996	1,433	2,607	Transmission among IDUs becomes manifest; includes 18 cases of mother-to-child transmission since 1987
1997	3,858	6,382	Includes cases among IDUs in the Kaliningradskaya Oblast; 2,057 IDUs are registered as HIV-positive; 256 persons have died since 1987, 63 in 1997
1998	3,709	10,091	59.7% of cases recorded in persons under 30; 84 children have died since 1987
1999	19,851	30,896	Includes cases among IDUs in Moscow, Saint-Petersburg, and Irkutsk; 533 children infected since 1987,175 due to mother-to-child transmission;101 children have died since 1987
2000	59,281	90,177	More than 2,700 cases in penal institutions (90% are IDUs)
2001	88,494	178,671	67% of cases recorded in persons aged 17 to 25 years
2002	49,917	228,588	2,277 persons have died since 1987 (including 153 children)

Social policy consequences of HIV/AIDS in Russia: an analysis

Introduction

There are 38 million persons living with HIV/AIDS (PLWHA) worldwide, 95 per cent of them in developing countries. The epidemic has already had an adverse effect on the social and economic development of the most affected countries.

Although the absolute number of PLWHA in the Russian Federation is relatively low according to official data, the current rate of growth of newly diagnosed cases of HIV is among the highest in the world. By 1 January 2003, there were 228,588 officially registered cases in the Russian Federation, or 159 per 100,000 population, a 50-fold increase since 1996. In 2002 alone, 49,917 new cases of HIV infection were registered.

Injecting drug users (IDUs) account for the majority of HIV-positive persons. Drug abuse itself has acquired epidemic proportions, which is confirmed among other indicators by the large number and high growth rate of hepatitis B and C infections in younger persons, including adolescents aged 11 to 14 years.

The Human Immunodeficiency Virus (HIV-1) is transmitted extremely quickly in the IDU community. As a result, according to several authoritative sources, the actual level of HIV in the country is likely to be 2.5 to 4 times higher than the level indicated by official case registration[2]. HIV is being transmitted most rapidly in Moscow Oblast, the City of Moscow, Irkutskaya Oblast, Saint-Petersburg, Orenburgskaya, Samarskaya, and Sverdlovskaya Oblasts, Krasnodarsky Territory, and the Khanty-Mansiisk Autonomous District.

The proportion of sexually transmitted HIV cases has increased in recent years, which may indicate a new phase in the epidemic's development. Although the probability of transmission associated with sexual intercourse remains considerably lower than that of parenteral transmission (transmitted by injection into the bloodstream), this development is a cause for concern, because the infectivity of new cases within the first few weeks is particularly high, and three quarters of cases are young persons aged between 15 and 29 years who comprise a highly sexually active group in the population.

The risk of HIV transmission multiplies dramatically in the case of concomitant sexually transmitted infections (STIs) that act as co-factors, and Russia has experienced persisting epidemics of STIs for the last 10 years. Besides being risk factors for HIV transmission, certain STIs lead to infertility, which can adversely affect the demographic situation of the country as well as public health care budgets, because of increasing costs of treating infertility and other complications of STIs.

Prevention of HIV transmission is made difficult by the lack of institutional mechanisms to tackle this complex issue and the absence of effective methods to monitor the country's epidemiological situation with regard to HIV infection and transmission risk factors.

In order to assess the socio-economic consequences of the epidemic in Russia, a computer model was developed. The model allows forecasting of the number of PLWHA, the cost of their medical examinations and treatment for the public health care sector, and the cost of paying short-term disability benefits. The model similarly permits analysis of the impact of HIV transmission on the size of the working population, on retired persons receiving a pension, and on the financial stability of the Pension Fund. The model stratifies the population into three sex and age groups: the uninfected population, HIV-positive persons, and AIDS patients. The population projection itself is demographically conservative.

[2] See, for instance, "The Economic Consequences of the HIV in Russia" by Christof Rühl, Vadim Pokrovsky, and Viatcheslav Vinogradov, at http://www.worldbank.org.ru/ECA/Russia.nsf/ECADocByUnid/56435B1EA108E164C3256CD1003FBE54

Modelling results depend on both the methodology and the assumptions built into the long-term demographic, macroeconomic, and epidemiological projections. The work reported here combines all three types of projections, which are treated as exogenous and not interrelated, as it is difficult to establish relevant correlations among them[3]. In order to check the adequacy and non-contradictory nature of the exogenous projections and the final results based on them, so-called inverse sums were solved in the course of developing the projections. One such problem is assessment of the probability of growth in HIV transmission for a given total of HIV-infected persons.

In the framework of this project an attempt was made to develop transmission probability profiles for HIV/AIDS and to employ a partial equilibrium model to assess the impact of the HIV/AIDS epidemic on:

- the population and the economically active population;
- the financial sustainability of the Pension Fund[4] ;
- costs associated with payment of short-term disability benefits;
- health care expenditures for diagnosis and treatment of persons living with HIV/AIDS;
- changes in the composition of the economically active population and employment, and consequently on the Gross Domestic Product (GDP).

The approach was determined by the objectives of the project to assess the impact of the HIV epidemic on some of the basic elements of the social protection system (pensions, sickness benefits, medical care) and the important socio-economic indicators (population, the economically active population, numbers of retired persons receiving a pension, Pension Fund revenues, affordable replacement rates and so on).

Further technical information

The partial equilibrium model used to estimate social policy costs of HIV/AIDS in the Russian Federation is described in Appendix 1. Interested readers may also wish to contact the authors for copies of the program they developed in VBA for Excel in order to analyse the long-term social policy consequences of the HIV epidemic. Also available from the authors are:

- tabulations of the basic data
- tabulations of the results of calculations of the transmission probability functions
- tabulations and illustrations of the distribution of the age and sex prevalence of AIDS patients
- assumptions underlying the demographic projections entered into the program
- base infection probabilities according to the data of the Russian Federal AIDS Centre
- transmission probability diagrams for 2000-2002 and initial distributions of HIV and AIDS cases for men and women

Interested readers are invited to write to:
iloaids@ilo.org

Partial equilibrium models are often used for detailed modelling of the pension system to take into account the specific features of different groups of contributors, persons receiving pensions and other parameters of the pension system. This project uses a partial equilibrium framework for assessing the impact of HIV/AIDS on the pension system, and the short-term disability benefits system. The reader is referred to the box for further technical information.

Partial equilibrium models have been used in the case of the Spanish pensions system. The model, called MODPENS-Spain, has also been adapted to the Portuguese context[5]. The model is based on disaggregated data

[3] To perform such a task a whole range of statistical data for a prolonged time period is required, and this information does not exist.

[4] The number of contributors to the Pension Fund and the main groups of pensioners (old age pensioners, disability pensioners, and survivor pensioners) were calculated for two cases: in the first case the impact of the HIV epidemic was taken into consideration, in the second it was not. The flow of contributions to the Fund was also calculated.

[5] José A. Herce. Modelling the Pension System. FEDEA and Universidad Complutense of Madrid. September 2002. http://www.ucm.es/info/icae/seminario/seminario0203/5nov.pdf

on workers or retirees by sex and age. Demographic and macroeconomic scenarios considered by the model are exogenous.

The pension model CESinfo was developed in Germany, and is also a partial equilibrium model. The impact of different factors on the financial sustainability of the pension system was assessed on the basis of this model[6].

Data and methods of analysis

1. Basic data for calculating the number of persons living with HIV/AIDS

To estimate the number of new cases of HIV infection and AIDS, the 'Stock' method was used, whereby a percentage of HIV-positive persons would be determined within the total population for the year. A transmission probability function was constructed for this purpose using statistical data; the function represents the rate of new cases of HIV infection in each separate age and sex group per total number of persons in the index group.

The Russian Federal AIDS Centre provided the data on numbers of newly-diagnosed cases of HIV infection by sex and age group as of 1996. Assuming that data for the last three years, 2000 through 2002, are the more reliable, these were the years selected for constructing the basic infection probabilities functions. Diagrams of this function are given in Figures 1 and 2, for men and women respectively. It will be noted that the infection probabilities vary significantly from year to year, particularly in the risk groups. The slowing saturation rate for risk groups is one possible explanation for this. For example, the age of men living with HIV reached a peak at 22 years and a total of 422 cases per 100,000 population in 2000, whereas it peaked at 23 years and 555 cases per 100,000 in 2001. In 2002 the maximum number of cases was observed at the same age, but cases fell to 249 per 100,000. Similar trends were observed for HIV-infected women. The significant and steady growth rate of HIV infection among newborns is particularly alarming (see origins in Figures 1 and 2). On the basis of these observations, the model was designed to allow for selecting transmission probability functions for five-year or single-year age groups for any of the three years 2000, 2001 and 2002 with subsequent changes both in amplitude and by age. A function constructed on the basis of the data for single-year age groups in 2002 was selected to perform the calculations that generated the tables presented in Appendix 2. Smoothing of data was not carried out because the initial function has no explicit inflexions.

To calculate the HIV prevalence for the base year, the number of HIV cases was calculated for each sex and age groups and adjusted to take into account both mortality and the age shift between 1996 and 2002. (see Figure 3). In this way, the distribution of HIV cases generated identifies the prevalence of HIV infection in each age group at the end of 2002. The distribution of cases by age and sex was estimated on the basis of the aggregate number of cases and the proportion of men and women who were HIV-positive. Assuming that this distribution is stable, subsequent assumptions regarding the number of HIV cases adjusted for undiagnosed and unregistered infections were made on the basis of the resulting distribution. The number of AIDS cases by 1 January, 2003 was 209.

Figure 1. Transmission probabilities for men according to age, 2000, 2001 and 2002

[6]Robert Fenge, Silke Übelmesser, Martin Werding. Old-Age Provision in Ageing Societies: Equity, Efficiency, and Sustainability. Working Paper. http://www.lrz-muenchen.de/~ces/l01_silke_06.htm#Punkt2; Hans-Werner Sinn and Silke Übelmesser. When will the Germans Get Trapped in their Pension System? August 2001. http://www.cepii.fr/anglaisgraph/communications/pdf/2001/enepri07080901/ubelmesser.pdf.

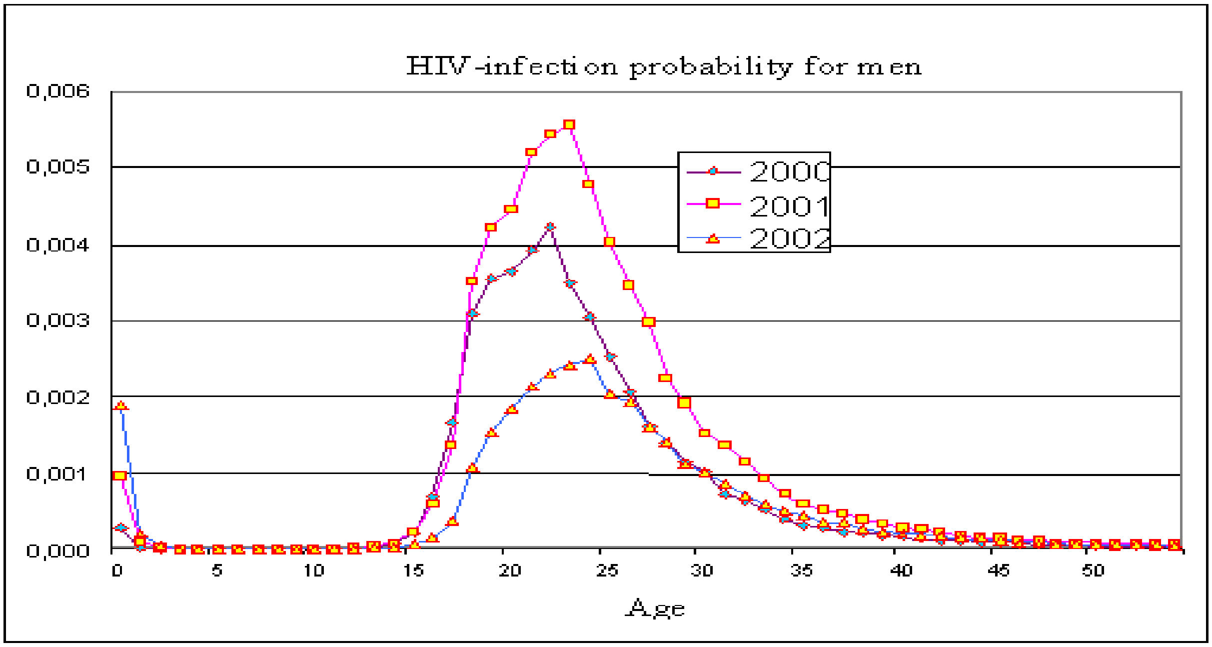


Figure 2. Transmission probabilities for women according to age, 2000, 2001 and 2002

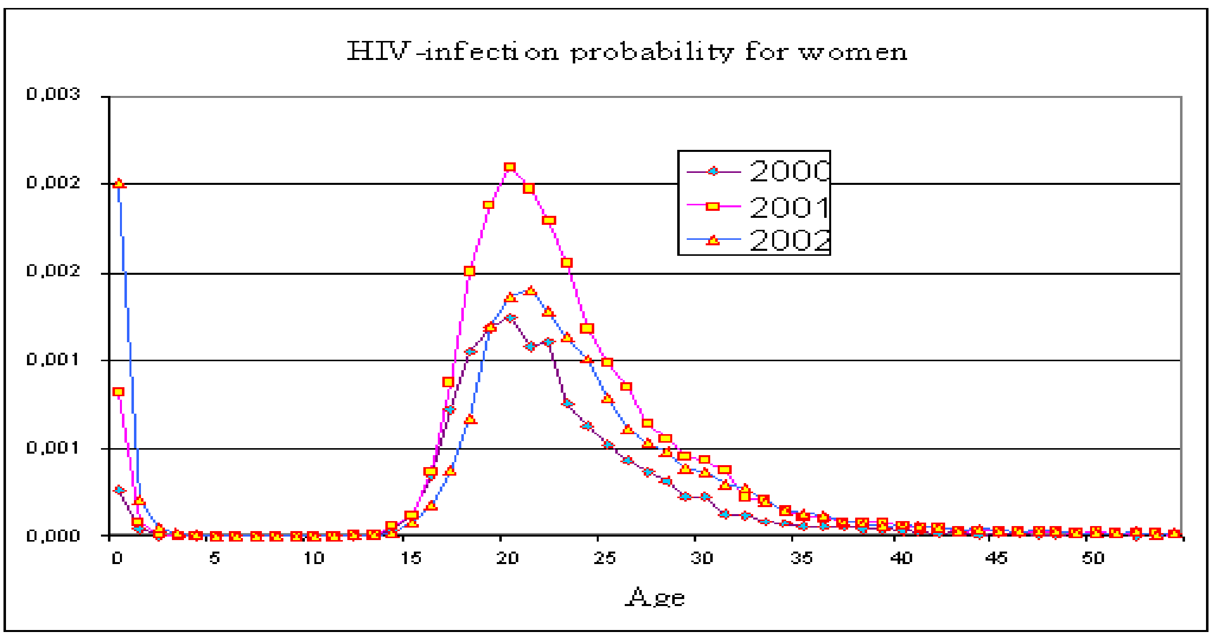
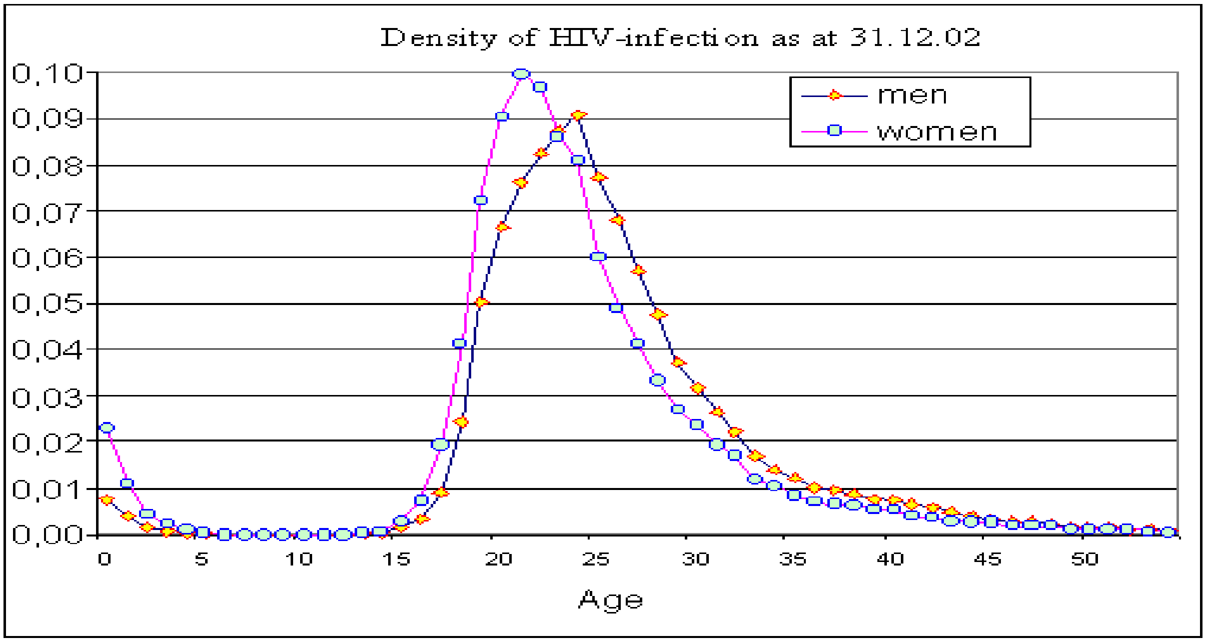


Figure 3. HIV prevalence by age (at December 31, 2002)



To assess the level of unregistered infections, the number of new cases of HIV infection in the population was compared to that in pregnant women. On the basis of this comparison, the number of unregistered infections for age groups under 40 years may reach four times the officially registered number of cases in 2002 (see Table 2). Based on this comparison, the number of HIV cases at the beginning of 2002 was estimated to be 500,000, which is approximately three times greater than the number of officially registered cases.

The death rate for persons who are HIV-positive was assumed equal to that of the uninfected population. The probability of death after onset of symptomatic AIDS in untreated cases was estimated at 0.5, assuming that life expectancy after onset of AIDS is 1 year. With treatment, however, the possibility of reversal of AIDS symptoms to a status of clinically asymptomatic HIV infection is introduced. The model takes into account the AIDS treatment costs and the probability of death is reduced to 0.15 when the treatment costs are at their maximum (the maximum annual cost of treatment of AIDS was assumed to be RR 150,000 per person). At maximum costs, life expectancy after developing the disease is about five years. At a lower level of costs, a linear dependence between treatment costs and probability of death was assumed. The model does not adjust this parameter for the patient’s age. It is assumed that the transition from the early HIV stage to the AIDS stage occurs after period of time 't', which currently is taken to equal 10 years. To even out the transition from one stage to the other, the model assumes that the probability of transition from HIV infection to AIDS is distributed according to the normal distribution with a 10-year average and a 2-year standard deviation. These values are the result of theoretical expectations and need to be confirmed with statistical data.

Table 2. Estimates of unregistered cases

	2000	2001	2002
Population at 31 December			
Male	67,779,645	67,287,019	66,893,193
Female	77,039,454	76,667,372	76,392,372
Total	144,819,099	143,954,391	143,285,565
Population aged 0-39 years			
Male	41,494,723	40,754,095	40,093,177
Female	40,375,450	39,660,376	39,033,679
Total	81,870,173	80,414,471	79,126,856
Population aged 0-49 years			
Male	52,848,602	52,208,234	51,615,002
Female	52,618,085	52,064,604	51,525,854
Total	105,466,687	104,272,838	103,140,856
Number of live births			
Male	649,608	673,515	695,441
Female	612,756	636,326	636,326
Total	1,262,364	1,309,841	1 331,767
HIV infection in pregnant women			
Number of HIV-positive pregnant women	751	2,430	3,351
Probability of transmission	0.0006	0.0019	0.0025
Incidence (per 100,000 pregnant women)	59	186	252
Number of HIV-positive cases for the population			
New infections	59,281	88,494	49,917
All cases of HIV infection	90,177	178,671	228,588
Incidence (per 100,000 population)	41	61	35
Incidence in population aged 0-39 years (per 100,000)	72	110	63
Ratio of incidence in pregnant women to incidence in population aged 0-39 years	0,8	1,7	4.0
Incidence in persons aged 0-49 years (per 100,000)	56	85	48
Ratio of incidence in pregnant women to incidence in population aged 0-49 years	1.1	2.2	5.2
Proportion of all HIV-positive cases in the population (%)	0.062	0.124	0.160

The rate of inflation, productivity and wage growth rates are based on the projections of the Ministry of Economic Development and Trade of the Russian Federation.

2. Determining medical care costs for people living with HIV/AIDS

As a rule, persons who are diagnosed to be HIV-positive and AIDS patients are examined and treated as out-patients. Hospital admission is indicated only in case of grave complications or comprehensive treatment. According to directives, HIV-positive persons are entitled to a regular comprehensive full medical examination that includes, among many things, quantification of the viral burden and cell-mediated immunity. A single medical examination costs approximately US$ 200-250. In reality, however, the majority of persons who are HIV-positive and AIDS patients do not receive a full medical examination because of its high cost. Possibly, with time and with development of the resource base, the medical examination cost will be reduced by half.

If performed in compliance with the existing directives, medical examination of an HIV-infected patient would have to take place at least twice a year during the first four years following infection, and at today's prices, the cost would amount to US$ 200 (250) x 2 = 400 (500) per patient per year. Starting with the fifth or sixth year after infection, patients should be examined at least four times a year, so the cost would amount to US$ 800-1000 per person per year. In practice, the costs of the current medical examination are considerably lower and amount to approximately US$ 20 per person per year.

There are only two domestic antiretroviral medications used for the treatment of HIV. As the standard therapy is a combination of three drugs, the inexpensive domestic drugs have to be combined with expensive imported antiretroviral drugs. The cost of treatment depends on the combination of drugs rather than the use or non-use of domestic preparations. In its least expensive form, the monthly combination costs around US$ 350-400 per person, while the most expensive one costs US$ 1,000 per month. It is possible that in the near future the cost of treatment will be reduced by 30 to 50 per cent because drug manufacturers may lower their prices, the preparations may start to be made in third countries, or Russia may enlarge its own production of antiretroviral drugs. Costs also depend on the timing of the beginning of treatment, i.e. on the treatment inception criteria applied. International experience shows that treatment starts, on average, seven years after infection.

If an opportunistic infection develops (opportunistic infections are observed after prolonged periods of carrying the virus, usually about eight or more years after infection), treatment costs may rise (or, rather, require being increased in certain cases) by another US$ 10,000 per patient per year. However, this level of cost is and will continue to be rare and exceptional. In case of hospitalization or the onset of grave (frequently terminal) conditions, treatment costs will increase further (US$ 40,000-50,000 per person per year).

Currently, there are about 4,000 citizens of the Russian Federation who require antiretroviral therapy (given the expanded indications for treatment).

The physical ability of HIV-positive people to work (leaving aside the fact that the majority of them are drug users) does not initially differ from that of the uninfected population in the same age and sex groups. It will be noted, however, that the ability to work may be affected by stress, depression, and other conditions resulting from the psychological reaction and adjustment to the knowledge that one has become HIV-positive. Disability associated with the initial psychological reaction to diagnosis can persist for two to three weeks. Competent counselling usually succeeds in mitigating the destructive consequences of the mental impact and the disabilities associated with it. Aside from this problem, if all required medical measures were taken in accordance with the existing directives, persons who are HIV-positive would be absent from work for two days a year in connection with the general medical examination (see earlier). As already mentioned, however, the directives are not followed and the medical examinations are not carried out in a number of cases. In theory, it could be expected that about 5 to 6 years after infection the short-term disability of persons with HIV (including those who receive treatment) would amount to 30 days a year. If no treatment is administered, complete disability can be expected after 7 to 10 years from the time of infection.

Estimates by WHO dating back to the early 1990s showed that Russia would have required a single investment of approximately US$ 90 million with subsequent annual investments of US$ 9-10 million to successfully counter the HIV epidemic. Such investments would have reduced HIV incidence by 50 to 70 per cent and provided for comprehensive antiretroviral therapy for AIDS patients. This, in turn, would have significantly reduced infectivity and thus would have further contributed to the prevention of HIV infection. International experience shows that the success or absence of preventive measures largely depends on the well-being of the society and its ability and readiness to allocate adequate resources (human and financial).

According to our projections, medical examination and treatment costs for HIV and AIDS patients will reach their highest value between 2008 and 2015, depending on the scenario. This is mostly due to the dramatic increase in the number of AIDS patients from the group of initial HIV-positive people, as well as the high incidence of new infections during the first years of the projection. Subsequently, the level of costs will drop considerably, not only because of the decreasing number of HIV and AIDS patients, but also because of the reduction in the relative cost of treatment. The model provides for indexing these costs in accordance with growing prices, while the average wage growth rate for the whole projection equals 6.5 per cent a year, which reduces the relative treatment costs. According to the most unfavourable scenario, health sector expenditures will reach their maximum value of 0.43 per cent of GDP by 2011 and fall considerably thereafter towards 2050.

3. Assessing the impact of the HIV epidemic on the Pension Fund

To assess the impact of the HIV epidemic on the financial stability of the Pension Fund, the number of contributors to the Fund and the main groups of pensioners - old age pensioners, disability pensioners, and survivor pensioners - were estimated with and without the HIV/AIDS epidemic. The dependency ratio for the pension system and the affordable replacement rate for the pay-as-you-go pension system were calculated in each case. The flow of contributions to the Fund was also calculated. The results were put into both tabular and graphical format. When the mean age of persons who are HIV-positive does not change, the annual number of newly infected people is reduced in proportion to the fall in the number of people in those age groups. In the long term this leads to a reduction in the total number of HIV-positive people. The aggregate number of pensioners in the presence of HIV/AIDS initially increases due to the larger number of disability pensioners (the model allows for granting a person disability status after she or he develops AIDS) and survivor pensioners, and then this number begins shrinking around 2025 because of higher than usual mortality in the preceding ages. An important point is that in the scenarios reviewed the affordable replacement rate changed insignificantly whereas the numbers of people in groups fluctuated noticeably, which speaks to the stability of the affordable replacement rate. The method used for calculating numbers of groups of pensioners and the affordable replacement rate is described in Appendix 1.

4. Calculating the growth of costs associated with payments for short-term disability

Calculating the costs associated with the payment of short-term disability benefits was based on the assumed number of HIV-positive persons, the average number of paid days in the case of short term disability, and an assumption that the level of ability to work when at the HIV stage is reduced on average by 20 per cent. The model assumes that a benefit will be paid during the time of temporary disability which is on the level of average wages. These costs were compared to the costs associated with paying short term disability benefits to the non-HIV-positive population. Results show that in the presence of the HIV/AIDS epidemic, aggregate expenditures associated with the payment of short term disability benefits increase by 5 to 10 per cent, depending on the scenario.

5. The scenarios

The modelling generated several scenarios for the epidemic, depending on the assumptions regarding the probability of transmission over time, and changes in the pattern of infection:

1. The first scenario assumes that the transmission probability remains constant throughout the period studied.

2. In the second scenario, the transmission probability grows non-linearly by 50 per cent towards the end of the period.

3. In the third scenario, the transmission probability decreases by 50 per cent over the period.

4. In the fourth scenario, the transmission probability does not change, but there is a shift towards infection occurring at a later age. This scenario models the rise in the mean age at onset of infection that is largely connected with a shift from transmission through injecting drug use to sexual transmission.

5. In the fifth scenario, it is assumed that new cases of infection in the risk group are added to the existing cases. This scenario assumes that 30 per cent of the risk group will become HIV-positive annually, and this will continue until virtually the whole risk group is HIV-positive (in our calculations the saturation time for the risk group was limited to eight years, in the course of which per cent of the risk group became HIV-positive). The risk group was assumed to comprise 1 million persons.

In all of the scenarios, the probability of transmission for the base year corresponded to the value of the transmission probability function in 2002, and the number of HIV cases at the beginning of 2002 was assumed to be 500,000. The ratio of men to women in HIV cases was assumed to be 3 to 1. The annual amount of AIDS treatment costs was assumed to be RR 150,000.

Scenario 1: Constant probability of transmission

In this scenario, the probability of transmission does not change and remains constant at the level reached in the base year, 2002.

The number of HIV cases reaches a peak of 685,000 in 2007 and the peak number of AIDS patients, 257,000 people, would occur in 2012. Health care costs[7] peak at 0.26 per cent of GDP in 2012.

The size of the employed labour force is lower by 0.1 per cent in 2005, 0.5 per cent in 2010 and 2.3 per cent in 2050 than in the absence of HIV/AIDS

The number of old-age pensioners is lower than in the absence of HI/AIDS beginning in 2010-2015 and reaches its lowest level in 2050, when it is lower by 1.9%.

The number of disability pensioners and survivors eligible for pensions grow in comparison to projections without HIV/AIDS until 2010-2015 when they are greater by 4 - 4.5 per cent. Beyond this time, the differences decrease, but a gap is still seen in 2050.

The affordable replacement rate in the pension system decreases by 1.7 per cent compared to projections in the absence of HIV/AIDS.

The maximum growth of the short-term disability benefit costs above those in the absence of HIV/AIDS amounts to 6-7 per cent and is reached in 2005-2010.

[7] “Health care costs” include medical examination costs for persons diagnosed with HIV and treatment costs for persons living with AIDS.

Scenario 2: Increasing probability of transmission

In this scenario, the probability of transmission increases by 50 per cent throughout the projection period. The scenario is developed with the assumption that the probability of transmission taken for the base year has not yet peaked and will rise in subsequent years (taking into account the unrecorded cases of HIV infection).

The number of HIV cases reaches a peak of 699,000 in 2008 and the peak number of AIDS patients, 259,000 people, would be reached in 2012. Health care costs peak at 0.26 per cent of GDP in 2011.

The size of the employed labour force is lower by 0.1 per cent in 2005, 0.5 per cent in 2010 and 3.0 per cent in 2050 than in the absence of HIV/AIDS

The number of old-age pensioners is lower than in the absence of HIV/AIDS beginning in 2010-2015 and reaches its lowest level in 2050 when it is 2.2 per cent lower.

The trends in numbers of disability pensioners and survivors eligible for pensions are similar to those in the first scenario, but the gap in 2050 between Scenario 2 projections with and without HIV/AIDS is greater than in the first scenario.

The affordable replacement rate is reduced by 2 per cent compared to projections without HIV/AIDS.

The maximum increase in the short-term disability benefit costs above those in the scenario without HIV/AIDS reaches 7-8 per cent and holds from 2005 to 2010.

Scenario 3: Decreasing probability of transmission

In this scenario, the probability of transmission decreases by 50 per cent throughout the projection period. The scenario is based on the assumption that the probability of transmission for the base year will decrease in subsequent years, and the high initial numbers of HIV cases are largely explained by the process associated with saturation of the risk group.

The number of HIV cases reaches a peak of 636,000 in 2006; the peak of AIDS patients, 255,000 people, is reached in 2011. Health care costs peak at 0.25 per cent of GDP in 2010-2011.

The size of the employed labour force is lower by 0.1 per cent in 2005, 0.5 per cent in 2010 and 1.4 per cent in 2050 than in the absence of HIV/AIDS.

The increase in old-age pensioners is lower than in the absence of HIV/AIDS beginning in 2010-2015 and reaches its lowest level in 2050 when it is 1.4 per cent lower.

The trends in numbers of disability pensioners and survivors eligible for pensions are similar to those in Scenario 2, but the number of disability pensioners to 2050 is 0.3 per cent lower than in the absence of HIV/AIDS, and the number of survivors eligible for pensions is the same as in the absence of HIV/AIDS.

The affordable replacement rate is reduced by 1.4 per cent compared to the projections in the absence of HIV/AIDS.

The growth in the short-term disability benefit costs above the projections without HIV/AIDS reaches a maximum of 5-7 per cent, in 2005-2010.

Scenario 4: A shift in the probability of transmission

In this scenario, the probability of transmission has a similar pattern as in the base year, 2002. Nevertheless, it is assumed that the mean age at becoming HIV-positive increases. This assumption models a shift in the profile of acquiring an HIV infection along the age axis. There is no increase in HIV cases. The idea of this scenario is to model the shift from transmission from injecting drug use (IDU-type) to sexual transmission.

The size of the employed labour force is lower by 0.1 per cent in 2005, 0.5 per cent in 2010 and 1.8 per cent in 2050 than in the absence of HIV/AIDS.

The trend in numbers of pensioners is similar to previous scenarios.

Scenario 5: Complete risk group saturation

This scenario assumes that the risk group of IDUs will become completely HIV-positive within the next few years. The group size is assumed to comprise 1 million persons; starting with the estimated 500,000 HIV cases at the beginning of 2002, this would imply there are an extra half million persons living with HIV.

The infection rate for this group is determined by the assumption that 30 per cent of the group acquires HIV each year. Consequently, the number of the infected *NI(t)* for each year can be determined using the following formula:

$$NI(t) = NR * (1-0.3)^{t} * 0.3,$$

where *NR* is the initial population of the risk group.

As can be seen in Table 2, this kind of saturation rate would result in 80 per cent of the group acquiring HIV within the first five years, and after 10 years the risk group would reach virtual saturation. The mortality of the risk group is not taken into account in Table 2.

Table 2. Saturation of the risk group.

Year	Number of newly infected HIV cases in the risk group	Total number of HIV cases in the risk group	Percentage of HIV cases in the risk group
2003	150,000	150,000	30%
2004	105,000	255,000	51%
2005	73,500	328,500	66%
2006	51,450	379,950	76%
2007	36,015	415,965	83%
2008	25,211	441,176	88%
2009	17,647	458,823	92%
2010	12,353	471,176	94%
2011	8,647	479,823	96%
2012	6,053	485,876	97%

The total number of HIV cases taking into account both the risk group and other groups would peak in 2008 at 1,169,000 persons. The peak number of AIDS patients (385,000 people) is reached in 2010. Health care costs peak at 0.43 per cent of GDP in 2011.

The size of the employed labour force is lower by 0.2 per cent in 2005, 0.9 per cent in 2010 and 5.4 per cent in 2050 than in the absence of HIV/AIDS.

The number of old-age pensioners is lower than in the projections without HIV/AIDS beginning in 2010-2015 and reaches its lowest level in 2050 when it is 4.2 per cent less than in the absence of HIV/AIDS.

The number of disability pensioners and survivors eligible for pensions increases in comparison to the projections without HIV/AIDS to a peak in 2010-2015 when it is greater by 7-8 per cent, and decreases thereafter.

The affordable replacement rate is lower by 4 per cent compared to the projections without HIV/AIDS.

The increase in short-term disability benefit costs above those in the absence of HIV/AIDS reaches a maximum of 11-12 per cent in 2005-2015.

This scenario results in the highest number of HIV cases of all the scenarios proposed and consequently this scenario portrays the possible consequences of the HIV/AIDS epidemic at their worst. This model takes account of the probability that the years following the saturation of the risk group will see an increasing probability of transmission in other groups. This would lead to the second wave of the epidemic, although there is the assumption that the new wave's amplitude would be lower. Although the scenario is theoretical and is dependent on the assumptions used, it is presented as an illustrative example. Moreover, this scenario preserves the qualitative picture of the epidemic's evolution.

Conclusions

The epidemiological situation with regard to HIV infection is as volatile as any other epidemic process. Factors that both exacerbate and mitigate the process are changeable, and it is difficult to foresee and assess the impact of this or that factor on the epidemic's dynamics. In this connection, constant monitoring of the situation over an adequately long period of time with a view to introducing corrections into the model is extremely important. Keeping track of constantly emerging factors that affect the epidemic's development (e.g. changes in the risk group structure, implementation of vigorous anti-epidemic measures, facilitation or obstruction of access to treatment, etc.) can help maximize the model's applicability.

The results of such monitoring should be available not only to specialists in the field, but also to the government, trade unions and employers' organizations, and NGOs, among others, with a view to reaching consensus on the need to take appropriate decisions and to evaluating effectiveness of alternative preventive interventions. These might include mass behaviour change campaigns designed to promote safer behaviour patterns among the young, promotion of condom use, awareness-raising with regard to the need for treatment, and so on.

This modelling analysed the impact of a growing HIV/AIDS epidemic over a long time period (up to 2050). According to various scenarios, and compared to projections without HIV/AIDS, the epidemic could result in the following:

- an estimated reduction of GDP on the order of 2-5 per cent,
- a population decline of approximately the same order of magnitude,
- an increase in costs associated with paying short-term disability benefits amounting to 5-7 per cent,
- Pension Fund revenues reduced by 2-6 per cent, and
- the affordable replacement rate reduced by up to 2 per cent.

To determine the number of new cases of HIV infection, this model used the 'Stock' method. Although this method allows a concordant change in the probability of transmission when changing the peak value of the number of instances of acquired infections, it is deemed interesting to build further models for the purposes of both monitoring the results attained and identifying the crucially important parameters of the epidemic. Such models include, for example, diffusion equation models that allow modelling transitions associated with the saturation of the IDU risk group and the subsequent development of the epidemic through other forms of transmission. Beyond this, models of this type can be used to investigate other emerging infections such as, for example, the atypical pneumonia, SARS.

The model's basic data should be periodically updated for the purpose of both monitoring the results of short-term projections and developing the model's methodology to improve longer-term forecasting. Consequently, it will be necessary to track the dynamics of the transmission probability function systematically, correct the health care cost figures that may change (should progress be made in this area), better specify indicators of the economic situation, and so on. The model can be expanded by adding supplementary modules.

As social protection systems in the CIS states are similar, the model can be applied to other countries of the subregion with some adjustments. In addition, modelling the impact of HIV/AIDS on pensions, short term disability benefits, and so on can be carried out at the regional level of the Russian Federation.

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Appendix 1. Description of the mathematical model

This Appendix reviews the methods applied in the mathematical model. It contains the main equations and their different analogues in the software code, and discusses approaches to modelling of the transmission probability profile on the basis of a logistic equation.

1. A demographic projection model for a situation characterized by a rising HIV epidemic

The demographic projection model for a situation characterized by a rising HIV epidemic is built based on the equations that are traditionally used for demographic projections. The particular feature of this model is the additional distribution of the population into three groups: uninfected population, HIV cases, and AIDS patients. In order to describe the dynamics of these three groups of population, it is necessary to describe the conditions of one-sided consecutive transition between the groups and determine the corresponding functions and coefficients.

For each sex this dynamic system can be described with three equations:

$$\frac{\partial P(a,s,t)}{\partial t} + \frac{\partial P(a,s,t)}{\partial a} = -(\mu_p(a,s,t) + \lambda_v(a,s,t)) * P(a,s,t) + Migr(a,s,t)$$

$$\frac{\partial PV(a,s,t)}{\partial t} + \frac{\partial PV(a,s,t)}{\partial a} = -(\mu_v(a,s,t) + \lambda_a(t)) * PV(a,s,t) + P(a,s,t) * \lambda_v(a,s,t) \quad (1)$$

$$\frac{\partial PA(a,s,t)}{\partial t} + \frac{\partial PA(a,s,t)}{\partial a} = -\mu_a * PA(a,s,t) + PV(a,s,t) * \lambda_a(t)$$

Where:

a	-	age
s	-	sex
t	-	time
P(a,s,t)	-	uninfected population
Migr(a,s,t)	-	net migration
μ_p (a,t)	-	probability of death in the uninfected population
λ_η)τ,σ,α(	-	probability of transmission
PH(a,s,t)	-	HIV-positive population
μ_h (a,t)	-	probability of death in the HIV-positive population
λ_a (a,s,t)	-	probability of transition to AIDS
PA(a,s,t)	-	number of AIDS patients
μ_a (a,t)	-	probability of death of AIDS patients

The number of newborns is determined by the birth rate that is a function of mother's age and of time:

$$P(0,s,t) = \int_{a1}^{a2} fert(a,t) * P(a, females, t) da,$$

where a1 and a2 are the boundaries of the age interval for child bearing;
fert is the fertility function;
The type of probability functions used for describing inter-group transitions will be given below.

The difference analogue of the System (1) looks as follows:

$$P(a+1,s,t+1) = P(a,s,t)*(1-\mu_p(a,s,t)-\lambda_v(a,s,t)) + Migr(a,s,t)$$

$$PV(a+1,s,t+1) = PV(a,s,t)*(1-\mu_v(a,s,t)-\lambda_a(t)) + \lambda_v(a,s,t)*P(a,s,t) \quad (2)$$

$$PA(a+1,s,t+1) = PA(a,s,t)*(1-\mu_a) + \lambda_a(t)*PV(a,s,t)$$

The number of newborn boys and girls is calculated using the following formulas:

$$P(0,males,t) = 0.515*\sum_{a=15}^{a\max} f(a,t)*P(a,females,t)$$

$$P(0,females,t) = 0.485*\sum_{a=15}^{a\max} f(a,t)*P(a,females,t),$$

of the coefficients 0.515 and 0.485 having been selected on the basis of the sex ratio at birth.

2. Description of the transmission probability profile

The transmission probability profile is the key element of this model. In order to determine change in this profile with time, a logistic equation which allows describing the transition process by setting the transition speed and the limiting value of the variable is used. This equation has the following form:

$$\frac{dN}{dt} = a*N - b*N^2,$$

The solution of this equation looks as follows:

$$N(t) = N_0 * \frac{a}{\exp(-a*t)*(a-b*N_0)+b*N_0} \quad (3)$$

Thus, the transition process from the initial value to the limiting value is described using Equation (3). Coefficients α and β are interpreted in the following manner.

Coefficient α regulates the speed of the transition process, β - the limiting value. With the α equal to one, the ratio for a unit time interval is:

$$\frac{N(1)}{N_0} = \frac{\exp}{1+\frac{N_0}{N_{\max}}*(\exp-1)},$$

The limiting value of the variable is determined as the quotient N(max)= α / β.

Equation (3), in the case of variable coefficients α and β, can be used for describing, for example, the decline in transmission probability at a given age as a result of preventive or some other measures that was increasing initially. In the case of variable coefficients it is better to solve this equation numerically.

This profile can change both in amplitude and according to age. By setting a maximum value for the growth of the transmission probability in relation to the base year, it is possible to construct a dynamic transmission probability profile that would depend on both time and age. Based on Equation (3), transmission probability at each age is represented as:

$$\lambda_v(a,s,t) = \lambda_v(a,s,0) * \frac{\alpha}{\exp(-\alpha * t) * (\alpha - \beta * \lambda_v(a,s,0)) + \beta * \lambda_v(a,s,0)} \quad (4)$$

Coefficients α and β are model parameters and are determined on the basis of expert assessment.

In order to make it possible to change the transmission probability with age, there is a horizontal shift of the infection profile in relation to the mean age of contracting the infection *(Ava(sex,t))* determined for the base year, using the formula:

$$Ava(s,0) = \frac{\sum_{a=0}^{100} \lambda_v(a,s,0) * a}{\sum_{a=0}^{100} \lambda_v(a,s,0)}$$, is used.

The change in mean age with time is determined similarly to Equation (4)

$$Ava(s,t) = Ava(s,0) * \frac{\alpha 1}{\exp(-\alpha 1 * t) * (\alpha 1 - \beta 1 * Ava(s,0)) + \beta 1 * Ava(s,0)} \quad (5)$$

Coefficients α1 and β1 are also the model parameters and are determined by expert assessment. Shifting the profile is done by way of horizontal displacement, using the following transform:

$$\lambda_v(a,s,t + shift) = \lambda_v(a,s,t) \quad (6)$$

where *shift* is the integer part of the difference *Ava(s,t) - Ava(s,0).*

Thus, using Equations (4), (5) and (6) can produce a transmission probability profile which is variable both with amplitude and age. The base year profile and the distributions of the HIV-infected individuals for the base year were obtained based on the data of the Russian Federal AIDS Centre. The transmission probability diagrammes for 2000-2002 and the initial distributions of the HIV and AIDS cases for men and women are given in the file HIV_Probabilities.xls.

3. Estimating the costs to the health sector for medical examination and treatment of people living with HIV/AIDS

Knowing the time-dependent number of HIV and AIDS cases, one can determine the aggregate cost of their medical examination and treatment. The model has two parameters that determine the base year costs of medical examination and treatment for both HIV and AIDS cases. The total costs are determined using the formula:

$$M\exp(t) = \sum_{s=1}^{2} \sum_{a=1}^{100} (PV(a,s,t) * ExpV(a,s,t) + PA(a,s,t) * ExpA(t)),$$

where *ExpH(a,s,t)* is the annual expenditures per one HIV-case;
ExpA(t) is the annual expenditures per single AIDS case.

The increase of an HIV case medical examination cost is seen as dependent on the length of the HIV phase. It is assumed that during the first four years following infection the annual level of expenditure amounts to RR 1,000 per HIV case, which equals the cost of two tests to determine the CD-4 count. Subsequently, the number of such tests increases, and it is assumed that 7 years after infection the annual cost will rise to RR 4,000 per case. After 8 years, the expenditures rises more sharply, because additional medical examinations are required and their estimated cost is RR 30,000. Thus, it is assumed that for the HIV phase the maximum cost of preventive medical examinations amounts to RR 34,000 a year per case. This cost is indexed following the inflation rate.

At the AIDS stage, annual expenditures per patient are assumed to be RR 150,000, this amount being also subject to inflation indexing.

4. Estimating costs associated with the payment of short-term disability benefit

Knowing the time-dependent number of HIV and AIDS cases, the total costs associated with the payment of the short-term disability benefit can be calculated using the formula:

$$A\exp(t) = \sum_{s=1}^{2} \sum_{a=1}^{100} PV(a,s,t) * LPRDecr(t) * Wage(a,s,t),$$

where *LPRDecr(t)* is the reduction of employment level for an HIV-positive employee;
Wage(a,s,t) is the average wage.

5. Impact of HIV transmission on the pension system

The transmission of HIV in Russia will lead to a decrease in the number of persons employed and, consequently, to reduced contributions to the Pension Fund. During the first years, the number of pensioners will grow due to a larger number of disability and survivor pensioners. At the end of a prolonged time period estimated to last for 20-30 years, the number of pensioners will decrease relative to projections without AIDS given that a part of the population will not reach the retirement age because the average life expectancy after becoming HIV-positive is 12 years. Bearing in mind that this model did not aim to provide a precise estimate of the pension system parameters, the number of the employed, the pensioners and, consequently, the dependency rate for the pension system were determined using the 'Stock' method.[8]

The following formula was used to calculate the number of employed:
*NE(s,a,t) = P(a,s,t) * LPR(a,s,t) * (1-UN(a,s,t)),*

where *LPR(a,s,t)* is the level of economic activity;
UnR(a,s,t) is the unemployment level.

The number of pensioners was calculated separately for the following groups:

1. old age pensioners: NP_Old (a,s,t) = P (a,s,t) * Share_Old (a,s,t)
2. disability pensioners: NP_Dis (a,s,t) = P(a,s,t) * Share_Dis (a,s,t)
3. survivor pensioners: NP_Sur (a,s,t) = P(a,s,t) * Share_Sur (a,s,t)

where: Share_Old(a,s,t), Share_Dis(a,s,t), Share_Sur(a,s,t) are the corresponding share matrices determining the percentage of the corresponding type of pensioners within a certain sex and age group.

The model assumes that all AIDS patients are disability pensioners. Aside from this, the increase in the number of survivor pensioners has been taken into account. This category in the model refers to children whose parents with AIDS have died. In order to model this process it is assumed that if an AIDS patient dies between 20 and 40 years of age, the probability of his/her having one child approaches a normal distribution. Thus, the total number of new survivor pensioners is determined using the formula:

$$NP\_SurA(s,t) = \sum_{a=20}^{40} \frac{a-20}{20} * \mu_a * PA(a,s,t) * C,$$

[8]More complex issues associated with isolation of the number of contributors to the Fund from the total number of employed in the economy, taking into account those who dodge contributions to the Fund and dividing the payers into employees and the self-employed, have not been reviewed in this model.

where: C is a constant taken as 0.5 in the model, which means that half of AIDS patients who reach the age of 40 and die leave one child.[9]

Consequently, the HIV/AIDS-specific number of disability and survivor pensioners will equal, respectively:

NP_Dis(a,s,t)= P(a,s,t) * Share_Dis (a,s,t) + PA(a,s,t)

NP_Sur(a,s,t)= P(a,s,t) * Share_Sur (a,s,t) + NP_SurA(a,s,t)

The pension dependency rate is determined as the ratio of the number of employed to the number of pensioners, and the affordable replacement rate in the pay-as-you-go system as the ratio of the effective contribution rate to the pension dependency rate. The affordable replacement rate for the base and the insurance parts of the labour pension can be calculated as:

$$RRafPAYGO(t) = \frac{CR_{eff}(t)}{SDR(t)},$$

SDR(t), the pension dependency rate:

$$SDR(t) = \frac{NE(t)}{NP\_Old(t) + NP\_Dis(t) + NP\_Sur(t)}$$

CR*eff,* the effective contribution rate, was determined using the formula:

$$C\mathrm{Re}\,ff(t) = \frac{\sum_{s=1}^{2}\sum_{a=1}^{100} CR(a,s,t) * NE(a,s,t)}{\sum_{s=1}^{2}\sum_{a=1}^{100} NE(a,s,t)}$$

where CR(s) is the contribution rate to the pension system.

The impact on the funded component of the pension is not analyzed in the model.

[9] This parameter requires further specification.

Appendix 2. Scenarios 1 - 5

Scenario 1: Constant transm
of values proje

	2002
GDP	100.0
Population	100.0
Number of employed	99.9
Number of pensioners:	100.0
Retired pensioners	100.0
Disability pensioners	100.0
Survivor pensioners	100.0
Contributions to the Pension Fund	99.9
Total expenditures for short-term disability benefits	105.4

	2002
Total expenditures of the health care sector for medical examination and treatment of people living with HIV/AIDS	0.00

Scenario 2: Increasing trans
of values proje

	2002
GDP	100.
Population	100.0
Number of employed	99.9
Number of pensioners:	100.
Retired pensioners	100.
Disability pensioners	100.
Survivor pensioners	100.
Contributions to the Pension Fund	99.9
Total expenditures for short-term disability benefits	105.4

	2002
Total expenditures of the health care sector for medical examination and treatment of people living with HIV/AIDS	0.00

Scenario 3: Decreasing tran
cent of values

	2002
GDP	100.0
Population	100.0
Number of employed	99.9
Number of pensioners:	100.0
Retired pensioners	100.0
Disability pensioners	100.0
Survivor pensioners	100.0
Contributions to the Pension Fund	99.9
Total expenditures for short-term disability benefits	105.4

	2002
Total expenditures of the health care sector for medical examination and treatment of people living with HIV/AIDS	0.00

Scenario 4: Transmission p
values projecte

	2002
GDP	100.
Population	100.0
Number of employed	99.9
Number of pensioners:	100.
Retired pensioners	100.
Disability pensioners	100.
Survivor pensioners	100.
Contributions to the Pension Fund	99.9
Total expenditures for short-term disability benefits	105.4

	2002
Total expenditures of the health care sector for medical examination and treatment of people living with HIV/AIDS	0.00

Scenario 5: Risk group satu
projected in th

	2002
GDP	100.0
Population	100.0
Number of employed	99.9
Number of pensioners:	100.0
Retired pensioners	100.0
Disability pensioners	100.0
Survivor pensioners	100.0
Contributions to the Pension Fund	99.9
Total expenditures for short-term disability benefits	107.1

	2002
Total expenditures of the health care sector for medical examination and treatment of people living with HIV/AIDS	0.01

ILOAIDS

International Labour Office
4 route des Morillons
CH-1211 Geneva 22
Switzerland

Tel: +41 22 799 6486
Fax: +41 22 799 6349
E-mail: iloaids@ilo.org
Web: www.ilo.org/aids

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