THE RETURN ON INVESTMENTS INTO HEALTH IN MODERN RUSSIA: MICROECONOMIC ANALYSIS

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The aim of this research is the empirical estimation of economic return on positive and negative investments into health of Russian population. On the basis of the "Russia Longitudinal Monitoring Survey (RLMS)" data two regression models are estimated. In the first model we investigate how individual investments affect health considering the probability of chronic diseases while the second model studies their effect on earnings of person. A 2000-2005 survey of the employed population aged 18-60 is used. We estimate the models with lags effects: investments into health are measured in time T-1, but incomes and health – in time T. Health investments (positive or negative) here are considered as following characteristics: playing sports, preventive physical examinations, healthy food, level of labor load and stresses, alcohol and tobacco consumption, environment condition in the region, etc. Models estimates clearly show the positive influence of healthy way of life (absence of bad habits, playing sports, etc.) on health. Mincer model estimations prove that these factors also influence earnings, including the regression with random effects. In particular, it is evident that smoking experience, overconsumption of alcohol and the combination of both sober way of life, and that sports activities provide impact for the whole sample.

Key words: Investments into health, incomes, disease, lifestyle

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Return on positive and negative investments into health: research questions[1].

In the 1990s the health of the Russian population deteriorated significantly. Exposure to diseases (first of all – tuberculosis, the diseases transferred by sexual intercourse, alcoholism, drug addiction) and death rates had grown, and the life expectancy had fallen. It meant considerable losses for individuals and for the society. In 2005 the priority national program "Health" was accepted in Russia, a number of public organizations and movements were created whose purpose was not only to develop public health services system, but to stimulate a healthy way of life among people.

Health is one of the types of human capital which is important not only as one of human values but which influences the period of accumulation and use of other types of human capital, such as education and professional experience. People's health depends on many factors, including income, ecology, system of public health services etc. Some factors do not depend solely on an individual. For example, due to changes in the system of public health services and reduction in income the availability of medical care has worsened, including preventive inspections; cost of medical products, including vitamins, has substantially grown, etc. Such factors as high workloads, work related stress, irregular rest can be compelled, connected with the necessity of earnings. However other factors substantially depend on personal behaviour which can be called "investments into health capital", by analogy to investments into other forms of human capital.

Individual activities which improve health, for example, sports, active mode of life, balanced food, vitamins consumption, preventive medical inspections etc., are understood investments in this paper as "positive". Others, which have an opposite effect (for example, smoking, unlimited consumption of alcohol, stresses, excessive workloads, irregular and too high-calorie food etc.), are "negative investments" into health. Economic and sociological theories have been questioning, for a long time, why a person, being aware of adverse consequences of some types of such behaviour, does not abstain from them. Thus, abusing alcohol is one of most acute problems for Russia. It leads to damages of liver, digestion system, nervous system and sense organs, cardiovascular system, urinogenital system of a person, and as a result mortality rates grow. Social losses arising from increase of absenteeism, decreased work capacity and productivity, falling of earnings, criminality growth are huge too. Thus, it is important to estimate the influence of a way of life on one's health, employment and earnings.

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Theoretical models and empirical research on investments into health.

In the economic literature health is considered as a consumer good as well as one of types of human capital. The first approach is connected with the analysis of «demand for health», along with other goods; the second one studies returns on «health capital», along with other types of capital. The classical model of demand for health has been suggested by M. Grossman (Grossman 2000). In this model individuals are both consuming and producing their own health.

An individual is endowed with some level of health, and he (she) can either improve it (for example, by adhering to a healthy way of life, making investments in health protection by medical institutions etc.), or worsen it (for example, by not consulting a physician in case of diseases, have bad habits, bad working conditions etc.). Demand for health is determined by the two competing factors. Firstly, it is a component of the utility function, secondly health level affects the duration of working ability/disability of individuals and, hence, their income.

In the beginning of their life cycles individuals are endowed with some initial stock of “health capital” which eventually diminishes, and the rate of this diminishing is rising as time passes. Since the probability of the fatality is extremely high when the health level falls below some critical level, individuals can increase the duration of their life by influencing the stock of this capital. Gross investments into the health capital are made according to a production function which translates investments, such as consumption of public health services, compliance with the diet, playing sports, smoking, alcohol drinking etc., to an outcome of health level. Personal characteristics influence the efficiency of such investments, i.e. how health level changes at the given level of investments.

Grossman's model (Grossman 2000, P. 352) assumes that health is one of the components of the intertemporal utility function of a typical consumer:

$U= U(\varphi_t H_t, Z_t)$, $t=0, 1, \ldots, n$ where H_t is the stock of health at age *t* or in time period *t,* φ_t is the service flow per unit stock, $h_t = \varphi_t H_t$ is total consumption of "health services", and Z_t is consumption of other goods. The stock of health in the initial period (H_0) is fixed, but the stock of health at any other age is endogenous. The length of life as of the planning date (n) also is endogenous. In particular, death occurs whenever $H_t < H_{min}$, which exogenously set. Length of life is determined by the amount of health capital that maximizes utility subject to production and resource constraints.

Net investment into the stock of health equals gross investment minus depreciation:

$H_{t+1} - H_t = I_t – \varphi_t H_t$, where I_t is gross investment and φ_t is the rate of depreciation during the t-th period ($0 < t < 1$). The rates of depreciation are exogenous but age-dependent.

Consumers produce gross investment in health and the other goods that enter utility function according to a set of household production functions:

$I_t = (M_t, TH_t, E)$, $Z_t = (X_t, T_t, E)$, where M_t is a vector of inputs (goods) purchased in the market that influence health (including medical services), X_t is a similar vector of goods inputs that contribute to the production of Z_t, TH_t and T_t are time inputs, and E is the consumer's stock of knowledge or human capital exclusive of health capital. This latter stock is assumed to be exogenous or predetermined. Grosman also assumes that an increase in knowledge capital raises the efficiency of the production process in the nonmarket or household sector.

The first budget constraint equates the present value of goods (M_t and X_t) to the present value of income over the life cycle plus initial assets (discounted property income). Incomes equal the wage rate multiplied by the hours of work during the employment period. The second budget constraint requires that the total amount of time available at any period can be spent on time of work (TW_t), time of consumption (T_t), time of the investment into health (TH_t) and time losses due to illness and injury (TL_t). The special feature of Grossman’s model is capturing the time lost due to illness. This time depends negatively on H_t - the amount of health capital and on $\square_t$ - the flow of services (or healthy time) per unit of *Ht*. Therefore health influences earnings not by decreasing the wage rate of the person with low volume of the health capital, but by increasing amount of the days lost due to illness, and, hence, decreasing the total labour income.

Investments into health at any period t increase health stocks in all subsequent periods (taking into account depreciation), and, hence, also increase life expectancy; the same logic applies to the duration of employment time. The income during life cycle and also total volume of consumed goods Z_t therefore increase. Spending part of the labour income on investment into health instead of consumption, a person reduces his/her current well-being. However, he/she increases it in the future

through higher stock of the health capital available. Health increases utility both as a goods and as capital (via decreasing the quantity of working days lost due to illness, and via lengthening of the period of labour activity), that raises total volume Z_t during a life.

Model equilibrium conditions are the following.

1) The present value of the marginal cost of gross investment in health in period *t* - 1 must equal the discounted marginal value to consumers of the output produced by health capital till the end of life cycle.

2) Total cost is minimized when the increase in gross investment from spending an additional dollar on medical care equals the increase in total cost from spending an additional dollar on time TH_t.

The analysis of "pure" investment model has allowed M.Grossman to show that the optimum health level is influenced positively by the wage rate. If it grows the "value" of "healthy" time of individual increases. In addition, this value of healthy time is influenced by change of rates of depreciation of health capital, rate of return on this capital and by opportunity costs of investments into health. As the rate of depreciation varies with age, age influences an optimum stock of the health capital as well. As a result demand for health decreases with age and the investments required to keep health level on a certain level increases.

According to Grossman model assumptions marginal return on investments into health and return on health is higher for people with higher educational level, therefore their optimal stock of health capital also is higher. Increase of return on investments into health among educated peoples is explained by their best knowledge about real consequences of such investments (for example, smoking), that leads to a choice of more effective set of goods invested in health given total level of costs. Education also changes preferences of consumer goods influencing health – for example, in favor of less fat products or playing sports.

In his model of health as a consumer good M. Grossman shows that two results remain the same: the first one concerns demand for health diminishing with age due to growth of deterioration rate s, and the second one covers growth of total investments into health if the elasticity of substitution between the present and the future health is less than unity. If the wage rate is constant and the marginal costs of the investment into health are constant too, growth of wealth will cause demand for increased health. For unemployed individuals there is no effect of health on total earnings caused by the decrease in days lost due to illness.

The empirical model proposed by M.Grossman (Grossman 2000, P. 379) includes two linear equations for the main endogenous variables: stock of health H_t and medical care M_t for each year. Both these variables depend on the wage rate (W), prices for medical care (P), a stock of the human capital (E) other than health, age (t), and also on unobservable variable φ_t (depreciation rate of health). $\ln H = f(\ln W, \ln P, E, t)$ $\ln M = f(\ln W, \ln P, E, t)$

In the empirical model estimated by M.Grossman using nationwide US survey data for the year 1963 the following dependent variables were used: a self-estimation of "health time" (return on the health capital –working days lost due to illness), and medical care consumption – expenses on visiting doctors, taking drugs, the medical equipment etc. As the author had no data on the prices for medical care, he assumed that they were not differentiated among consumers and not correlated with others regressors. Other model determinants were age, the weekly wage rate, quantity of years of education and the family income. Thus the Grossman model was missing many important factors, that contribute to health status - alcohol consumption, smoking, playing sports, food quality etc.

In the theoretical models of influence of consumption of alcohol and tobacco on health the latter is considered as function of stock of health in the proceeding period, income, medical care, consumption addictive goods and of the other factors influencing health (Cook, Moore 200), Chaloupka, Warner 2000). As both positive and negative investments, as a rule, influence health only in the future, these factors must be taken into account with a time lag. Reviews of many researches have shown negative influence of overconsumption of alcohol on health in the diseases of a cirrhosis and cardiovascular diseases (Cook, Moore 2000), and tobacco – lung diseases (Chaloupka, Warner 2000).

As for the influence of investments into health on incomes, connection between them is indirect. Investments influence health (with a lag), and health as one of types of human capital, positively influences earnings. Sources of such influence include increase in duration of working hours

(including reductions in amount of the days lost due to illness) and growth of labour productivity of "more healthy" people. However, the interrelation of health and earnings is ambiguous.
On the one hand, according to Grossman's model, people with higher wage rate lose more in income if they are unable to work due to illness, and, hence, they are more interested in positive investments into health. On the other hand, healthier people are potentially more efficient. Models with time lag can be regarded as a solution to this problem, since a person makes investments into health based on his/her health in the present, present earnings and their forecasting; at the same time any investment into health can have effect only after a while. Thus, the standard model can be made nore adequate with the inclusion of return on investments into the human capital, along with education, previous investments into health.
Western empirical researches have documented rather high level of interrelation between health and employment, as well as between health and incomes (Costa 1994). However, as a rule, return on health was considered rather than return on investments into health. In addition not only health influences incomes, but incomes influence health too. In particular, A.Deaton has shown, that the inequality in health is influenced more likely by an inequality in incomes than their absolute level (Deaton 1999).
A number of Russian papers considered relation between various socio-economic factors including incomes, places of residing, a way of life and population health. M.Denisenko and A.Sagradov (Denisenko, Sagradov 2000) have not found such interrelation, whereas in papers of V.Tapilina (Tapilina 2003) and I.Nazarova (Nazarova 2003) it has been found. However it should be noticed, that self-estimation of people health were used in all these papers; models without a lag were used whereas it is quite obvious that many variables can influence health and, hence, earnings, only after some period of time rather than instantly.

Methodology and results of empirical research.[2]

The purpose of this paper is an empirical estimation of returns on investments into health of Russian people during 2000-2005, in particular, their influence on incomes and health deterioration.
The object of research is the employed Russian population aged 18 – 60. The sample is restricted to those who are employed mainly because earnings of the individual are used as one of the models variables. Secondly, for the elderly, the age itself is a very good predictor of health status for obvious reasons and this predictive power of age suppresses the effect of all other factors. Data about the unemployed and those out of the labor force are used for sample bias correction.
As empirical base of research we use RLMS data (the Russian monitoring of an economic situation and population health)[3] for 2000-2005, which constitute a representative panel survey of the population. These data contain almost all variables necessary for models estimation. Panel character of data is also important, as it will allow us to compare investments into health of the individuals in the past with the level of their incomes in the present, as well as to estimate changes in their health.
We will use the following *dependent variables* in the models:

- Health deterioration (exposure to chronic and other serious diseases) in comparison with the past (years from T to T+3);
- Wage rate in a year T on the first jobs, in the price level of 2005.

The independent variables measuring level of positive and negative investments into health and other factors influencing health and incomes are as follows:

- In a year T: gender, age, marital status, number of children, education, work experience, job characteristics (for Mincer model), dummies on region and urbanization level;
- In a year T-1 (with a lag): health level, duration and conditions of job, income (for health model), alcohol and tobacco consumption, preventive physical examinations, food type, intensity of playing sports, regional characteristics of environment and public health care.

Dynamics of health and a way of life of the Russian population in 1990-2000: stylized facts[4].

Health conditions of Russian population have been deteriorating for the last 40 years. But from the beginning of the 1990s these changes became critical. Thus, in the middle of the 1980s life expectancy at birth in RSFSR equaled 70 years. In 1995 this indicator in Russia decreased to 58,1

[2] See complete text in Russian http://new.hse.ru/sites/infospace/podrazd/uvp/id/preprints/DocLib/WP3_2008_05.pdf
[3] See methodology and description on http://www.cpc.unc.edu/rlms/
[4] All statistical data in this part of the paper come from (Zdravoohranenie v Rossii 2006) and (Socialnoe polojenie… 2006) and RLMS survey, if other is not stipulated

years for men and 71,6 years for women. In 2004 it equaled 58,9 and 72,3 years respectively. In 1970 mortality rate per thousand people was 8,7, in 1990 it was 11,2, and in 2003 it reached 16,4. During the 1990s there appeared a considerable difference between mortality rates of men and women. Mortality rates of the economically active people grew faster – from 4,88 per thousand people in 1990 to 8 in 2004. Moreover, this indicator is almost 4 times higher among men as compared to women. During 1990-2004 the average sickness rate grew by 1,35, and sickness rate with the diagnosis firstly established – by 1,15 times. Together with growth of spirits sales per capita from about 5,38 liters of absolute alcohol in 1990 to 9,7 liters in 2005 mortality rates due to all reasons connected with its consumption has substantially grown.

The factors influencing health have also changed. Incomes have decreased; the food structure has dramatically worsened, as share of protein (meat) in the menu decreased and the share of carbohydrates (bread and potato) increased, though total quantity of calories consumed grown. At the same time emissions of the basic polluting substances in atmosphere and sewage have decreased; living conditions have been improved; the number of fitness clubs and swimming pools has grown. Many indicators of "public health care" industry have also been constantly improving – number of doctors per person, number of polyclinics visits, volume of medical care, sales of drugs and medicines. As a whole changes of macroeconomic and social situation had ambiguous influence on population health. However, this paper will concentrate on individual behaviour influencing health only.

The micro data in use provide details on objective estimation of respondents' health for the period of 2000-2006 only. During this period the questionnaire contained questions about chronic diseases. This research will focus on objective characteristics of health only, i.e. answers of respondents that they suffer from this or that illness at the moment of polling or suffered from it ever in the past. Though such indicators are obviously subject to measurement errors as well, they are much more precise than self-estimation of health level which is used in research more often. According to RLMS estimations during the considered period of 2000-2005 sickness rate of the basic classes of illnesses has at first grown a little by 2003, and then it has decreased by 2005, that is supported by official statistics. At the same time the percentage of people who estimated their health as «bad or very bad» decreased permanently: from 8,7 % to 6,1 % for women and from 5,6 % to 3,9 % for men. As a whole people's health is quite bad: almost 50% of women and 40 % of men suffer from some chronic illness.

According to RLMS data in 2000-2005 among the employed of the age 18-60 the share of those who did not consume any alcoholic drinks within 30 days before polling has grown from 34,4% to 37,9%. However the share of those who had drunk more frequently than 4 times a week practically has not changed (3,5%), as well as consumption volume (in an equivalent of pure alcohol a month). We will consider consumption of pure alcohol over a certain dose a month (200 grams for men and 100 for women) for two years as an "overconsumption" indicator. The share of smokers has grown as well from 41,4% to 43,6%, and the share of people who smoke more than 10 cigarettes a day has also increased a little (from 25,2 to 27,1%).

We use a number of other characteristics of a way of life of the employed which (with a time lag) can have essential impact on health as model determinants. These variables are dummies for playing sports, fear of losing a job, dissatisfaction with working conditions, workaholism (more than 60 working hours in a week), work as the head of enterprise[5] (the first category of employment in isco-88), optimism (people who are completely satisfied with their life). Unfortunately, in RLMS data variables on food consumption (to be more precise on grocery purchases) are available on per household rather than per person basis. Therefore we have constructed the variables characterizing grocery purchases per person in natural units (kg, litre). Lower deciles in purchases of meat products and fruits characterize low consumption of these products, and upper deciles in purchases of meat products and sweets characterize their high consumption.

In 2000-2005 the share of respondents, who regularly carry sport activities almost did not change; the share of those who fear to lose job has decreased (from 31 to 24%); the share of people unsatisfied with their working conditions has decreased a little. The share of people who are completely satisfied with life has grown (from 3,5 to 5,5%). The percentage of those who has consulted a physician with preventive purpose has grown (from 17 to 21 %), as well as the share of people from families buying few meat and fruits.

[5] As enterprises heads are often subject to stresses

Regression analysis testing the influence of investments into health on exposure to illness.

We have selected respondents who did not suffer from each given disease in a year T (T=2000, 2001, 2002). For this sample a number of regressions of the same type (probit estimation method) were estimated. For each respondent in a year T the dependent variable was equal to 1 if at least in one of the next three years (T+1, T+2, T+3) he\she answered that he\she was suffering from this disease at that moment. The dependent variable was equal to 0 if the respondent remained healthy. Model determinants (a set of social and economic characteristics and investments into health) were fixed in a year T. This allows us to soften a problem of endogeneity, and to estimate the influence of investments into health on exposure to disease in the future. The set of dependent variables corresponds to the list of the chronic diseases included in the questionnaire, and is augmented with three other diseases: heart attack, diabetes (sugar in blood) and the high arterial pressure (table 1).

Each model has been tested on the sample of employed people of the age 18-60, separately for two age groups – "younger" (18-40 years), and "senior" (41-60 years), and for four gender-age[6] groups. Our result on the influence of a given way of life on exposure to illnesses will be biased towards more healthy people, because we are looking at people who were not suffering from a particular disease at the beginning of the period considered. In a sense, we are estimating conditional probabilities to get sick in the future if an individual stayed healthy at the moment of polling.

We did not test the models for the probability to recover from chronic diseases in the future for several reasons. First, two types of questions are included in the questionnaire. The first type of questions is: «Do you suffer from this chronic disease»; the second type of questions is: «Had your doctor ever diagnosed you with …» (diabetes, heart attack, stroke etc.). The question of the second type does not assume possibility to recover from the given illnesses. Second, preventive actions (including «a healthy way of life») contribute mainly to maintaining a good health status while it is medical care that affects treatment and curing. Unfortunately, it is impossible to measure the amount and the quality of medical care received from available data. And finally, the mere quantity of people who is suffering from this or that chronic disease is rather low.

Estimations of all models have shown that the probability to get sick with all chronic diseases grows with age. However, some illnesses do not demonstrate dependence on the subsample of either only men or only women, as well as the youth. Variable «age squared» is significant in models of probability to get sick with heart, lungs, kidneys, stomach diseases, with diabetes and hypertension. That is age influence on health is not linearly and it strengthens for older individuals. Marginal effects confirm that in the majority of models age is the most influencing variable. For example, every year of life the probability to get sick with chronic heart disease increases by 4,8%. The risk of heart illness is higher by 4,7% if the person is in the group of alcohol overconsumption, but this risk is lower by 3,6 % for those who plays sports.

Influence of age is the strongest for people over 40 (every year increases risk of heart disease for people below 40 by 1,3 %, and for people over 40 years – by 8,3 %). Age influence is higher for women (every year the probability to fall ill with chronic heart disease for women over 40 increases by 10,3 %, and for men – by 5,9 %).

Positive influence of wage rate on health predicted by Grossman was proved only partially. That is for some diseases and some age groups only. The probability to get sick depends negatively on incomes for people younger than 40 years, especially for men. For women over 40 the influence of wage rate on risk to get sick is positive. This dependence can stem from the fact that older workers with higher earning usually have the paid sick-list and that is why their expected losses in the income because of absence from job due to the illness are low, that do not stimulate investments into health.

According to model we expected that incomes of other family members would influence exposure to illness negatively (as they give the chance to pay health maintenance care). However their influence occurred to have an opposite sign (for some illnesses and some groups of respondents). The similar fact has also been found out by Grossman who explained it by positive elasticity of tobacco and alcohol consumption (which influence health negatively) on family incomes.

Family characteristics (marital status, small children, family size) have been used in models as controls. Probability to get sick among young men is higher if they have children. Probably, it can be explained by the fact that parents give more attention to health of the child than to their own health.

[6] models estimation by gender-age groups are not showed owing to text length

Besides, young families with children often have lower incomes. For respondents of senior age, on the contrary, small children are a favorable factor for health preservation. We believe that on the one hand elderly parents have higher incomes and on the other hand respondents with children prefer more active way of life than people without children (or with adult children). Influence of the family size on disease is unstable.

Grossman model assumes that education influences health positively. However our models estimates have shown that people with higher education have higher probability to fall ill, especially the young ones. We believe the main reasons for this are the high education requirements and huge intensity of study and work which become a basis for illnesses development. At the same time people with high education, as a rule, have office work that can lead to illnesses of a backbone and a gastro-enteric path. However it is also possible that this fact is a consequence of better diagnostics of educated people as they are more interested in their health and are better informed of their health status.

We have also included into regressions a number of control variables characterizing living conditions which can influence health status. Our results have shown that characteristics of a place of residence have ambiguous influence on various diseases in different groups of gender and age. Stable influence is observed only for lung diseases: the exposure to these diseases is lower in all settlements in comparison to Moscow and St.-Petersburg, and it is the lowest for villages.

This fact can be explained that the bigger a city is the more intensive is the air pollution which obviously influences lungs diseases. In other settlements except both capitals (Moscow and St.-Petersburg) the youth fall ill with diseases of a backbone less often. But the older people, especially men, more often suffer from high blood pressure. The fact that in other cities and villages, in comparison to Moscow and St.-Petersburg, senior people risk of getting diabetes is lower for women and higher for men is difficult to explain.

Control variables of regional characteristics by statistical data such as atmosphere pollution (volume of harmful emissions), number of doctors per thousand of people and the logarithm of incomes per capita have been included in models as well. We believed that the first indicator would have positive influence on sick rate, and the two others would influence it negatively. Expected positive influence of bad ecology has been confirmed for illnesses of heart and kidneys in some groups of the population. However negative influence of this factor on the probability of falling ill with diseases of lungs looks paradoxical. Our conjecture is that this fact originates from the unavailability of data on air pollution in particular settlements, and regional level of pollution does not captures the one of a settlement. The hypothesis that in rich regions probability to fall ill is lower (because of higher standard of living, good development of a recreational infrastructure etc.) has not proved to be true too.

Quantity of the medical personnel in region also has positive effect on sickness rates (except for lung diseases). This seeming paradoxical fact can be explained by positive dependence of probability to diagnose an illness on availability of medical care and its quality. We believe that the same explanation is applied to the positive influence on risk to fall ill of such variables as visiting of the doctor with the preventive purpose, the policy of obligatory medical insurance and the policy of additional medical insurance. It means that availability of medical care in Russia is not a factor of the prevention of diseases yet. Efforts of medical institutions aimed at maintenance of patients' health rather than at curing them from illnesses they already developed are very low.

The living space per person in a family has been found insignificant in all models. Though the absence of centralized sewage has significant positive impact on some illnesses in some groups of people it has negative influence in other cases. We believe that this factor captures village status of a settlement. On the other hand, as we deal with the limited list of diseases, it is probable that exposure to infectious diseases (information about which we do not have) substantially depends on this factor.

We have included in the models a number of dummies characterizing grocery purchase per person in a family of the respondent. Stable influence of these indicators on disease has not been revealed. Only the high consumption of meat products have positive impact on probability to get sick with liver, backbone and kidneys diseases, mainly for the older age groups. But even purchase of a significant amount of sweets does not influence the probability of diabetes or higher concentration of sugar in blood.

However, a superfluous food and a motionless way of life, as is widely known, lead quite often to this or that degree of obesity which in turn is a serious risk factor for health. So, the high index of body weight leads to higher exposure to heart and liver diseases and the "other" chronic illnesses (which have been not listed in the questionnaire), high concentration of sugar in the blood, high blood

pressure, and also illnesses of kidneys for young men and a heart attack for older men. At the same time this factor prevents from illnesses of backbone and stomach (especially among older women) though it is not quite clear why.
We believed that some characteristics of employment (in particular a post of the director and workaholism) will influence health negatively in the future as high physical, emotional and psychological loadings that weaken the organism. Indeed, great volume of working hours raises the risk of heart and lungs diseases, of high concentration of sugar in blood, especially among people younger than 40. However, for a number of other illnesses risk among workaholics, on the contrary, is lower. The job of the director has ambiguous effect. It is probable that people who are less exposed to stress are more eager to accept jobs requiring hard work and higher job positions.
Two variables of a psychological status of the person – fear to lose job (stress), on the one hand, and life satisfaction (optimism), on the other hand, according to our hypothesis, should have opposite impact on sickness rate. Really, stress raises risk of diseases of heart and kidneys, and of high blood pressure for women younger than 40 years, and of diseases of gastroenteric path for older women. However stable influence of optimism on health has not been found.
Being sport active is one of the most important characteristics of a healthy way of life. Indeed, this factor has an extremely high influence on health preservation, and it reduces risks of the majority of diseases, especially for the young. Among determinants which depend on human behaviour sport activity is, according to models estimation, the strongest factor of the prevention of some illnesses. As we saw above it is the strongest among positive factors of decreasing the risk of diseases of heart (by 3,6%). The same is true about the reduction of risk of high blood pressure (by 6,8%). The unique significant positive influence of playing sports on the probability to get sick is observed for illnesses of lungs, however its marginal effect is essentially lower, than for preventive maintenance of diseases – 1,6 %.
At last, we will look at so-called "bad habits" which are the important component of a way of life. Though they have the negative influence on health proved by medicine (especially when abused), nevertheless people often do not abstain from them for a variety of reasons, first of all for the social ones.
We used two indicators for smoking – the number of smoked cigarettes per day and the smoking experience (normalized on age). It has occurred that the second measure captures negative effect of smoking better. The experience of smoking at the healthy person has the strongest impact on the probability of illnesses of lungs that is already confirmed by medicine. According to physicians, smoking more often causes lung cancer, but we have no data on this disease.
The smoking experience strongly influences the probability of chronic disease of lungs among all other investigated factors (the marginal effect is equal to 6,1%). The longer the person smokes, the higher are risks of diseases of kidneys (young men), stomach (all men), high blood pressure (young men) and a heart attack (men older than 40 years). However, for some groups of people and some diseases the positive effect of smoking (risk decrease) is observed.
As for the alcohol, it is generally accepted, that its moderate consumption is useful for health. Therefore we compared those who did not drink at all during two rounds, T and T-1 (for the 30 days before polling), those who excessively consumed it (200 grams of pure alcohols a month for men and 100 grams for women, in rounds T and T-1) with individuals drinking moderately. Really, the model estimates have shown that abstainers more likely are subject to risk of diseases of a gastroenteric path, a heart attack, a backbone than persons drinking moderately.
At the same time for abstainers the probability of the high sugar in blood is lower, as of illnesses of lungs and kidneys for nondrinkers under 40 years. But alcohol overconsumption does have harmful effect, which the doctors are speaking about insistently. So, in all gender and age groups drinking raises significantly the risk of chronic disease of heart and (except young men) liver. Alcohol overconsumption raises risk of illnesses of a liver by 10,2%, and for older people over 40 years – by 23,5%, for women – by 30%, and for men – by 18,4%.

Influence of investments into health on earnings estimation.

For the solution of this problem we tested a standard Mincer model with the logarithm of wages for the last 30 days on the principal job as a dependent variable for the people of 18-60 years old (table 2). We also tested it separately for men and for women[7]. Following models have been estimated:
- Pooled regression (cross-section model for the sample of employed people),

[7] Because of text limitation the regresses estimations by gender are not shown

- Pooled regression with Heckman correction on selection bias, i.e. inclusions in the model of the inverse Mill ratio calculated from selection equation (employment decision),
- Panel regression with random effects and with fixed effects and Heckman correction.

As our results have shown correction of sample bias has not affected the significance of variables for all sample of respondents. All estimates of this model are consistent with the theoretical predictions. The positive effect on earnings has been found for all diplomas, starting from secondary professional one (including 2-3 years of higher education and postgraduate study) and of the specific work experience The square-law dependence of salary on the general work experience was found (the experience here is equal the age minus the number of years spent on education). Earnings depend on gender (they are higher for men), and they do not depend on marital status and on number of children. Rather strong influence of the enterprise characteristics and of job level was also found.

As for investments into health, though physical training in the year before polling influences employment negatively, they have positive influence on incomes (the standardized coefficients show the return as high as return on the secondary professional education diploma though it is 7 times smaller than the return on higher education). Optimism level in the past has no effect on employment, but it is significant for earnings, though its influence is lower than those of doing sports.

Despite the positive effect of sports, people with higher index of body weight earn more though the big weight is a risk factor of many diseases. And finally though smokers have higher income, those who have longer experience of smoking earn less. Just as expected by the theory people not drinking alcohol earn less than those who drink moderately. But losses in earnings due to alcohol overconsumption are higher than losses from all other negative factors, except decrease of the general professional experience expressed by experience square.

However models for gender groups do not confirm some revealed dependences. Thus, among investments into health only smoking for women keeps positive sign, and the smoking experience is not significant. Abstaining from alcohol consumption is not important, but for men influence of alcohol overconsumption proves to be true. The "sweet" way of life influences positively earnings of women only, and optimism – those of men. The index of body weight is not significant for all groups. It means that most likely the effect of this variable on the whole sample was caused by influence of gender.

Then we have estimated our model with random effects. The test has shown that the regressors do not correlate with unobservable random effects - that is why model estimations are consistent. Breush-Pagan test (Prob> chi2=0,0) shows that the model with random effects for Mincer equation describes data better than the pooling regression. In the model with random effects influence of variety of investments into health (index of body weight, type of a food of a family, life satisfaction) on incomes was not found. In addition, for women the influence of doing sports has disappeared and positive effect of smoking was not observed as well. Instead, negative return on a sober way of life was found out for women, and the positive return on fear of losing a job for men.

We will look now at estimates of a model with the fixed effects. Wald test (Prob> F=0,0) shows that it is more adequate than a model of pooling regression (which estimations appear to be not consistent). According to Hausman test (Prob> chi2=0,0) the model with the fixed effects is better than a model with random effects. Though estimates of a model with the fixed effects are consistent in the absence of endogeneity, the coefficient for some variables o interest are insignificant.

The second drawback of a fixed effects method is its inability to capture the influence of the variables that do not vary with time (in particular, gender, region, etc.) (Ratnikova 2004, P. 28). It is also generally accepted that the model with random effects is better for modelling the processes on large samples (that is selective surveys of the population), and the one with the fixed effects suits better the sets of the limited number of objects (regions, countries etc.) (Verbeek 2000, P.318). Therefore we believe that it is not advisable to reject all results of a model with random effects.

With the removal of all not observable individual effects in the model with fixed effects all kinds of investments into health become insignificant. This fact can be interpreted as the absence of the influence of change of these parameters on earning of each given person: that is, people excessively drinking alcohol in real terms earn less that people drinking moderately, but change of behaviour of each person within a year does not affect their income. It is also quite probable, that the observable independent variables characterizing the investments into health had a small variation across years. That is, for example, in all observable periods most of people either played sports or did not it, either smoked, or did not it, etc.

Conclusions.

The estimated models have allowed to confirm the high influence of people's behaviour on preservation or deterioration of their health. Besides socially-demographic characteristics, the most influencing variables are being sport active (positive effect), and tobacco and alcohol consumption (negative effect). These patterns of behaviour can be considered as various kinds of investments into health. Models have also allowed to see that the additional medical insurance and preventive visiting of the doctor do not have expected precautionary effect for healthy people, but promote diagnostics and revealing of diseases. There are significant distinctions in influence of investments into health for different population groups.

Investments into health have huge impact on employment. So, people who had chosen healthy way of life in the past, have higher probability to work in the future. Though an estimation of pooled Mincer model and the model with random effects show the significant influence of lagged investments into health on incomes, with the bulk of this influence stems from gender differences. The model estimations separately for men and women confirmed the negative influence of the excessive alcohol consumption on incomes of men only. The model with random effects leads to losses of efficiency in estimations of corresponding factors.

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Appendix.

Table 1. The model of probability to get sick for the first time (by types of diseases) in the subsequent periods, employed population of 18-60 years old, 2000-2002(probit regression)

	Diseases				
	Heart	Lungs	Liver	Kidneys	Stomach
Age /10	**0.133****	-0.43	**0.145****	-0.061	0.04
Age squared /100	**0.022****	**0.021****	0.005	**0.026*****	**0.018****
Number of children	-0.037	0.063	0.011	-0.016	-0.017
The logarithm of incomes of other members of a family per person	**0.019***	**0.019***	0.012	-0.039	-0.002
Number of members of a family	0.022	**-0.049***	**0.043***	0.021	-0.026
Married	**-0.105***	-0.057	-0.066	0.046	0.034
The logarithm of the wage rate	0.035	**-0.056***	**-0.043***	0.026	0.032
The smoking experience / Age	-0.136	**0.668****	0.065	-0.001	0.117
Does not consume alcohol	0.016	-0.098	-0.032	-0.068	**0.198****
Consumes > 200g (100) of alcohol a month	**0.256***	0.095	**0.523****	-0.091	-0.036
Plays sports	**-0.262****	**0.157***	-0.088	-0.023	**-0.174****
Fear of losing work	0.022	0.044	0.014	0.062	**0.145****
Workaholic	0.071	0.058	-0.058	-0.059	-0.046
Director	-0.033	-0.111	**-0.214***	-0.166	0.013
Satisfied with a life	0.004	-0.071	-0.203	**-0.299***	-0.110
Food: meat is not enough	-0.165	-0.071	0.214	0.023	0.004
Food: It is a lot of meat	0.032	0.071	0.033	**0.189****	-0.031
Food: It is not enough fruit	-0.020	0.032	-0.202	-0.031	-0.034
Food: It is a lot of sweets	-0.125	-0.041	-0.026	-0.015	**-0.119***
There is no water sewage	0.065	-0.095	0.013	0.003	-0.073
Index of body weight	**0.019****	-0.004	**0.015****	0.003	**-0.010****
Living space per person	0.000	0.000	0.000	0.000	0.000
Routine inspections of the doctor	-0.041	0.008	0.041	0.029	-0.033
Policy of obligatory medical insurance	-0.084	-0.026	0.050	0.053	-0.072
Policy of additional medical insurance	-0.053	0.073	-0.066	0.036	0.028
Secondary professional education	0.072	0.066	**0.140****	0.057	0.054
Higher education	0.048	0.099	0.054	-0.032	**0.113***
2001	**-0.165****	**-0.108***	**-0.185****	-0.090	**-0.225****
2002	**-0.332****	**-0.248****	**-0.304****	**-0.198****	**-0.391****
Northern, Northwest regions	0.015	**-0.418****	-0.161	0.181	-0.001
Volga, regions Volgo-Vjatsky	0.036	0.001	0.104	0.142*	-0.070
The north Caucasus	0.073	0.017	**0.321****	**0.373****	**0.302****
Urals mountains	**-0.175***	-0.086	0.082	0.088	0.056
Western Siberia	0.122	0.055	**0.214****	**0.431****	**0.176****
The far east	0.119	0.193	**0.376****	**0.514****	0.084
The regional centre except Moscow and Petersburg	-0.123	**-0.595****	0.148	-0.018	0.207
City of regional submission	-0.143	**-0.672****	-0.189	-0.087	0.097
Village	-0.055	**-0.608****	-0.041	0.059	0.043
Number of doctors per 1000 persons in region	0.032	**-0.153****	0.017	0.022	0.005
Emissions in atmosphere (tons on km2) in region	0.010	-0.011	-0.007	0.012	-0.006
The logarithm of incomes per capita in region	-0.061	-0.066	0.001	-0.015	0.081
Male	**-0.128****	-0.095	**-0.265****	**-0.362****	**-0.152****
Constant	**-2.248****	0.184	**-2.306****	**-2.332****	**-1.849****
Observations	7176	7480	7252	7196	6521

Table 1 (continued).

	Diseases			
	Backbone	Diabetes	Heart attack	Hypertension
Age /10	**0.205*** **	-0.096	**0.415** **	-0.020
Age squared /100	0.001	**0.031*** **	0.002	**0.035*** **
Number of children	0.037	-0.071	0.066	0.004
The logarithm of incomes of other members of a family per person	0.008	0.010	0.021	-0.009
Number of members of a family	-0.013	0.022	-0.018	**-0.037** **
Married	-0.025	-0.007	0.111	**0.089***
The logarithm of the wage rate	-0.023	0.002	**-0.159** **	**-0.048** **
The smoking experience / Age	0.033	-0.021	0.112	-0.031
Does not consume alcohol	**0.097***	**-0.209** **	**0.307** **	-0.021
Consumes > 200g (100) of alcohol a month	-0.039	0.112	-0.422	0.133
Plays sports	-0.056	**-0.204***	0.184	**-0.190** **
Fear of losing work	0.045	0.107	-0.021	0.064
Workaholic	0.004	**0.238***	-0.150	-0.036
Director	-0.052	0.036	-0.156	0.118
Satisfied with a life	-0.103	0.153	0.120	-0.145
Food: meat is not enough	0.077	-0.065	0.216	0.009
Food: It is a lot of meat	**0.122***	**0.265** **	0.049	-0.046
Food: It is not enough fruit	-0.154	-0.264	-0.237	-0.055
Food: It is a lot of sweets	-0.051	-0.018	-0.042	-0.071
There is no water sewage	**0.094***	-0.091	-0.106	-0.079
Index of body weight	**-0.009***	**0.032** **	0.006	**0.047** **
Living space per person	0.000	-0.001	0.000	0.000
Routine inspections of the doctor	**0.104***	0.106	0.015	**0.082***
Policy of obligatory medical insurance	-0.037	0.101	0.046	-0.034
Policy of additional medical insurance	**0.166***	0.035	-0.021	0.081
Secondary professional education	-0.021	-0.017	0.032	-0.037
Higher education	**0.131** **	**0.153***	-0.189	-0.063
2001	**-0.096***	**-0.202** **	-0.006	**-0.298** **
2002	**-0.263** **	**-0.339** **	**-0.201***	**-0.496** **
Northern, Northwest regions	**0.523** **	0.048	0.276	**-0.157***
Volga, regions Volgo-Vjatsky	-0.063	-0.048	**0.275***	0.061
The north Caucasus	**0.366** **	-0.225	-0.019	-0.083
Urals mountains	0.069	0.018	0.087	-0.033
Western Siberia	**0.318** **	-0.016	-0.084	**-0.210** **
The far east	**0.456** **	-0.171	-0.165	-0.119
The regional centre except Moscow and Petersburg	-0.170	0.183	0.385	**0.361** **
City of regional submission	**-0.267***	0.128	0.297	**0.492** **
Village	**-0.412** **	0.089	0.227	**0.514** **
Number of doctors per 1000 persons in region	0.028	0.036	**0.103***	-0.017
Emissions in atmosphere (tons on km2) in region	-0.002	**-0.021***	**-0.026***	-0.007
The logarithm of incomes per capita in region	**-0.149***	0.029	0.124	**0.213** **
Male	**-0.110** **	**-0.267** **	**0.291** **	**-0.174** **
Constant	-0.252	**-3.731** **	**-5.784** **	**-3.551** **
Observations	6588	7664	7793	5490

*** - 1% , * - 5% significance*

Table 2. Estimation of the Mincer equation: the pooled model, probit Model of employment, model with Heckman correction, Fixed effect, Random effect. RLMS, 2001-2005.

	Employ-ment Model	Models for wages			
		Without correction	Heckman correction	Fixed effect	Random effect
High school diploma		**0.0367***	0.0340	-0.0126	0.0281
Professional courses		0.0102	0.0112	-0.0074	0.0019
Professional school without secondary education diploma		0.0092	0.0045	-0.0300	-0.0056
Professional school with secondary education diploma		0.0057	0.0038	-0.0622	-0.0227
Secondary professional diploma		**0.0750****	**0.0657****	-0.0113	**0.0555****
University diploma		**0.3088****	**0.2921****	0.0692	**0.2654****
2-3 years of University		**0.1447****	**0.1421****	0.0554	**0.1509****
Postgraduate study		**0.1347***	**0.1322***	0.0864	0.1151
Working experience /10		**0.2384****	**0.2157****	**0.2664***	**0.2352****
Working experience /10 square		**-0.0629****	**-0.0569****	**-0.0630****	**-0.0606****
The experience at the given enterprise /10		**0.0181***	**0.0193***	-0.0284	0.0131
The logarithm of working hours		**0.2662****	**0.2646****	**0.2093****	**0.2368****
Works not at the enterprise		**0.2509****	**0.2503****	**0.1285****	**0.2067****
Number of workers at the enterprise		0.0033	0.0034	0.0007	**0.0040***
The enterprise with the foreign property		**0.1917****	**0.1904****	0.0404	**0.1428****
The enterprise with a private property		**0.2343****	**0.2329****	**0.0771****	**0.1894****
Military		**0.5403****	**0.5373****	0.1284	**0.4099****
Directors		**0.6596****	**0.6561****	**0.2292****	**0.5257****
Experts of a highest level of qualification		**0.4416****	**0.4364****	**0.2367****	**0.3956****
Experts of an average level of qualification		**0.4139****	**0.4087****	**0.1482****	**0.3381****
Office workers		**0.3127****	**0.3049****	0.0663	**0.2481****
Workers of sphere of services and trade		**0.2242****	**0.2205****	0.0600	**0.1909****
Operators of mashines		**0.4433****	**0.4381****	**0.1758****	**0.3693****
Industrial workers		**0.4442****	**0.4387****	**0.1921****	**0.3665****
Married	**0.1894****	0.0246	0.0170	0.0041	0.0102
Number of children		-0.0057	-0.0095	-0.0089	-0.0177
The logarithm of nonlabour personal incomes	**-0.1741****				
The logarithm of incomes of other members of a family	**-0.0283****				
Age	**0.0148****				
Number of children <= 3 years old	0.0089				
Number of children 4 -6 years old	**0.1041****				
Number of children 7 -17 years old	**0.1107****				
Number of Members of a family	**-0.0259****				
Secondary professional education	**0.3167****				
University diploma	**0.6186****				
Rate of unemployment in the region	**-0.0399****				
The logarithm of wage in the region		0.7798**	0.7718**	0.8065**	0.7987**

Table 2 (continued).

2002	-0.0496	0.0303	0.0319	0.0524	0.0401*
2003	0.0061	0.0656**	0.0677**	0.0864	0.0730**
2004	0.0050	0.0621**	0.0636**	0.1140	0.0839**
2005	-0.0459	0.1017**	0.1092**	0.1362	0.1142**
Northern, Northwest regions	0.3675**	0.0962**	0.0945**		0.0930*
Volga, regions Volgo-Vjatsky	0.0447	-0.0803**	-0.0772**		-0.0948**
The North Caucasus	-0.0751*	0.0531*	0.0665**		0.0694*
Urals Mountains	0.1246**	-0.0897**	-0.0919**		-0.1057**
Western Siberia	0.1008**	-0.1043**	-0.1006**		-0.1175**
The Far East	0.1642**	-0.3004**	-0.2966**		-0.3044**
Moscow, Petersburg	**-0.0805**	**0.3395****	**0.3414****		**0.3443****
The regional centre except Moscow and Petersburg	**0.1886****	**0.3215****	**0.3144****		**0.3316****
City of regional submission	**0.2431****	**0.2987****	**0.2894****		**0.3054****
Male	**0.3574****	**0.3797****	**0.3623****		**0.3860****
Variables in a year T-1					
Smoker		**0.0812***	**0.0854***	0.0611	**0.0927****
The smoking experience / Age	**-0.2129****	**-0.1745****	**-0.1736****	-0.2240	**-0.2170****
Did not consume alcohol	**-0.2365****	**-0.0426****	**-0.0301***	-0.0018	**-0.0248***
Playing sports	**-0.1359****	**-0.0969****	**-0.0903****	-0.0080	**-0.0576***
Fear of losing job	**-0.1131****	**0.0486****	**0.0558****	0.0068	**0.0371****
The workaholic		0.0097	0.0074	0.0311	0.0218
The director		0.0265	0.0239	0.0274	0.0328
Satisfied with his life	-0.0256	**0.0896****	**0.0951****	-0.0193	0.0389
Food: meat is not enough	**-0.1077***	-0.0483	-0.0455	-0.0310	-0.0303
Food: It is a lot of meat	**0.1114****	**0.0992****	**0.0959****	-0.0120	0.0361
Food: It is not enough fruit	**-0.0723***	-0.0232	-0.0216	0.0216	-0.0022
Food: It is a lot of sweets	0.0578	**0.0929****	**0.0911****	-0.0056	**0.0494****
There is no water drain	**0.0149****	**0.0035****	**0.0028***	-0.0027	0.0014
Inverse Mill's ratio			**-0.1427****	**-0.1883****	**-0.1514****
Constant	-0.3483	**-1.1330****	**-0.9569****		**-0.9363****
Observations	25314	10977	10968	10968	10968
R-squared		0.40	0.40		

*** - 1% , * - 5% significance*