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Health Status of Working Pensioners

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***Abstract*—This article draws out two points of view regarding the health of working pensioners. The study presented in the article is aimed at testing two hypotheses put forward on the basis of analysis of theoretical models and sociological surveys of the population. The first hypothesis is about that the labor activity of pensioners contributes to the preservation of their health, and the second – only those healthy pensioners continue to work. As a criterion for verifying the research hypotheses, two multivariate linear regression models were constructed that estimated the statistical relationships between employment, health status of pensioners, and other variables. Based on the calculation of determinant of correlation matrix, the presence of a linear relationship between the explanatory variables in the regression models was excluded. The study was conducted on the example of women of 55-59 years of age according to statistical data. The results of the regression analysis confirmed only the first hypothesis, the second one was rejected.**

Keywords—health, employment, elderly, labor activity, regression, pair correlation.

I. Introduction

Recently developed state measures in the field of improving the quality of life of elderly population are based on a new approach, which focuses not so much on providing various mechanisms of social protection as on stimulating the development and use of the potential of the elderly. Within the framework of this approach, new terms have appeared relatively recently – people of the "third age" [1] and the "fourth age" [2], who deny past ideas about old age. The concept of active longevity, formed in the 1990s and aimed at solving the problem of aging populations, was also widely used [3]. According to the World Health Organization [4], active longevity is the process of optimizing opportunities in terms of health, participation and security in order to improve the quality of life as people age. Here, the labor and physical activity of the elderly is considered as the basis of their health [5]. These ideas are reflected not only in the studies of Russian scientists [6], but also in government documents ("new pension formula", "Strategy for action on elderly citizens until 2025").

However, this approach may encounter serious barriers in the form of social stratification and differentiation in terms of health, income level, activity of the elderly population, etc. As A. Vishnevsky rightly notes [7], in Russia, in contrast to European countries, aging occurs almost entirely due to the low birth rate over many decades, and the continued high mortality rate is a significant limitation that does not allow building up the potential for active longevity. Researches Maleva T.M. and Sinyavskaya O.V. [8] showed that by the time a person reaches retirement age, he usually has a number of chronic diseases, and often disability. A population survey conducted in 2013 by the Institute of Social Analysis and Forecasting of the RANEPA (Russian Presidential Academy of National Economy and Public Administration) [9-10] showed that the reasons for stopping work to reach retirement age are poor health and fatigue, since it is they that determine the ability of an elderly person to work. At the same time, a number of sociological and medical studies [11-12] show that working pensioners are healthier. Thus, in the scientific literature there are two points of view regarding the health of working pensioners. The first point of view is based on the concept of active longevity and involves the involvement of older people in labor, which is supposed to solve not only the problems of population aging (labor shortages, burden on the employed population, etc.), but will also contribute to maintaining health. The second point of view takes into account the fact that Russian seniors approach retirement with poor health, and continued work may aggravate their condition. The study of the cause-effect relationship between the employment of pensioners and their health will make it possible to substantiate an effective state policy in the field of improving the quality of life of older people. Therefore, in the framework of this research, the objective was set – to identify these relationships.

II. Methods

Based on the considered theoretical models and sociological surveys of the population, the following research hypotheses were put forward:

- H_1: retirees continue to work, which keeps them healthy.
- H_2: only healthy retirees continue to work.

The study was conducted on the example of women 55-59 years old according to statistics for 2002-2018. To test the hypotheses H_1, the age-specific mortality rate for women 55–59 years old, ppm, was taken as the dependent variable Y_1. Obviously, in retirement age, health is clearly associated with mortality by a close correlation. In addition, if medical statistics may not reflect the full picture due to latent morbidity and the problem of detectability, then in statistical reference books the mortality rate is presented more clearly.

A number of indicators were used as input (explanatory) variables: X_1 – the proportion of women aged 55-59 years in the total amount of employees,%; X_2 – the number of doctors per 10,000 people; X_3 – emissions of air polluting substances per person, in kg; X_4 – average cash income of the population per capita (in prices of 2018), in thousand rubles; X_5 – expenses of the consolidated budget of the constituent entity of the Russian Federation and the territorial state extra-budgetary fund for health care per person (in prices of 2018), in thousand rubles.

To test the H_2 hypotheses, the proportion of women aged 55-59 in the total amount of employed, in %, was considered as a dependent variable Y_2. As input (explanatory) variables, such indicators are used as: X_6 – expected life expectancy when women reach 55 years, in years; X_2 – the number of doctors per 10,000 people; X_3 – emissions of air polluting substances per year per person, in kg; X_7 – unemployment rate (according to the methodology of the International Labor Organization),in %; X_8 – the proportion of the over the working age population in the total population, in %; X_9 – replacement rate (pension replacement level of lost earnings),in %.

The logic of the study is as follows. If the variable X_1 (in the case of solving the hypothesis H_1) is statistically significantly related to the dependent variable Y_1, then the hypothesis is not rejected (accepted). As a criterion of statistical significance, the statistical significance of the coefficient in front of the variable X_1 in multidimensional linear regression dependence was used. At the same time, the regression model should satisfy quality indicators. Similar logic was applied to solve the H_2 hypothesis. The calculations were carried out in the Statistica software.

III. Research results

To identify the relationship between the employment of women 55-59 years old and their health, a regression analysis was performed. Table I shows the correlation matrix for the input and dependent variables to test hypothesis H_1.

TABLE I. Correlation matrix for input and dependent variables

	X_1	X_2	X_3	X_4	X_5	Y_1
X_1	1.000	-0.136	-0.430	0.797	0.786	-0.848
X_2	-0.136	1.000	0.362	0.155	0.213	0.143
X_3	-0.430	0.362	1.000	-0.637	-0.483	0.787
X_4	0.797	0.155	-0.637	1.000	0.944	-0.912
X_5	0.786	0.213	-0.483	0.944	1.000	-0.846
Y_1	-0.848	0.143	0.787	-0.912	-0.846	1.000

The input variables turned out to be multicollinear – the determinant of the correlation matrix is 0.0058. After removing statistically insignificant factors (X_2 and X_4) from the model, a regression model was obtained (Tables II and III). There is no multicollinearity with respect to the three remaining significant factors – the determinant of the correlation matrix is 0.2902.

TABLE II. Results of regression analysis

	Beta	Std.Err. of Beta	B	Std.Err. of B	t(13)	p-level
Intercept			13.5647	3.64125	3.72528	0.002544
X_1	-0.41793	0.078887	-0.34714	0.065524	-5.29787	0.000144
X_3	0.466521	0.055641	0.0633	0.007551	8.38455	0.000001
X_5	-0.2925	0.081338	-0.0902	0.025092	-3.59609	0.003256

TABLE III. Results of regression analysis

Indicator	Value
Multiple R	0.9846
Multiple R^2	0.9694
Adjusted R^2	0.9623
F(3,13)	137.2551
p	0.0000
Std.Err. of Estimate	0.3658

To test the H_2 hypothesis, a correlation matrix was also constructed for the input and dependent variables; its results are presented in Table IV.

TABLE IV. Correlation matrix for input and dependent variables

	X_6	X_2	X_3	X_7	X_8	X_9	Y_2
X_6	1.000	0.024	-0.632	-0.835	0.957	0.531	0.704
X_2	0.024	1.000	0.391	-0.111	-0.206	-0.048	0.304
X_3	-0.632	0.391	1.000	0.249	-0.724	-0.861	-0.023
X_7	-0.835	-0.111	0.249	1.000	-0.780	-0.144	-0.902
X_8	0.957	-0.206	-0.724	-0.780	1.000	0.548	0.613
X_9	0.531	-0.048	-0.861	-0.144	0.548	1.000	0.049
Y_2	0.704	0.304	-0.023	-0.902	0.613	0.049	1.000

As the calculation of the determinant of the correlation matrix showed (it is 0.00027), the input variables are multicollinear, to exclude this, statistically insignificant factors (X_6, X_2 and X_8) were removed from the model. The resulting regression model is presented in Tables V and VI. There is no multicollinearity with respect to the two remaining significant factors – the determinant of the correlation matrix is 0.3045.

TABLE V. Results of regression analysis

	Beta	Std. Err. of Beta	B	Std. Err. of B	t(15)	p-level
Intercept			6.0613	21.2036	0.2859	0.7789
X_3	0.5491	0.1713	0.2121	0.0662	3.2050	0.0059
X_7	-0.9837	0.0881	-3.2787	0.2935	-11.1709	0.0000
X_9	0.3803	0.1677	0.5114	0.2255	2.2681	0.0385

TABLE VI. MAIN STATISTICS OF REGRESSION ANALYSIS

Indicator	Value
Multiple R	0.9508
Multiple R^2	0.9040
Adjusted R^2	0.8903
$F(2,14)$	65.9108
p	0.0000
Std.Err. of Estimate	0.7517

In addition, pairwise and partial correlation between the input variables and the dependent variable were calculated. The results for hypothesis H_1 are presented in Table VII, for hypothesis H_2 – in Table VIII.

TABLE VII. PAIRED AND PARTIAL CORRELATION COEFFICIENTS BETWEEN INPUT VARIABLES AND DEPENDENT VARIABLE (FOR HYPOTHESIS H_1)

i	1	2	3	4	5
$r_{x_i y_1}$	-0.848	0.143	0.787	-0.912	-0.846
$r_{x_i y_1 \backslash x_1 \ldots x_5}$	-0.744	-0.122	0.789	-0.028	-0.366

The results presented in Table VII are consistent with the results of a regression analysis. The variables X_2 and X_4 also turned out to be uncorrelated with the dependent variable Y_1 when other factors were fixed. The high pair correlation between X_2 and Y_1 was caused by the influence of other factors (the effect of multicollinearity of input variables).

TABLE VIII. PAIRED AND PARTIAL CORRELATION COEFFICIENTS BETWEEN INPUT VARIABLES AND DEPENDENT VARIABLE (FOR HYPOTHESIS H_2)

i	6	2	3	7	8	9
$r_{x_i y_2}$	0.704	0.304	-0.023	-0.902	0.613	0.049
$r_{x_i y_2 \backslash x_1 \ldots x_9}$	-0.040	0.051	0.575	-0.682	0.247	0.446

The results presented in Table VIII are also consistent with the results of regression analysis. The variables X_6, X_2, and X_8 also turned out to be uncorrelated (X_6, X_2) or weakly correlated (X_8) with the dependent variable Y_2 when other factors were fixed. The differences between the partial correlation coefficients and from the pair coefficients and, accordingly, was caused by the influence of other factors due to the multicollinearity effect.

IV. CONCLUSION

The results of the study confirmed the hypothesis about that the labor activity of pensioners preserves their health. The proportion of working women aged 55-59 years is statistically significantly related to the mortality rate of women of the corresponding age. With the remaining factors fixed, an increase in the share of working women by 1% on average reduces their average mortality by 0.347 ppm for 2002-2018, or by 3.79%. The hypothesis about the decisive role of health status in the continuation of labor activity of women of retirement age was rejected. Statistically significant factors affecting the employment of women of 55-59 years were economic growth (accompanied by anthropogenic environmental pressure in the form of atmospheric emissions), labor market tension (causing unemployment) and the level of pension provision (the level of pension replacement for lost earnings). Based on the obtained results, it can be concluded that the decision of retirees to continue working is affected more by material incentives than their health status. Hence, the existing employment of pensioners in Russia is not a result of a policy to stimulate the activity of the elderly, but the consequence of a poorly thought-out pension system that does not provide a decent level of pension. The effect of the federal law [13] is acting as a confirmation for the additional income is the main factor for the employment of pensioners. According to this law, indexation of pensions to working pensioners was canceled, which led to reduce their share from 35.7% to 22.9% only in the first year of its implementation. Therefore, in the context of an aging population and the threat of labor shortages, state policy in the field of improving the quality of life of the older generation should include the financial security of pensioners so that their labor activity is not forced, on the one hand, and the employment provision for the elderly, taking into account their capabilities and requests, on the other hand.

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