

DEMOGRAPHIC AND STATISTICAL MODELLING OF GRANDFATHERHOOD IN RUSSIA

Oksana Shubat
Mark Shubat
Ural Federal University
620002, Ekaterinburg, Russia
E-mail: o.m.shubat@urfu.ru
E-mail: Mark.Shubat@urfu.me

KEYWORDS

Grandfatherhood, grandparents, demographic modelling, statistical demographic model.

ABSTRACT

In recent years, negative demographic trends have been developing in Russia. The most important is a decline in the birth rate. Researchers are actively looking for new determinants of this process, on the basis of which measures of population policy can be developed. One of these determinants may be active grandparenting, which means the active participation of grandparents in the processes of caring for grandchildren. The aim of this study is to create a demographic and statistical model of a typical Russian grandfather, actively involved in childcare. We used the following methods: parametric and nonparametric independent samples tests (t-test, Mann-Whitney U test, median test), regression analysis, indirect method of calculations. As a result, two models were presented – statistical demographic model of the age when Russian men enter grandparenthood and demographic model of a typical Russian grandfather actively involved in childcare. Our study is a preliminary stage for a large-scale survey of grandparenting practices in Russia. The number of older people is growing fast, which makes this socio-economic group increasingly important for addressing the problems of demographic decline in Russia. Therefore, large-scale research of grandparenthood is crucial for more efficient policy-making in this sphere.

INTRODUCTION

Recent demographic trends in Russia present an alarming picture: since 2016, the country has experienced a natural population decline and falling birth rates and the period of 2019-2020 marked a significant population decline (Demographic Indicators 2020).

To address these issues, a number of state measures are being developed and implemented, including the national project “Demography” for the period until 2024, which came into force on 1 January 2019. The project aims at increasing healthy life expectancy to 67 and ensuring a rise in the total fertility rate to 1.7 children per woman. The project encompasses several federal projects dealing with specific goals (Passport of

the national project 2019). We believe, however, that these goals can be achieved not only through targeted effort but also as a result of a synergistic effect. One of the factors contributing to the growth in fertility and healthy life expectancy is the involvement of grandparents into the process of caring for their grandchildren.

There is a substantial body of international research on grandparents' role in childcare and upbringing (Sichimba at al. 2017; Nedelcu 2017; Coall at al. 2018). These studies bring to light a number of social and psychological benefits enjoyed by grandparent caregivers: for example, there is evidence that child-raising has a positive impact on grandparents' cognitive functions (Arpino and Bordone 2014), that it enhances their subjective well-being (Mahne and Huxhold 2015), reduces the risk of depression (Grundy 2012), and decreases the mortality rates in elderly people (Hilbrand at al. 2017). There are studies focused on grandparents' positive influence on the well-being of their grandchildren, for instance, on their academic performance (Del Boca at al. 2018). Some studies highlight the role of grandparents in helping families surmount crises (Attar-Schwartz and Buchanan 2018).

At the same time, the level of grandparents' involvement in childcare may differ across countries and regions. For example, there is evidence that it varies significantly across northern and southern European countries (Buchanan and Rotkirch 2018). The intensity of grandparental involvement may also change with time: for instance, as is shown in (Chapman at al. 2017), Finnish children born in 1869 spent on average four years with at least one of their grandmothers and one year with at least one of their grandfathers; for children born in 1950, these figures rose to 24 and 13 years respectively.

In Russia, grandparents have traditionally played an important role in providing childcare and support. Unfortunately, there are currently no studies in Russia that would provide reliable data on grandparenthood, which precludes efficient policy-making in the social and demographic sphere. At the same time, obtaining such assessments could become the basis for the development of those measures of state social and demographic policy that would contribute to a more effective solution of demographic problems in the country.

In Shubat and Bagirova (2020), we presented a demographic-statistical model of a typical Russian grandmother actively involved in childcare. The aim of this study is to create a demographic and statistical model of a typical Russian grandfather, actively involved in this process.

DATA AND METHODS

In order to model the specific features of Russian grandfathers, we had to address two methodological tasks.

First, we needed to identify the socio-demographic group of grandfathers as men with grandchildren. Despite the fact that the Russian government pays close attention to the problems of senior citizens (measures to support the elderly are specified in the above-mentioned national project “Demography”), there are currently no large-scale national surveys of grandparenthood in Russia. Therefore, there is a perceived lack of statistical data on the size of this group and the criteria that can be applied to identify who belongs to it. Based on the data available in Russian statistics, we found it possible to identify this group based on the age criterion. Therefore, we had to find at what age Russian men and women enter grandparenthood.

The age of grandparenthood is easier to calculate for women with the help of the statistical indicator “Mean age at first birth (the mean age of women at the birth of their first child)”. We need to add up these indicators for the two consecutive generations of women to calculate the mean age of entering grandmotherhood. However, it was impossible to use the same approach to estimate at what age Russian men enter the age of grandfatherhood as there are no data on the mean age at first birth for men. Therefore, we had to build a more complex statistical demographic model. To this end, we used the following statistical data sources:

- mean age at first birth (for women);
- average age at marriage (for women);
- average age at marriage (for men).

The data were provided by the Human Fertility Database, a joint project of the Max Planck Institute for Demographic Research and the Vienna Institute of Demography (The Human Fertility Database 2021). We also relied on the data of the annual demographic report “Population of Russia” (Collection of indicators 2020), whose estimates are based on the Russian and international official statistics.

Second, it is important to note that focusing exclusively on the age criterion makes it possible to identify only the socio-demographic group of potential grandfathers. However, not all Russian men who have entered the age of grandparenthood are actually grandfathers and not all of them take an active part in childcare. Therefore, we had to distinguish between actively involved and disengaged grandparents. As noted above, in Russia no research on the problems of grandparenthood is currently conducted. The only source of valid and reliable data to build a demographic

and statistical model of a typical Russian grandfather actively involved in childcare is the federal statistical survey “Comprehensive Monitoring of Living Conditions” (Comprehensive Monitoring of Living Conditions 2018) conducted by the Federal State Statistics Service of Russia. The survey's results are considered representative not only of the country in general but also of specific regions and socio-demographic groups. The most recent data were collected in 2018. We used some of the questions from this survey to build a model of a typical Russian grandfather actively involved into childcare.

The question we used to identify such men was as follows: “Do your daily activities include unpaid care for children, your own or somebody else's?”. Grandfathers who gave a positive answer to this question were identified as grandfathers actively involved into childcare.

To build our model we used the following variables:

- Var 1: age (years);
- Var 2: educational level (years spent on education);
- Var 3: marital status;
- Var 4: place of residency (urban or rural area);
- Var 5: social activities – visiting theater, cinema, sports, religious events, cafes and restaurants traveling around the country and abroad in the last year. These variables were used to build a new one (Var 5), reflecting the total number of grandfathers' activities in the last year;
- Var 6-9: health-related variables - objective and subjective health estimations:
 - ✓ Var 6: frequency of health practitioner visits;
 - ✓ Var 7: frequency of ambulance calls;
 - ✓ Var 8: self-assessment of health (from 1 – “very bad” to 5 – “very good”);
 - ✓ Var 9: self-assessment of the opportunity to lead an active life.

We suppose that these variables can determine grandfathers' engagement in childcare. For example, we suppose that those grandparents who are more active socially also tend to be more actively involved in raising their grandchildren while healthier grandparents are also more likely to be willing to take care of their grandchildren and so on.

To study the specific characteristics of such grandparents, we analyzed the statistical differences between this group and the group of grandparents that disengaged from childcare. For this purpose we used the following parametric and nonparametric independent samples tests:

- t-test;
- Mann-Whitney U test;
- median test

These statistical tests were chosen for the following two reasons: first, they are suitable for different types of data with different characteristics of distribution. In our study the tested variables were measured in different scales and the distribution of some variables differed

from the normal. Second, in contemporary research literature, there is no universal agreement regarding the applicability or benefits of this or that test, in each case the authors' own experiments and simulations were used to show the effectiveness of the chosen test (see, for example, (Gibbons and Chakraborti 1991; Hollander et al. 2013; Mood 1954; Zar 2018; Zimmerman 1987)). In our analysis, we considered the differences between the groups to be confirmed if at least two of the significance tests we used showed a positive result.

For dichotomous and categorical variables, we used crosstabs to model for differences and computed the Phi coefficient and Cramer's V. We also used econometric modelling, that is, estimated a regression model by the OLS method.

RESULTS

The main results of our study are as follows.

1. We used the available statistical data to build a statistical demographic model of the age when Russian men enter grandparenthood (see Figure.1).

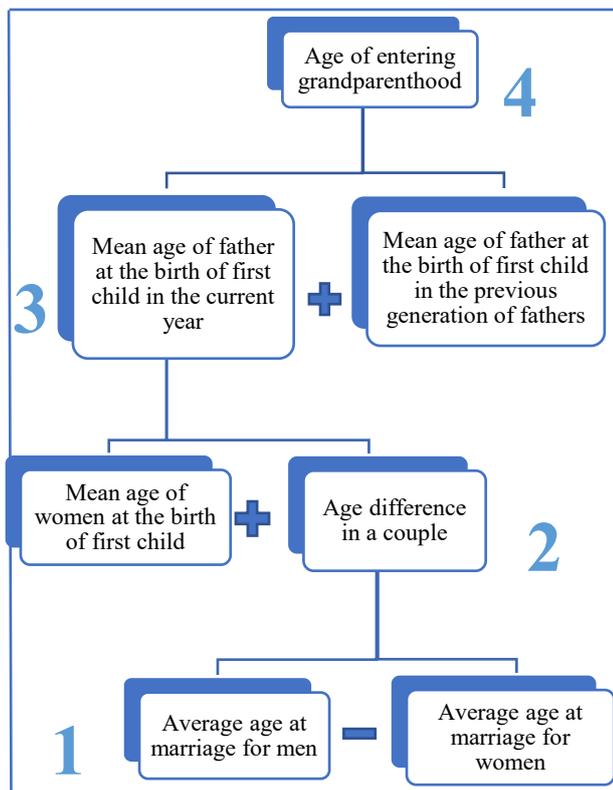


Figure 1: Statistical Demographic Model of the Age When Russian Men Enter Grandparenthood

2. Relying on the above-described model and the available statistical data, we were able to estimate the mean age of entering grandparenthood for Russian men in 2007-2016 (see Table 1).

Table 1: Mean Age at Grandfatherhood in Russia in 2007-2016

Year	2007	2008	2009	2010	2011
Mean age	51,9	52,1	52,3	52,3	52,3
Year	2012	2013	2014	2015	2016
Mean age	52,4	52,6	52,8	53,07	53,1

3. As noted previously, the most recent information that can be used for demographic modelling of a typical Russian grandfather refers to 2018. To calculate the mean age of entering grandparenthood for this year we used econometric modelling, more specifically, we estimated a trend model. Visualization of the primary data highlighted a linear trend. According to the econometric model (see Tables 2-3), the mean age of entering grandfatherhood in 2018 was 53.3.

Table 2: Model Summary

R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
0.961	0.956	0.079	196.7	0.000

Table 3: Coefficients

Model		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
1	Constant	-192.349	17.457	-11.018	0.000
	Year	0.122	0.009	14.026	0.000

4. We applied the age-related criterion to form two groups of grandfathers – “active” (engaged in childcare on a daily basis) and “inactive” (disengaged from active childcare). As a result of the selection process, the first group comprised 1,562 respondents, while the second, 16,091. Thus, grandparents taking care of their grandchildren on a daily basis account for only 9% of the whole populatio.

5. We tested for the significance of the differences and found that the major differences between the two groups of grandfathers are related to the following:

- Var 1: age (“active” grandfathers tend to be younger);
- Var 2: education (“active” grandfathers have a higher level of education);
- Var 5: social activity in different spheres (“active” grandfathers are also more prone to be socially active - they more often go to the cinema or theatre, to cafes and restaurants or sports events);
- Var 8: self-assessed health status (“active” grandfathers rate their health higher).

Test results are presented in Tables 4-8. In particular, Table 4 shows mean values of the variables analysed in two groups of grandfathers. Table 5 provides results of testing the significance of these mean values' differences; the equality of variances in the groups compared was verified preliminarily using Levene's Test. The results show that differences for all variables tested are statistically highly significant ($p < 0.001$).

Tables 6 and 7 present results of nonparametric Mann-Whitney Test, which we used to test whether two samples are likely to derive from the same population. As the data show, null hypotheses (H_0 : The two populations are equal) were not confirmed ($p < 0.001$), which testifies to the significance of the differences identified by comparing two groups of grandfathers. Table 8 shows results of comparing medians of the variables studied. Tests proved that differences between medians are statistically significant ($p < 0.01$).

Table 4: Group Statistics (t-test)

Variable	Is childcare a part of daily activities?	N	Mean
Var 1	Yes	1562	62.91
	No	16091	65.43
Var 2	Yes	1556	12.18
	No	15993	11.80
Var 5	Yes	1562	0.83
	No	16091	0.60
Var 8	Yes	1561	3.03
	No	16075	2.90

Table 5: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Sig. (2-tailed)
Var 1	1*	156.368	0.000	-11.691	0.000
	2*			-14.374	0.000
Var 2	1*	15.380	0.000	5.675	0.000
	2*			6.183	0.000
Var 5	1*	43.438	0.000	8.134	0.000
	2*			7.257	0.000
Var 8	1*	89.929	0.000	7.876	0.000
	2*			8.720	0.000

* 1 – Equal variances assumed
2 – Equal variances not assumed

Table 6: Ranks (Mann-Whitney Test)

Variable	Is childcare a part of daily activities?	Mean Rank	Sum of Ranks
Var 1	Yes	7544.27	11784157.00
	No	8951.52	144038874.00
Var 2	Yes	9436.24	14682791.50
	No	8710.67	139309683.50
Var 5	Yes	9740.63	15214857.50
	No	8738.31	140608173.50
Var 8	Yes	9626.57	15027071.00
	No	8740.03	140495995.00

Table 7: Mann-Whitney Test Statistics

	Var 1	Var 2	Var 5	Var 8
Mann-Whitney U	1.06E+07	1.14E+07	1.11E+07	1.13E+07
Wilcoxon W	1.18E+07	1.39E+08	1.41E+08	1.40E+08
Z	-10.429	-5.453	-8.749	-7.926
Asymp. Sig. (2-tailed)	0.000	0.000	0.000	0.000

Table 8: Median Test Statistics

	Var 1	Var 2	Var 5	Var 8	
Median	64.0	12.0	0.0	3.0	
Chi-Square	77.4	7.7	72.7	9.0	
Asymp. Sig.	0.000	0.006	0.000	0.003	
Yates' Continuity Correction	Chi-Square	76.9	7.6	72.2	8.7
	Asymp. Sig.	0.000	0.006	0.000	0.003

6. The test results were used to build the following demographic model of a typical Russian grandfather actively involved in childcare (see Figure 2).

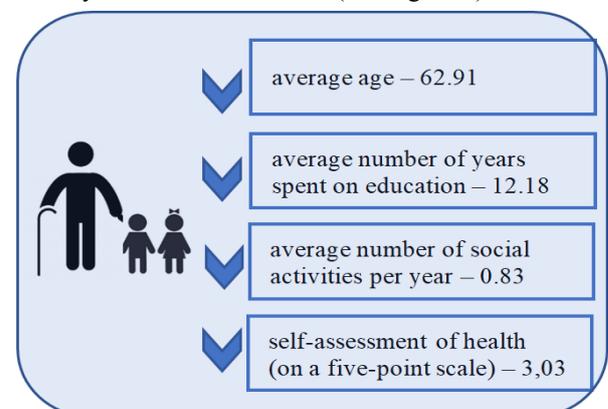


Figure 2: Demographic Model of a Typical Grandfather Actively Involved in Childcare

DISCUSSION

The following comments can be made regarding the results of our analysis.

First, it is necessary to comment on the specificity of the proposed statistical demographic model for estimating the age when Russian men enter grandparenthood. The model is based on the available statistical data, that is, the set of indicators assessed by the national statistical services. The model is also designed taking into account the length of the time series used in the study. However, this model can be applied in other countries, where, like in Russia, no specialized surveys of grandparenthood are conducted. The set of indicators used in the model is quite typical of national statistical systems and is by no means unique to Russia.

Undoubtedly, if the set of demographic indicators is expanded, there are more accessible data and large-scale surveys are conducted, especially regarding fatherhood statistics, the above-described indirect estimations may be subject to some corrections.

Second, the proposed model of an “active” grandfather - the one actively engaged in daily care for their grandchildren – also has room for improvement. In our study we used the data of the federal statistical survey “Comprehensive Monitoring of Living Conditions”, which is conducted once in every two years and the currently available data cover four time periods. Further research avenues may include comparative analysis of demographic and statistical models of active Russian grandfathers based on the data for different years. Such analysis will make the model more reliable and robust and will help reveal the model's changes over time.

Third, in Russia there are long-standing social, demographic and economic disparities across regions, which means that there might be also specific regional models of grandparenthood. Therefore, special studies investigating such regional models are necessary. It should be noted that those information resources that are currently available in Russia are suitable for regional-data analysis.

Fourth, our results have shown that the group of grandparents actively involved in childcare is quite small. At the same time, there are a number of studies we mentioned earlier, that confirm the high importance of this socio-demographic group. Therefore, in order to tackle the demographic (and other) issues more efficiently, the Russian government needs mechanisms to encourage active grandparenting, especially financial incentives such as payments to grandparents for the time spent looking after their grandchildren while their parents work or study. Such possibilities were explored in our previous publications (see, for instance, [14]).

It should be noted that the actual scale of grandparents' involvement in childcare is obviously greater. Indeed, grandparents can help parents from time to time or even regularly, but not every day. Unfortunately, there are no specialized studies that would estimate the scale of such involvement. The

currently available statistical and demographic resources do not provide such data.

Fifth, there is a number of issues concerning the specific characteristics of Russian grandfathers that our analysis has revealed. The fact that they are more active socially and, according to their own assessments, enjoy good health can be a reason for their active involvement in childcare or, vice versa, its result. This issue, therefore, requires further research. Nevertheless, the very fact of this correlation (regardless of its direction) supports the existing evidence regarding grandparenting practices in other countries and shows certain positive socio-psychological effects of grandparent-grandchild communication. This consideration can serve as one more argument to support the view that more incentives are necessary to encourage grandparents to engage in childcare.

CONCLUSIONS

This study proposes a statistical demographic model for estimating the mean age of entering grandparenthood for Russian men. This model relies on the indirect estimation of the Russian statistical data. It can also be applied for research in other countries whose national statistical organizations use a similar set of demographic indicators.

Our demographic model of a typical Russian grandfather who is actively engaged in childcare shows that such men are generally better educated, are more active socially and, according to their self-reported health status, enjoy better health.

The proposed models can be further improved by developing national demographic statistics, expanding the range of indicators and conducting special grandparenthood surveys.

Our findings demonstrate why more active involvement of grandparents into childcare is such a pertinent task and how the government can stimulate such involvement.

It should be noted that this study is a preliminary stage for a large-scale survey of grandparenthood practices in Russia. The number of older people is growing fast, which makes this socio-economic group increasingly important for addressing the problems of demographic decline in Russia. Therefore, large-scale research of grandparenthood is crucial for more efficient policy-making in this sphere.

ACKNOWLEDGMENTS

The reported study was funded by RFBR, project number 20-011-00280.

REFERENCES

- Attar-Schwartz, S. and A. Buchanan. 2018. “Grandparenting and adolescent well-being: evidence from the UK and Israel”. *Contemporary Social Science*, Vol 13(2), 219-231.
- Buchanan, A. and A. Rotkirch 2018. “Twenty-first century grandparents: global perspectives on changing roles and

- consequences". *Contemporary Social Science*, Vol 13(2), 131-144.
- Chapman, S.; M. Lahdenperä; J. Pettay; and V. Lummaa. 2017. "Changes in length of grandparenthood in Finland 1790-1959". *Finnish Yearbook of Population Research*, No. 52, 3-13.
- Coall, D.A.; S. Hilbrand; R. Sear; and R. Hertwig. 2018. "Interdisciplinary perspectives on grandparental investment: a journey towards causality". *Contemporary Social Science*, No. 13(2), 159-174.
- Collection of indicators of the Annual Demographic Report "Population of Russia". Moscow: Demoscope. URL: http://www.demoscope.ru/weekly/edd/edd_tab.php (access date 17.10.2020).
- Comprehensive monitoring of living conditions. 2018. Moscow: Rosstat. URL: https://gks.ru/free_doc/new_site/KOUZ18/index.html (access date 10.01.2021).
- Del Boca D.; D. Piazzalunga; and C. Pronzato. 2018. "The role of grandparenting in early childcare and child outcomes". *Review of Economics of the Household*, Vol. 16(2), 477-512.
- Demographic Indicators of the Federal State Statistics Service of Russia. 2021. Moscow: Rosstat. URL: <https://rosstat.gov.ru/folder/12781> (access date 20.01.2021).
- Gibbons, J.D. and S. Chakraborti. 1991. "Comparisons of the Mann-Whitney, Student's t, and Alternate t Tests for Means of Normal Distributions". *The Journal of Experimental Education*, 59:3, 258-267, DOI: 10.1080/00220973.1991.10806565
- Grundy, E. M.; C. Albala; E. Allen; A. D. Dangour; D. Elbourne; and R. Uauy. 2012. "Grandparenting and psychosocial health among older Chileans: A longitudinal analysis". *Aging & Mental Health*, No. 16(8), 1047-1057.
- Hilbrand, S.; D. A. Coall; D. Gerstorff; and R. Hertwig. 2017. "Caregiving within and beyond the family is associated with lower mortality for the caregiver: A prospective study". *Evolution and Human Behavior*, No. 38(3), 397-403.
- Hollander, M.; D. A. Wolfe; and E. Chicken. 2013. "Nonparametric Statistical Methods". New York: John Wiley & Sons.
- Mahne, K. and O. Huxhold. 2015. "Grandparenthood and subjective well-being: Moderating effects of educational level". *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, No 70(5), 782-792.
- Mood, A. M. 1954. "On the asymptotic efficiency of certain non-parametric 2-sample tests". *Annals of Mathematical Statistics*. 25(3), 514-522.
- Nedelcu, M. 2017. "Transnational grandparenting in the digital age: mediated co-presence and childcare in the case of Romanian migrants in Switzerland and Canada". *European Journal of Ageing*, No. 14(4), 375-383.
- Passport of the national project "Demography". 2019. Moscow: Rosmintrud. URL: <https://rosmintrud.ru/ministry/programms/demography> (accessed date 02.02.2021).
- Shubat, O. and A. Bagirova. 2020. "Russian grandparenting: demographic and statistical modelling experience". *Communications of the ECMS*, Vol. 34, Issue 1 (June), 78-83.
- Sichimba, F.; H. Mooya; and J. Mesman. 2017. "Predicting Zambian Grandmothers' Sensitivity Toward Their Grandchildren". *International Journal of Aging and Human Development*, No. 85(2), 185-203.

- The Human Fertility Database. URL: <https://www.humanfertility.org/cgi-bin/main.php> (accessed date 10.01.2021).
- Zar, J. H. 2018. "Biostatistical Analysis". Essex: Pearson Education Limited.
- Zimmerman, D.W. 1987. "Comparative Power of Student T Test and Mann-Whitney U Test for Unequal Sample Sizes and Variances". *The Journal of Experimental Education*, 55:3, 171-174, DOI: 10.1080/00220973.1987.10806451

AUTHOR BIOGRAPHIES

OKSANA SHUBAT is an Associate Professor of Economics at Ural Federal University (Russia). She received her PhD in Accounting and Statistics in 2009. Her research interests include demographic processes, demographic dynamics and their impact on human resources development and the development of human capital (especially at the household level). Her email address is o.m.shubat@urfu.ru and her webpage can be found at <http://urfu.ru/ru/about/personal-pages/O.M.Shubat/>

MARK SHUBAT is a student of the Ural Federal University. He is receiving his bachelor's degree from the Engineering School of Information Technologies, Telecommunications and Control Systems. His research interests are related to the application of methods of mathematical statistics to the study of socio-demographic processes. He is engaged in modeling and simulation of these processes.