

Economic Projections in Early Childhood Education: The Case of Four Federal Districts of Russia

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Abstract. This paper provides a review of Russian and international stud-

ies devoted to early childhood education policies, substantiating the need to forecast the demand for preschool education. Data on 2008–2018 preschool education in Central, Ural, Northwestern, and Volga Federal Districts is analyzed, and projections regarding their economic development in this sphere are made for the 2019–2031 period using Sergey Belyakov's model. The following indicators are projected for each region: the population aged 0–7; the number of preschool students; the ratio of potential enrollment to preschool capacity; the student–teacher ratio in early childhood education; and the demand for preschool teachers.

Keywords: preschool educational institutions, preschool education, early childhood education, predicting the development of preschool education, demand for early childhood education, children's participation in preschool, preschool teachers.

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A great deal of attention has been given lately to the development of preschool education, especially in terms of access improvement. The paramount objective is to reduce the number of children waitlisted, or queuing, for preschool enrollment. Trying to solve this problem, regional preschool authorities adopt long-term strategies, which means that they need not only data on the current state but also projections that make allowance for possible demographic changes in each specific region.

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from Russian by
I. Zhuchkova.

In 2018, from 60 to 90% of children aged 1–7 attended preschool institutions (kindergartens and daycare centers) in the majority of Russia's federal subjects. The 30-percentage-point gap between the boundary values results from a huge variation in the enrollment¹ of toddlers (aged 1–3) in daycare centers (from 5.2² to 66.9%³ across the regions). This factor has a decisive influence on the overall participation rate of 1–7-year-olds in preschool, as the rate for toddlers ranges between 70 and 100% in most regions of Russia⁴.

The main goal of making economic projections in early childhood education is to forecast the long-term demand for preschool places and preschool teachers in the interest of regional preschool education systems. A decrease or increase in the long-term demand for preschool teachers and places will depend first of all on the projected changes in the population aged 1–7 in the region. Such projections may serve the basis for developing and implementing managerial decisions necessary to improve the system of preschool education, namely to enhance the infrastructure and define the acceptable student–teacher ratio.

Prior to making projections, we used the 2008–2018 data to analyze the main factors influencing the development of early childhood education in Central Federal District (CFD), Ural Federal District (UFD), Northwestern Federal District (NFD), and Volga Federal District (VFD). The districts were selected to be the base for trying out the method of making economic projections in early childhood education⁵ refined by the Russian Presidential Academy of National Economy and Public Administration (RANEPA)'s Center for Lifelong Learning Economics (CLLE) in 2017. In 2015, the CLLE came up with the first version of the method, which was used to make projections for Southern and North Caucasian Federal Districts (SFD and NCFD) as well as some other regions of Russia. Those projections were published by RANEPA's North-Caucasian Institute [Kiseleva, Belova, Gukasova 2015] and Krasnogorsk Branch [Golovetsky, Ivanova, Grebenik 2015]. Further research using the refined method will produce projections for Siberian and Southern Federal Districts.

¹ Enrollment is understood as the ratio of the number of children in a specific cohort attending preschool institutions to the total population of children within that cohort in the region (yearly average rates).

² The Republic of Ingushetia (2018 statistics).

³ The Komi Republic (2018 statistics).

⁴ Except for some regions in North Caucasian Federal District (the Republic of Dagestan, the Republic of Ingushetia, and the Chechen Republic).

⁵ The method was originally developed under the guidance of Sergey Belyakov, Doctor of Sciences in Economics, Chief Researcher, Center for Lifelong Learning Economics, Institute of Applied Economic Research, Russian Presidential Academy of National Economy and Public Administration.

The number of children attending preschool and the number of preschool teachers are key indicators used for predicting the development of preschool education⁶.

1. Early Childhood Education Projections in Russia and Worldwide

Development of early childhood education has been analyzed in a number of large-scale studies in Russia and beyond in the recent years. Available findings associate high-quality preschool education with better student performance later on [OECD2013; 2014].

Providing equal access to preschool education is a major trend in education policies of many OECD countries. In the OECD countries, on average 70% of 3-year-olds are enrolled in early childhood education, although the rates vary greatly across the countries [OECD2015–2019]. As participation rates are growing, it becomes vital to provide equal access to high-quality education for all social groups and reduce the achievement gaps resulting from socioeconomic disparity [OECD2018].

The OECD' early childhood education policies can be loosely grouped into three categories, depending on whether they target development strategies, content quality, or kindergarten assessments [OECD2015].

For instance, Australia adopted the National Early Childhood Development Strategy in 2009 to support vulnerable social groups and provide universal access to early childhood education. Under the National Partnership Agreement on Universal Access to Early Childhood Education (2013–2014), every child has access to a preschool program in the 12 months prior to full-time schooling.

Poland amended its Law on School Education to make preschool education compulsory for five-year-olds and accessible to children aged 3–4 (2011, 2013). The Polish government also set up the upper limit for preschool tuition and introduced direct grants to local authorities to compensate for preschool education expenses.

Other examples include child care allowance in Slovenia, provided for by the Law on Enforcement of the Right for Public Funds (2008, 2012), one year of free early childhood education and care in Austria (2010), legal entitlement to a place in kindergarten from one year old in Norway (2009) and for 1–2-year-olds in Germany (2013), the introduction of early childhood education programs in Canada (2014), etc.

Preschool curricula have been developed in nearly all OECD countries (Iceland, Italy, South Korea, Czech Republic, Sweden, Finland, and others) to provide integrity and continuity throughout the stages of education. In addition, early childhood assessment instruments have been developed. In Australia, for example, data is collect-

⁶ Unified Interagency Statistical Information System (UISIS): <https://www.fed-stat.ru/organizations/>

ed every three years to monitor early childhood development (Early Development Instrument, 2009), and Danish municipalities must carry out language assessment of all three-year-old children to detect deficits early in life and provide the necessary support to parents (2010) [OECD2015].

Researchers around the globe have been trying to perform complex analysis of expenditure on education and its impact on learning outcomes. In this context, strategic planning at all levels of educational management becomes a pressing issue. Predictive analytics based on data obtained from management information systems is a critical tool in strategic planning, and sufficiency of available indicators to make projections and managerial decisions is a prerequisite thereof.

A study projecting the demand for preschool education in Astana, Kazakhstan, based on the population dynamics and population projections up to 2030 [Sikhayev 2012], makes the case that low preschool enrollment is one of the risk factors contributing to inequality in education, and inadequate funding drives up tuition fees, making preschool institutions inaccessible for some social groups. Population growth was projected using the cohort-component technique. Baseline data was obtained for three projection scenarios. Assumptions were based on analyzing the components of demographic change with regard to the factors involved.

In Taiwan, the population of preschool children in different school districts is constantly changing. These changes challenge school resource planning, especially in terms of teacher hiring [Ashouri et al. 2018]. The bureaus of education in charge of resource allocation are in need of accurate school-level forecasts of the number of incoming first-grade classrooms.

As a response to the declining birth rate, the government of Taiwan initiated a childcare subsidy policy to support economically disadvantaged families, which changed the demand to supply ratio in the public and private sectors. An autoregressive model was used to predict the gap between potential enrollment and kindergarten capacity up to 2027 and provide recommendations for the government on bridging that gap [Dian-Fu Chang, Ting Huang, Hsiao-Chi Chang 2018].

The approaches described above allow making well-grounded inferences about the demand for resources and teachers in early childhood education so as to devise development scenarios associated with specific managerial decisions. Those objectives are also important for regional preschool education systems in Russia.

Up to 2015, however, early childhood education research in Russia was prevalingly focused on early childhood development prospects, development of child's personality, the current state of the preschool education system, development priorities, and integrative processes in early childhood aesthetic and artistic education. Those targets were the most coherent with the goals and objectives of federal education development programs adopted, including the following: improve the

education system in the interests of a harmoniously developed, socially active, creative personality and make it a factor of economic and social progress in accordance to the priority of education declared by the Russian Federation (Federal Program for Educational Development in 2000–2005); provide conditions to satisfy the demand of people, society, and labor markets for high-quality education (Federal Targeted Program for Educational Development in 2006–2010); and ensure accessibility of high-quality education that conforms to the requirements of innovative socially-oriented development of the Russian Federation (Federal Targeted Program for Educational Development in 2011–2015) [Belyakov 2017:13–21].

Meanwhile, available studies neither analyze the existing potential of the preschool education system nor try to predict its further development with regard to key characteristic indicators.

The Federal Targeted Program for Educational Development in 2016–2020 defines its paramount goal as to create conditions for efficient development of Russian education (including early childhood education) in order to ensure accessibility of high-quality education that conforms to the requirements of innovative socially-oriented development of the Russian Federation. This program is part of Russia's State Program "Education Development 2013–2020"⁷, the main goal of which was stated as to provide a high quality of Russian education in response to population's changing demands and the long-term objectives of national socioeconomic development [Belyakov 2017:21].

As a result, early childhood education research in 2015–2017 specifically zeroed in on (i) analyzing the interactions among stakeholders in preschool education within the framework of national preschool education standards, (ii) evaluating the quality of preschool education, i. e. the system's ability to provide a range of services to meet consumers' expectations and demands as well as legal requirements, (iii) assessing early childhood teachers' professional readiness for teaching preschoolers, and (iv) identifying the regions of Russia with high and low levels of educational quality.

To achieve the goal of providing a high quality of education, economic projections have been made for early childhood education and care systems of some federal subjects of Russia. For instance, the method introduced in 2015 by Sergey Belyakov (CLLE, RANEPa) was used in 2015 and 2016 by RANEPa branch researchers to make projections for Vladimir Oblast, Moscow Oblast, Moscow, the Altai Republic, North Caucasian Federal District, and Southern Federal District [Golovetsky, Ivanova, Grebenik 2015; Kiseleva, Belova, Gukasova

⁷ [Resolution](#) of the Government of the Russian Federation No. 295 "On Approving the State Program of the Russian Federation "Education Development 2013–2020" of April 15, 2014 was declared null and void as of January 1, 2018 by Resolution of the Government of the Russian Federation No. 1642 of December 26, 2017.

2015]. In 2015, employees of a few institutions in Tambov Oblast produced a forecast of families' demand for early childhood education and care in the region [Kotenev, Simonov, Simonova 2015]. Such projections could serve the basis for regional preschool development initiatives, but they are only available for a limited number of federal subjects.

Therefore, projections of preschool education development have been made either for particular regions or the country as a whole [Sintsa 2017]. Besides, researchers normally project changes in only one of the indicators characterizing the early childhood education and care system. So far, there have been no complex predictions for all the regions of Russia or universal approaches allowing to project changes in more than one indicator (with the exception of the CLLE's research).

In 2017, based on the data obtained using a previously developed method, the CLLE refined the method of economic forecasting in early childhood education, which is used in this study to predict the development of preschool education in four federal districts.

2. Analyzing the Systems of Early Childhood Education and Care in Regions of CFD, UFD, NFD, and VFD

The state of early childhood education and care in Central, Ural, Northwestern, and Volga Federal Districts in 2008–2018 was analyzed along four region-level indicators: changes in the population aged 0–7, changes in the preschool enrollment rate among children aged 1–7, changes in the demand for preschool places in 2017⁸ among families with children aged 0–7⁹, and changes in the number of preschool students per 100 preschool places.

From 2008 to 2017, the population aged 0–7 was growing in all the regions of all the four federal districts studied. In 2018, a downward trend emerged in every region except Moscow and Moscow Oblast in CFD, Tyumen Oblast in UFD, Saint Petersburg, Leningrad Oblast, and Kaliningrad Oblast in NFD.

Using the 2017 statistics, all regions can be conventionally divided into three groups, depending on whether the demand for preschool places among families with children aged 0–7 in the region was above 90%, ranging from 70 to 90%, or below 70%. Table 1 displays the 2017 estimates for every region.

As can be seen, the demand for early childhood education and care is less than 100%, ranging from 70 to 90% in most of the regions (32 out of 49). Demand for kindergartens is higher than for daycare

⁸ In April 2019, the most recent data on children waitlisted for preschool available on the websites of national statistical offices was from 2017.

⁹ Demand for preschool places among families with children aged 0–7 is understood as the ratio of the sum of two indicators (the number of preschool students and the number of children waitlisted for preschool) to the annual average population aged 0–7 expressed as a percentage (yearly values are compared).

Table 1. CFD, UFD, NFD, and VFD regions grouped as a function of the demand for preschool places among families with children aged 0–7 in the region (based on 2017 statistics)

Regions with the demand for preschool places among families with children aged 0–7		
above 90%	from 70 to 90%	below 70%
CFD		
Ivanovo Oblast Kostroma Oblast Moscow Oblast Yaroslavl Oblast	Belgorod Oblast Bryansk Oblast Vladimir Oblast Voronezh Oblast Kaluga Oblast Kursk Oblast Lipetsk Oblast Oryol Oblast Ryazan Oblast Smolensk Oblast Tambov Oblast Tver Oblast Tula Oblast	Moscow
UFD		
Chelyabinsk Oblast	Kurgan Oblast Sverdlovsk Oblast Tyumen Oblast Khanty-Mansi Autonomous Okrug Yamalo-Nenets Autonomous Okrug	–
NFD		
Arkhangelsk Oblast Vologda Oblast Leningrad Oblast Murmansk Oblast Nenets Autonomous Okrug Novgorod Oblast Republic of Karelia Komi Republic	Kaliningrad Oblast Pskov Oblast Saint Petersburg	–
VFD		
Nizhny Novgorod Oblast Chuvash Republic Udmurt Republic	Kirov Oblast Orenburg Oblast Penza Oblast Perm Krai Republic of Bashkortostan Mari El Republic Republic of Mordovia Republic of Tatarstan Samara Oblast Saratov Oblast Ulyanovsk Oblast	–

Table 2. CFD, UFD, NFD, and VFD regions grouped as a function of the preschool enrollment rate for age 0–7 (based on 2018 statistics)

Regions with the enrollment rate			
above 80%	ranging from 70 to 80%	ranging from 60 to 70%	below 60%
CFD			
Vladimir Oblast	Bryansk Oblast Ivanovo Oblast Kaluga Oblast Kostroma Oblast Moscow Oblast Smolensk Oblast Tambov Oblast Tver Oblast Tula Oblast Yaroslavl Oblast	Belgorod Oblast Voronezh Oblast Lipetsk Oblast Oryol Oblast Ryazan Oblast	Moscow Kursk Oblast
UFD			
–	Sverdlovsk Oblast Tyumen Oblast Chelyabinsk Oblast Khanty-Mansi Autonomous Okrug Yamalo-Nenets Autonomous Okrug	Kurgan Oblast	–
NFD			
Arkhangelsk Oblast Vologda Oblast Murmansk Oblast Nenets Autonomous Okrug Novgorod Oblast Komi Republic	Kaliningrad Oblast Leningrad Oblast Pskov Oblast Republic of Karelia	Saint Petersburg	–
VFD			
–	Kirov Oblast Nizhny Novgorod Oblast Penza Oblast Perm Krai Republic of Bashkortostan Republic of Mordovia Chuvash Republic Udmurt Republic	Orenburg Oblast Samara Oblast Saratov Oblast Mari El Republic Republic of Tatarstan Ulyanovsk Oblast	–

services, because many parents, as long as they can afford it, prefer not sending their children to preschool until they reach the age of three or more (six for pre-first grade programs). In some cases, instead of attending preschool education institutions, children aged

Table 3. CFD, UFD, NFD, and VFD regions grouped as a function of the number of preschool students per 100 preschool places (based on 2018 statistics)

Regions with number of preschool students per 100 preschool places	
more than 100	fewer than 100
CFD	
Belgorod Oblast Bryansk Oblast Kaluga Oblast Kostroma Oblast Kursk Oblast Lipetsk Oblast Moscow Oblast Oryol Oblast Ryazan Oblast Tambov Oblast Yaroslavl Oblast	Ivanovo Oblast Vladimir Oblast Voronezh Oblast Moscow Smolensk Oblast Tver Oblast Tula Oblast
UFD	
Tyumen Oblast Chelyabinsk Oblast Yamalo-Nenets Autonomous Okrug	Kurgan Oblast Sverdlovsk Oblast Khanty-Mansi Autonomous Okrug
NFD	
Vologda Oblast Kaliningrad Oblast Saint Petersburg Pskov Oblast	Arkhangelsk Oblast Leningrad Oblast Murmansk Oblast Nenets Autonomous Okrug Novgorod Oblast Republic of Karelia Komi Republic
VFD	
Nizhny Novgorod Oblast Orenburg Oblast Penza Oblast Perm Krai Republic of Bashkortostan Republic of Mordovia Republic of Tatarstan Samara Oblast Udmurt Republic Ulyanovsk Oblast	Kirov Oblast Mari El Republic Saratov Oblast Chuvash Republic

0–7 are enrolled in early childhood development programs in various private child care centers, the number of which has been growing in regions lately.

In 2018, Moscow and Kursk Oblasts (CFD) showed the most troubling preschool enrollment rate of as low as 55%. The other regions were distributed as follows: 7 with the enrollment rate over 80%, 27 with the rate ranging from 70 to 80%, and 13 with the rate of 60 to 70% (Table 2).

That is to say, less than 80% of children aged 0–7 are currently enrolled in preschool education institutions in most of the regions studied.

Between 2008 and 2018, the demand for preschool places among families with children aged 0–7 consistently exceeded the preschool enrollment rate for age 0–7 in every region of all the four federal districts.

Utilization rates of kindergarten and daycare centers, i. e. the number of preschool students per 100 preschool places¹⁰, is another important indicator of early childhood education in regions. Based on the 2018 preschool utilization rate data, all the regions were split into two groups depending on whether they had more than 100 children per 100 preschool places or fewer (Table 3).

As stated above, demand for preschool places among families with children aged 0–7 exceeded preschool enrollment rates for age 0–7 in every region of all the four federal districts throughout the period from 2008 to 2018. The fact that some regions had fewer than 100 preschool students per 100 preschool places can be explained by excess preschool capacity in rural areas.

¹⁰ This indicator was estimated based on the aggregate number (urban+rural) of preschool students and preschool places.

3. Economic Projections in Early Childhood Education across the Regions of CFD, UFD, NFD, and VFD

The forecasting technique proposed by the RANEPА CLLE was used to develop long-distance projections (for 2019–2031) of the population of children aged 0–7¹¹, the number of preschool students, the ratio of potential enrollment to preschool capacity, and the demand for preschool teachers.

3.1. Projected population of children aged 0–7 up to 2031

The number of 0–7-year-olds is projected to decrease up to 2031 in all 49 regions of the four federal districts studied¹², starting with a steep drop in 2019 and continuing into a more gradual downward trend (from 2020–2026 on, depending on the region). The decrease in the number of preschool-age children will have an impact on other projected indicators¹³.

In 43 out of 49 regions, the highest population aged 0–7 was observed in 2017. In the other six regions—Moscow and Moscow Oblast in CFD, Tyumen Oblast in UFD, Saint Petersburg, Kaliningrad Oblast, and Leningrad Oblast in NFD—the rates peaked in 2018. Figures 1–5 show data from 2008 and 2018 as well as projections for 2031.

In 2031, if no targeted measures are undertaken, the population of children aged 0–7 will be lower than in 2018 in every region of the four federal districts studied. In 45 out of 49 regions—with the exception of Moscow, Moscow Oblast, Saint Petersburg, and Tyumen Oblast (autonomous okrugs not included)—it will be even lower than in 2008.

3.2. Projected number of preschool students up to 2031

According to projections of the population of preschool-age children (without regard to possible effects of the measures envisaged by the Demography National Project and the annual Presidential Address to the Federal Assembly), the number of preschool students will be lower in 2031 than in 2018 in every region of the four federal districts studied. Depending on the rate of decrease in the population of children aged 0–7, the number of preschool students will start decreasing in 2019 or in 2022–2024 in different regions. Projected number of preschool students was estimated based on the highest demand for preschool places among families with children aged 0–7 between 2015

¹¹ Population projections were made by the CLLE independently, as no projection data on population dynamics by *single year of age* in the *federal subjects of Russia* was publicly available at the time of doing this research, and neither is there any now. Population projections were calculated (allowance made for mortality and migration rates) based on the principle of extrapolating the population figures by single year of age into the next year's single-year-of-age group. The Federal State Statistics Service (Rosstat) uses the same principle to make its population projections.

¹² The trend of this region-specific projection is consistent with that of Rosstat's official nationwide projection for the same period.

¹³ A set of measures have been envisaged by the President and the Government of Russia (stated in the Demography National Project and the annual Presidential Address to the Federal Assembly) to improve the demographic situation in regions, including childcare subsidies.

Figure 1. **Changes in the population of children aged 0–7 (thousand people)**



Figure 2. **Changes in the population of children aged 0–7 in CFD regions (except Moscow and Moscow Oblast) (thousand people)**

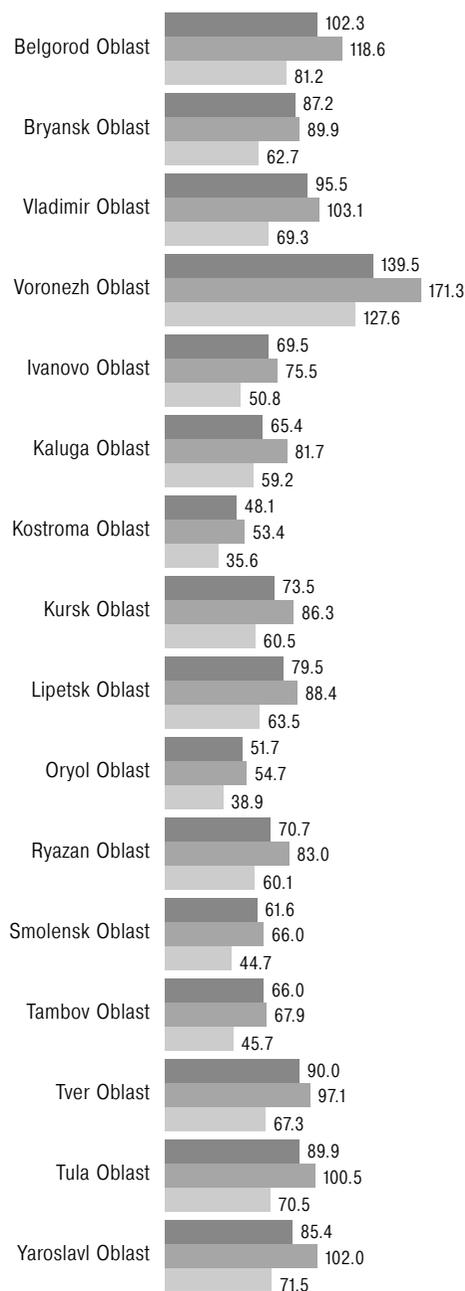


Figure 3. **Changes in the population of children aged 0–7 in UFD regions (thousand people)**

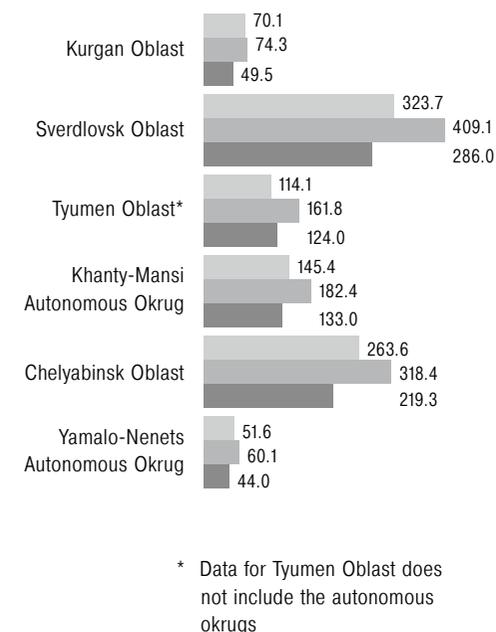
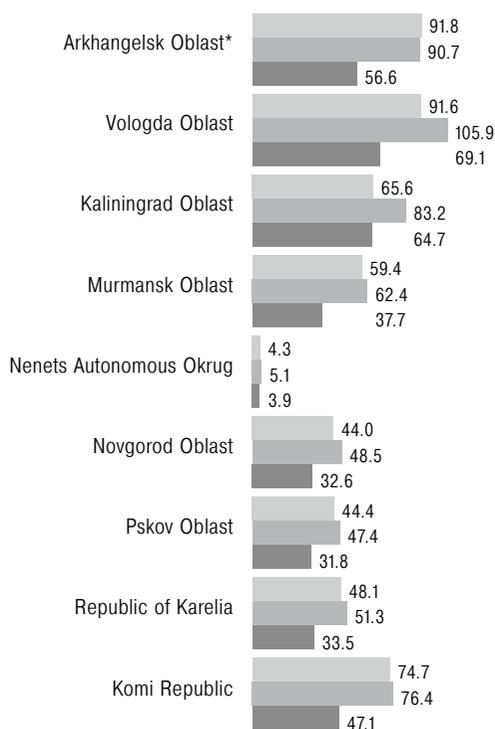


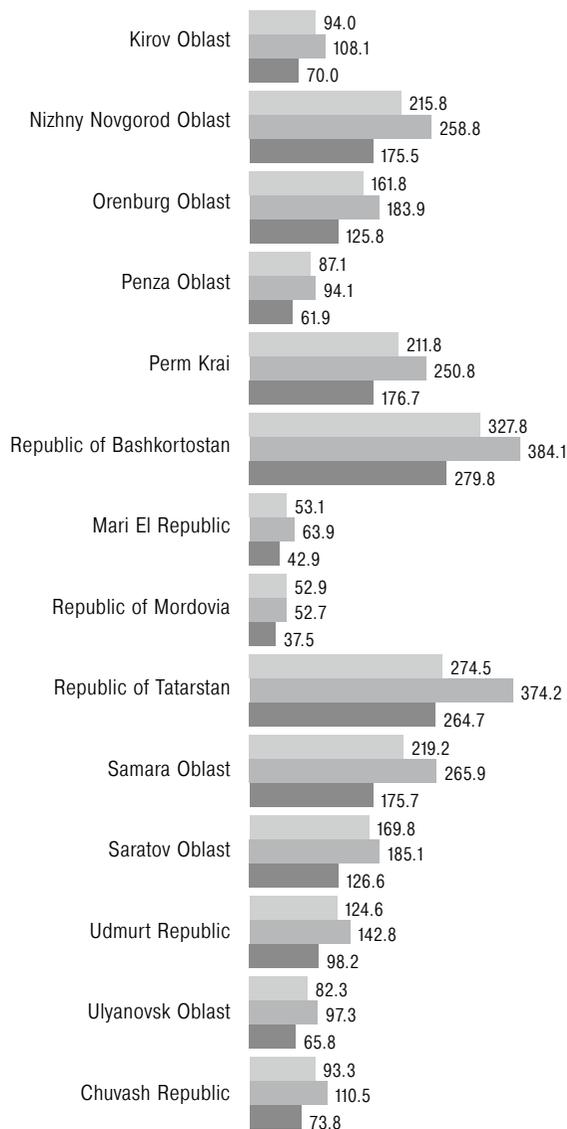
Figure 4. **Changes in the population of children aged 0–7 in NFD regions (except Saint Petersburg and Leningrad Oblast) (thousand people)**



* Data for Arkhangelsk Oblast does not include the autonomous okrug

■ 2008
■ 2018
■ Projections for 2031

Figure 5. **Changes in the population of children aged 0–7 in VFD regions (thousand people)**



and 2017 (since the most recent publicly available data on children waitlisted for preschool was from 2017). Estimates were carried out on the strict condition of stabilizing the “potential” capacity of preschool education institutions at the level of 2018, with no further extension envisaged. This condition was introduced to find out whether the regions would be able to meet the population’s future demand in

preschool education without increasing preschool capacity in case of demographic change. “Potential” preschool capacity was interpreted as either the number of preschool places or that of preschool students in 2018, whichever was greater.

At the beginning of the projection period, the demand for preschool places will still exceed the actual capacity of preschool institutions, but then (in 2023–2025, depending on the region), the situation will change, and actual preschool capacity will start exceeding the demand. This will result in excess capacity in early childhood education, which may lead to a reduction in the number of preschool teachers employed¹⁴. Regional preschool education authorities will have to make decisions concerning subsequent employment of preschool teachers. Scenarios of this kind are projected for 48 out of the 49 regions studied.

The Komi Republic (NFD) is the only region in which the actual number of preschool places will exceed the demand for those places throughout the projection period, even though the demand is one of the highest in this region (93.7% of all preschool-age children).

3.3. Projected number of preschool teachers

The number of preschool teachers depends on the student–teacher ratio, which, in its turn, depends on the type of preschool program¹⁵ and the total number of preschool students enrolled. In compliance with the Sanitary Norms and Regulations (SanPiN), maximum capacity of a preschool education institution is defined as the ratio of total surface area to the minimum required surface area per student. That is why the student–teacher ratio may vary from 8 to 20 across institutions within the same region. Projections used two versions of this indicator, the region’s average student–teacher ratio in early childhood education and the ratio of 11.8 defined in the 2018 Roadmap¹⁶.

Between 2008 and 2018, the student–teacher ratio in preschool education was constantly growing in every region of all the four federal districts studied. Projections allow assuming that it will continue growing in the long-term perspective. The 2031 projection splits regions into two groups. The first one includes regions where the student–teacher ratio will never reach the roadmap value of 11.8 by 2031: three in CFD (Kursk, Orlov, and Yaroslavl Oblasts), two in UFD (Khanty-Mansi and Yamalo-Nenets Autonomous Okrugs), six in NFD (Arkhangelsk, Murmansk, and Pskov Oblasts, Nenets Autonomous

¹⁴ Preschool teachers include regular and senior teachers, music teachers, physical education teachers, speech therapists and pathologists, child psychologists, early childhood counselors, facilitators, etc.

¹⁵ Preschool education institutions may offer drop-in, half-day, full-day, extended-day, and 24/7 programs.

¹⁶ Roadmap on Alterations in the Areas of Social Sphere Aimed at Increasing the Effectiveness of Education and Science (Resolution of the Government of the Russian Federation No. 722-r of April 30, 2014).

Okrug, the Republic of Karelia, and the Komi Republic), and two in VFD (Kirov Oblast and the Republic of Mordovia). In the remaining 36 regions, the number of preschool students per preschool teacher is projected to exceed 1.8 by 2031.

Data on the annual growth rate of the student–teacher ratio in early childhood education indicates that the demand for preschool teachers will decrease in every region of all the four federal districts throughout the projection period, as compared to 2018. If, however, the 2018 roadmap projection of 11.8 is taken as a basis, the demand for preschool teachers will increase in Tyumen Oblast (UFD) and Kaliningrad Oblast (NFD) and decrease, as in the first case, in all the other regions by 2031. Meanwhile, if the ratio of 11.8 is constant throughout the projection period, 38 out of 49 regions will face a much smaller staff reduction in preschool education than in the scenario based on the annual growth rate of the student–teacher ratio.

Scenarios of projected changes in the number of preschool teachers between 2018 and 2031 (depending on the student–teacher ratio) are visualized in Figures 6–10.

4. Conclusion

It follows from the above that the population of children aged 0–7 will decrease in all the regions of CFD, UFD, NFD, and VFD by 2031 because of the birth rate declining since 2018¹⁷.

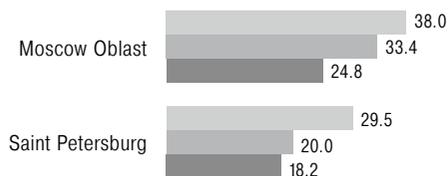
If preschool capacities are stabilized at the level of 2018 for the whole projection period in every region of the four federal districts studied, the number of preschool students will decrease by 2031 as compared to 2018.

If the student–teacher ratio in early childhood education increases every year throughout the projection period, the number of preschool teachers will be lower in 2031 than in 2018. If the ratio is stabilized at the level defined in the 2018 Roadmap (11.8), the number of preschool teachers will increase in two out of 49 regions and decrease, just as in the previous scenario, in the other 47.

All the economic projections obtained using the method proposed only show the overall picture of early childhood education development in regions, as calculations were based on aggregate data from urban and rural areas and used the demographic projections available at the time. Nevertheless, the method allows obtaining data of sufficient accuracy, provided that necessary official statistics (raw data for analysis and forecasting) are available for specific regions as well as cities, towns, villages, municipal districts, etc.

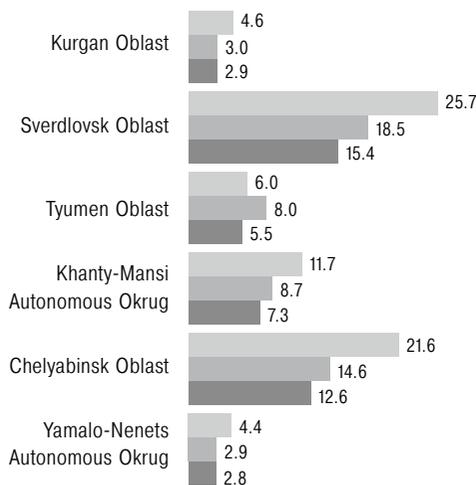
¹⁷ This prediction did not make allowance for the measures envisaged by the Demography National Project and the annual Presidential Address to the Federal Assembly. Meanwhile, demographers believe that the measures proposed cannot have a great impact on demographic processes, although small changes are not impossible (see, for instance, <https://www.youtube.com/watch?v=rgcS1lzc-M>).

Figure 6. **Number of preschool teachers in 2018 and 2031 projections** (thousand people)



Note: The number of preschool teachers in Moscow is not displayed due to invalid data (for 2018) in statistical data forms 85-K and OO-1.

Figure 8. **Number of preschool teachers in 2018 and 2031 projections for UFD regions** (thousand people)



- Number of preschool teachers in 2018
- Projected number of preschool teachers in 2031 in case the student-teacher ratio is stabilized at the 2018 Roadmap level of 11.8
- Projected number of preschool teachers in 2031 in case the student-teacher ratio grows every year

Figure 7. **Number of preschool teachers in 2018 and 2031 projections for CFD regions except Moscow and Moscow Oblast** (thousand people)

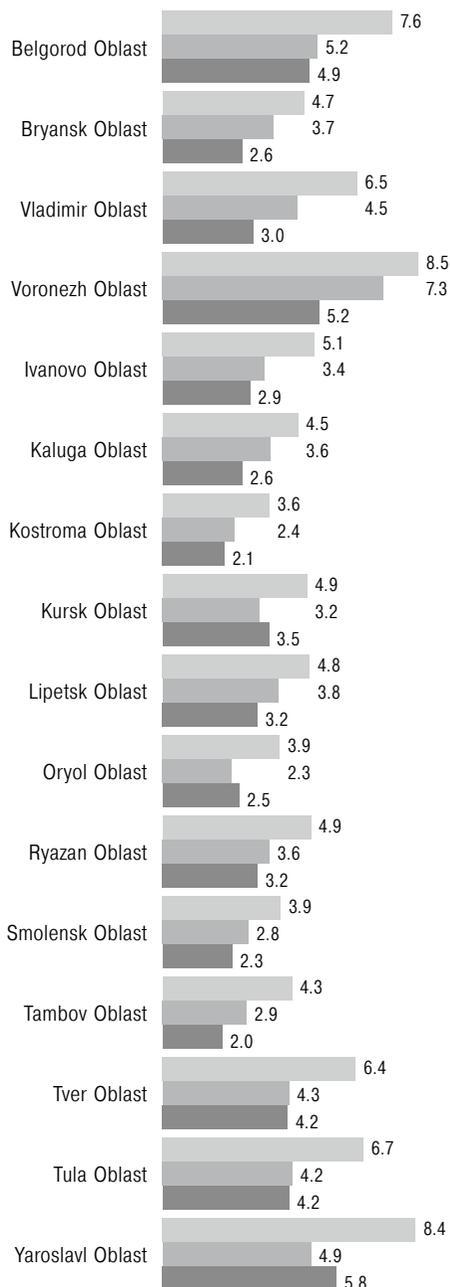


Figure 9. **Number of preschool teachers in 2018 and 2031 projections for NFD regions except Saint Petersburg** (thousand people)

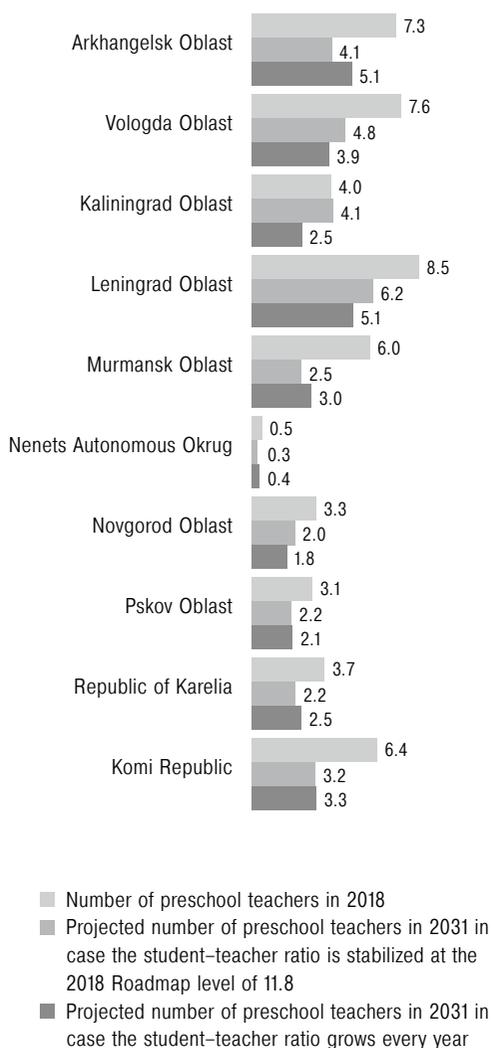
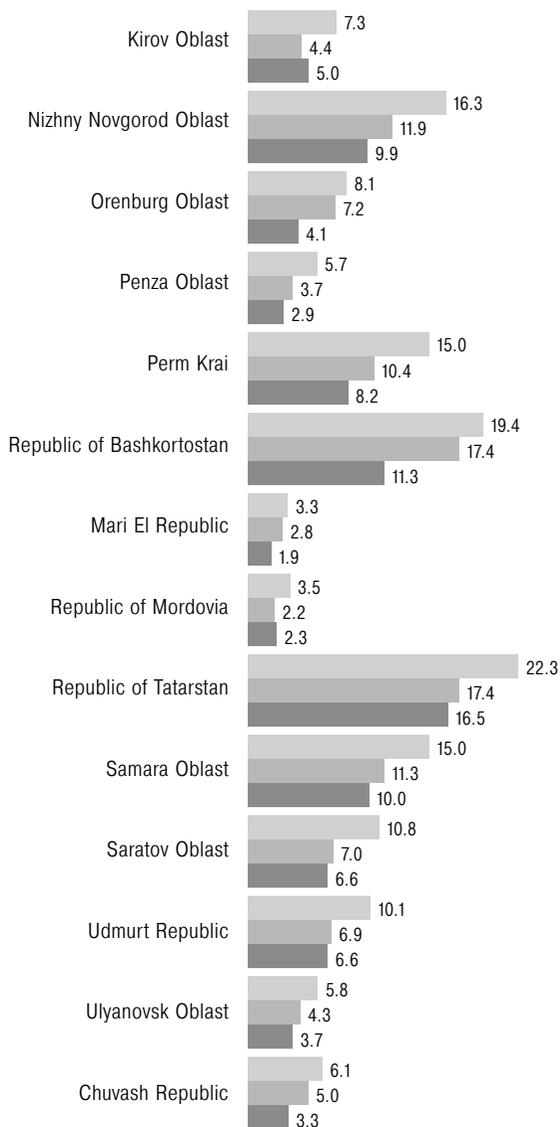


Figure 10. **Number of preschool teachers in 2018 and 2031 projections for VFD regions** (thousand people)



The method for analyzing and predicting the economic development in early childhood education used in this study was not designed to make allowance for preschool teachers' age in projecting the demand for preschool teachers. The relevant condition will be included in the method in upcoming research.

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