

ASSESSMENT OF INDICATORS OF CHILDREN EDUCATION IN SERBIA WITH IMPLICATION TO THE HEALTH LITERACY

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PROCENA INDIKATORA OBRAZOVANJA DECE U SRBIJI SA IMPLIKACIJAMA NA ZDRAVSTVENU PISMENOST

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ABSTRACT

Objective. Access to primary education is the basic right of every child. The aim of the work is to assess the status of the share of children of official primary school age who are not enrolled in school, differentiated by gender, as well as the share of children enrolled in pre-school education, in Serbia, over a period of 15 years.

Method. The research was conducted as an observational epidemiological study. The indicators analysed in this research are the "Share of children of official primary school age who are not enrolled in school" and the indicator "Gross rate of enrolment in preschool education", with observation period from 2006 to 2021.

Results. The average percentage of male children outside primary school education was 2.18%, while the percentage of female children was 2.14%. The lowest percentage was observed in 2006, and the highest increase in 2010. The linear regression showed a positive trend for both sexes. There was a significant difference in the percentage of boys and girls outside primary school education in Serbia. On average, almost 60% of children were enrolled in preschool institutions in Serbia, and this increase has shown a significant positive trend over the observed period.

Conclusion. Serbia stands at a crossroads where continued progress in education could lead to major gains in health literacy and equity. Addressing existing disparities with targeted and inclusive educational policies will be essential not only for achieving educational justice but also for building a healthier and more informed society.

Key words: child; education; health literacy.

INTRODUCTION

Access to primary education is the basic right of every child. An effective primary education can build a solid foundation and open the way for future success (1). With its profound implications for both, the individual and the society, primary education plays a key role in reducing extreme poverty and promoting social change (2). The

SAŽETAK

Uvod. Pristup osnovnom obrazovanju je osnovno pravo svakog deteta. Cilj rada bio je da se proceni status udela dece zvaničnog uzrasta za osnovnu školu koja nisu upisane u školu i razlike po polu, kao i dece upisane u predškolsko obrazovanje, u Srbiji, tokom perioda od 15 godina.

Metod. Istraživanje je sprovedeno kao opservaciono-epidemiološka studija. U ovom istraživanju analizirani su sledeći indikatori: udeo dece zvaničnog uzrasta za osnovnu školu koja nisu upisane u školu i bruto stopa upisa u predškolsko obrazovanje. Period posmatranja bio je od 2006. do 2021. godine.

Rezultati. Prosečan procenat muške dece van osnovnog školskog obrazovanja iznosio je 2,18%, dok je procenat ženske dece bio 2,14%. Najniži procenat je zabeležen 2006. godine, a najveći porast 2010. godine. Linearna regresija je pokazala pozitivan trend za oba pola. Postojala je značajna razlika u procentu dečaka i devojčica van osnovnog školskog obrazovanja u Srbiji. U proseku, skoro 60% dece je bilo upisano u predškolske ustanove u Srbiji, i ovaj porast je pokazao značajan pozitivan trend tokom posmatranog vremena.

Zaključak. Srbija se nalazi na raskrsnici gde bi kontinuirani napredak u obrazovanju mogao dovesti do značajnih poboljšanja u zdravstvenoj pismenosti i ravnopravnosti. Rešavanje postojećih razlika ciljanim i inkluzivnim obrazovnim politikama biće neophodno ne samo za postizanje obrazovne pravde već i za izgradnju zdravijeg i informisanijeg društva.

Ključne reči: deca; obrazovanje; zdravstvena pismenost.

Sustainable Development Agenda recognizes the importance of primary education in Goal 4 which stipulates that by 2030, the world should ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, including the goal of universal access to primary education (3). Although there are different standards, primary education is usually designed for children aged 6 to 11. Globally, 16% of

children and youth (which includes primary and secondary school) do not attend school. At the primary level, 1 in 10 children worldwide do not go to school. In Europe it is 1.9% (4). Education is also recognized as key to human development. In the context of international goals and commitments, the number of out-of-school children is one of the most frequently cited education statistics. It is therefore crucial that not only an appropriate definition and methodology are used, but that there is a good understanding of the results, their interpretation and limitations (5).

Data on enrollment in pre-school education by age, which are needed to identify children of primary school age, are missing for too many countries. The concept of children out of school implies that there is a group of children who should be in school but are not. This group is recognized both nationally and internationally (6).

Significant progress has been made towards achieving general primary education and the attendance rate in 2021 reached 87 percent, however, despite this, 64 million children of primary school age still do not attend school, and most of them come from marginalized groups (7).

Serbia has made significant strides in improving access to education for children, with national indicators showing nearly universal primary school attendance and high completion rates for secondary education. According to UNICEF data, over 97% of children complete primary education, and upper secondary attendance is estimated at 94% (8). However, these averages mask deep-rooted disparities that continue to affect marginalized groups such as Roma children, those living in poverty, and children with disabilities. For instance, while national lower secondary school attendance is nearly 99%, only about 28% of Roma adolescents continue to upper secondary school, compared to 79% among the poorest quintile of the general population (9).

Health literacy, especially among parents and young people, remains a concern. One study found that approximately 32% of primary healthcare users in Belgrade have inadequate functional health literacy, and an additional 14% are classified as marginal (10). In the context of pharmacotherapy, research shows that many parents of preschool children in Serbia lack the literacy required to interpret medication instructions accurately, which can lead to medication errors and poor health outcomes (7). Among adolescents, digital health literacy is emerging as a vital skill. While Serbian teenagers often report confidence in searching for health information online, many lack the ability to critically evaluate the quality and relevance of digital health content (11).

The aim of the work is to assess the status of the share of children of official primary school age who are not enrolled in school and children enrolled in pre-school education, in Serbia, over a period of 15 years and to

assess progress throughout the observed period. Also, the goal was to determine the existence of a statistically significant difference in the share of children of official primary school age who are not enrolled in school, according to gender.

SUBJECTS AND METHODS

Medical indicators are taken from the World Health Organization's publicly available database, *Health for all*, which deals with long-term evaluation and monitoring of indicators obtained from national authorities. The research was conducted as an observational epidemiological study based on macro aggregation data of the national population of Serbia. The data is anonymous and does not belong to individual citizens, so there is no need to protect data privacy.

The indicators analysed in this research are "The share of children of official primary school age who are not enrolled in school", for both sexes, in 15 years, observation period (2006 to 2021). These are the last available years after the update of the mentioned database, on January 24, 2024. The indicator "Gross rate of enrolment in preschool education" was also observed in the same period. Datasets are publicly available at: <https://gateway.euro.who.int/en/datasets/european-health-for-all-database/>.

We used IBM SPSS version 26.0 (Statistical Package for Social Science Software), to perform the tests. Descriptive statistics of continuous variables are presented as mean value, median value, and standard deviation, minimum and maximum. First, the normality of the variables was assessed, and after it was established that the data were normally distributed, a parametric test - T test was performed, with the aim of determining the existence of a statistically significant difference in gender representation, with a 95% confidence interval. A statistically significant difference is one with a p value below 0.05.

A linear trend analysis was also performed with the aim of assessing the current state of the indicators during the years observed. Regression uses the following formula to calculate its predictions: $Y = A + BX$. Regression showed the change of trend of observed indicators, defining it as positive or negative. The results are presented in Table 1 and Figure 1.

RESULTS

The average percentage of children, of both sexes, of official primary school age who were not enrolled in schools, in the observed period of 15 years, was $2.18 \pm 1.54\%$, where the minimum percentage in the observed period was 0.16% in 2006, and the maximum

Table 1. Descriptive presentation of observed indicators (2006-2021), the first and last observed year, linear trend and t-test.

Gender	Mean	Median	SD	Min	Max	1 st yr	2 nd yr	Trend	p	95% CI	
										UL	LL
Share of children of official primary school age who are not enrolled in school											
Male	2.20	1.68	1.39	0.16	4.85	0.16	3.93	Positive	<0.01	1.46	2.94
Female	2.14	1.77	1.45	0.11	5.32	0.11	3.56	Positive		1.37	2.91
Both	2.18	1.60	1.54	0.16	5.31	0.16	1.43	Negative	/	/	/
Children enrolled in preschool education											
Percent	57.75	58.27	4.97	49.61	65.37	56.84	63.79	Positive	/	/	/

SD-standard deviation; Min, Max-minimal and maxima values; yr-observational year; Trend-linear trend; p value, indicator of statistical significance, t-test; CI-confidence interval, UL-upper limit, LL-lower limit

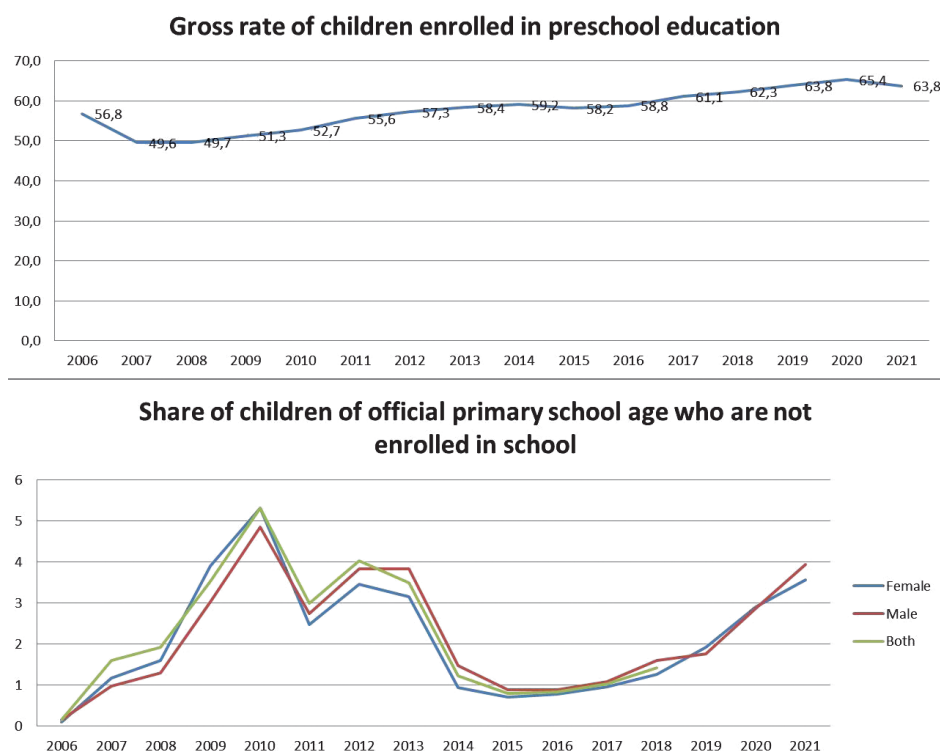


Figure 1. The linear trend of observed indicators (2006-2021) in Serbia.

percentage was 5.31% in 2010. Observing the first and last year, an increase in the percentage of children of both sexes who were not enrolled in schools can be observed, while a linear regression analysis established a negative trend throughout the observed period of 15 years ($y = -0.0849x + 2.7738$; $R^2 = 0.0462$).

The average percentage of male children, of official primary school age that were not enrolled in schools, in the observed period of 15 years was $2.20 \pm 1.39\%$, while the minimum percentage in the observed period was 0.16% also in 2006, and the maximum percentage was 4.85% in 2010. Observing the first and last year, an increase in the percentage of male children who are not enrolled in schools can be observed, which was established by linear regression analysis ($y = 0.0389x + 1.871$; $R^2 = 0.0178$).

The average percentage of female children of official primary school age who were not enrolled in schools, in the observed period of 15 years was $2.14 \pm 1.45\%$, while the minimum percentage in the observed period was 0.11% also in 2006, and the maximum percentage was 5.32% in 2010. Observing the first and last year, an increase in the percentage of female children who are not enrolled in schools can be observed, which was established by linear regression analysis ($y = 0.0067x + 2.0833$; $R^2 = 0.0005$).

The t-test showed a statistically significant difference in the percentage of children of official primary school age who were not enrolled in schools, according to gender ($p = 0.00$).

The average percentage of children enrolled in preschool education in the observed period of 15 years

was $57.75 \pm 4.97\%$, while the minimum percentage in the observed period was 49.61% also in 2007, and the maximum percentage was 65.37% in 2020. Observing the first and last year, an increase in the percentage of children enrolled in preschool education can be observed, which was established by linear regression analysis ($y = 0.9433x + 49.731$; $R^2 = 0.8165$).

DISCUSSION

According to World Bank data, 11% of children in Serbia are out of primary school education in 2022. Several determinants have shown a significant increase in the number of children who do not start primary school education within the stipulated period, namely the socioeconomic indicators of children and families, primarily the sex of the child, and then the education of the mother, the economic stability of the family, and the place of residence (12).

Education plays a crucial role in shaping an individual's capacity to access, understand, and use health information. Evidence shows that maternal education in Serbia significantly affects child nutrition outcomes, with children of mothers with only primary education being almost three times more likely to suffer from undernutrition compared to children of more educated mothers (13). Furthermore, educational exclusion begins early. Only 7% of Roma children aged 3 to 5 attend preschool, which limits cognitive development and early acquisition of critical skills necessary for lifelong learning and health behavior (14). Children with disabilities also face systemic barriers, with thousands still enrolled in special schools instead of being integrated into inclusive education systems (15).

Looked at by gender, in the world there is a higher share of girls who do not attend school, compared to boys, with a percentage ratio of 28% to 24%. Our study also found significance by gender (16).

Globally, a lower percentage of children from the poorest families have primary education compared to their wealthier peers (17). While almost all children from the highest wealth quintile (94%) attend primary education, only 74% of children from the lowest wealth quintile attend primary education (18). As far as Serbia is concerned, this fact is also an adequate reason to explain why a certain number of children do not start primary school. This is intertwined with the fact about the education and level of literacy of the parents of the children, as well as the nationality of the children and parents. More than twice as many children of mothers with no education are out of school – 36% compared to 16% for children of mothers with some education. Looking at the location of residence, 83% of children from rural areas attend schools for primary education, in comparison to

92% of those from urban areas. Looking at gender, that percentage is similar, namely 87% of boys and 86% of girls (19).

In the past 20 years, the number of out-of-school children of primary education age has decreased by 35 percentages, with over half of these children being female. Despite this tremendous progress, the world must accelerate the pace at which it reduces the number of children out of school, as the total number of children has stagnated since 2007 (20). This data coincides with the data analysed in our study in Serbia, where a very slight positive trend in the increase in the number of boys and girls who do not attend primary school education was demonstrated, almost at the level of stagnation.

Measured by the adjusted net enrolment rate, about three out of four countries and territories of the 122 countries for which data are available have achieved gender parity in primary education. Although the number of countries where boys and girls are disadvantaged is similar, there are still countries where gender parity is not met (21).

Findings from the Multiple Indicators Survey Program (MICS6) show that many countries are not equipping their children with basic literacy and numeracy skills. Specifically, as measured by the median across the 35 countries and regions with available data, only one in five children in grades 2 or 3 demonstrated basic reading skills at par with their grade level (22).

Among children out of school, 3.3% do not have a mother, and 3.8% do not have a father. In the sample, 67% of all children of primary school age have mothers without any formal education (primary, secondary or tertiary). If the father has formal education, the children are more likely to be in school and the probability increases with the level of education of the parents (23). Orphans, i.e. children without a mother or father or whose parents live in another household, are more likely not to attend school (24). Recent study that focused on the poverty risk of children in Europe found no significant gender differences in Serbia, but implies that education of family is very important factor (25).

In our study, the overall rates of non-enrolment in primary school were very low and showed only slight gender differences, with boys somewhat more likely than girls to be out of school. This finding is consistent with global evidence showing that the gender gap in primary enrolment has narrowed substantially over the past two decades, although progress has been uneven and full parity is not yet universal (26). The World Bank's Gender Data Portal also confirms that many countries have achieved parity in enrolment, but gender disparities persist in certain regions, particularly in terms of completion, where girls often remain disadvantaged (27). At the same time, recent analyses indicate a reversal in some contexts, with

boys now more likely than a girl to be out of school, repeat grades, or fall behind, which resonates with our observation of slightly higher non-enrolment among male children (28). Considering regional, familial, and socio-economic factors, it becomes clear that educational inequalities are multi-layered, and in more developed regions, disparities are less pronounced than in less developed areas. Longitudinal analyses in Spain have shown that early school leaving is strongly associated with poverty, unemployment, migration, and the structure of local industry, with significant gender differences (29). Taken together, these comparisons suggest that while broad global progress toward gender parity has been made, local patterns may differ, and both boys' and girls' vulnerabilities in education require attention.

The close relationship between education and health literacy suggests that improvements in school access and quality could have a lasting impact on public health. Strategies aimed at increasing preschool enrollment for vulnerable groups, improving inclusive education practices, and supporting parents with low education levels could enhance health literacy and, in turn, child health outcomes. Incorporating health literacy into the national education curriculum, especially focusing on digital literacy and medication comprehension, is a timely intervention that could address current gaps and prepare young people for independent and informed health decisions.

We should also consider other factors that may contribute to the increase in the number of children who have interrupted primary education, such as various health conditions and diseases that prevent them from doing so, as well as certain disorders in intellectual development that require different approaches. Due to limited data about specific reasons for children out of education system, we were unable to provide data about this topic, but this is something that should be considered in future work.

The very low R^2 values for the regression models of children not enrolled in primary school show that time explains almost none of the changes in these rates. This is because the percentages are small and fluctuate a lot from year to year, so the data do not follow a clear upward or downward pattern across the 15-year period. Although there are differences between the first and last year, the highest values appeared in the middle years, which break any consistent trend. The small and mixed directions of change for boys, girls, and the total further reduce the strength of the models. In contrast, preschool enrolment increased steadily and more predictably over time, which is why its regression model showed a much stronger fit.

In conclusion, continuous, systematic monitoring of out-of-school children is essential to track trends and guide timely interventions. Our findings highlight

persistent gender disparities in primary school enrolment and a positive, yet uneven, increase in preschool participation. To ensure equitable access to education, it is crucial to conduct region-specific research that evaluates the socioeconomic, familial, and regional factors contributing to non-enrolment, particularly in underserved areas of Serbia. Based on such evidence, educational policy should prioritize targeted measures, including community outreach programs, financial support for disadvantaged families, gender-sensitive interventions, and enhanced access to early childhood education. By addressing these disparities through inclusive and data-driven policies, Serbia can strengthen literacy, promote educational equity, and foster a healthier, more informed population.

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