

## Review of Behavioral Risks Among Kazakhstani Adolescents and the Experience of Establishing a Health School in Kazakhstan

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### Abstract

**Objective.** This study aimed to investigate long-term trends in the prevalence of behavioral risk factors among adolescents in Kazakhstan and highlight a successful preventive intervention, specifically the establishment of a health school. **Materials and Methods.** The authors analyzed publications from the past 10 years to monitor behavioral risk factors, existing trends among adolescents in Kazakhstan and abroad, and recommendations and guidelines from global health authorities. **Results.** Alongside a decline in tobacco and alcohol consumption, there has been an observed increase in obesity, vaping, depression, use of digital devices, and engagement with TikTok. A model is proposed based on implementing a Preventive Program by establishing a Health School, guided by international best practices and recommendations. **Conclusion.** In recent years, there has been a noticeable shift in public health behavior in Kazakhstan. While tobacco use and alcohol abuse have declined, new challenges are emerging, such as increasing rates of obesity among adolescents and excessive engagement with online games, gadgets, and social media. Simultaneously, physical activity levels have significantly decreased. To promote healthy lifestyle habits, a Health School was established at the Republican Sanatorium "Alatau" under the Ministry of Health of the Republic of Kazakhstan.

**Key Words:** Health School ▪ Healthy Lifestyle ▪ Prevention ▪ Adolescents ▪ Suicides.

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### Introduction

Kazakhstan ranks among the countries with the highest suicide rates in the world, with 80% of the cases involving adolescents. Annually, between 3,500 and 4,000 people die in the country, which corresponds to approximately 9–10 deaths per day (1). Recently, incidents have been occurring at an increasingly younger age, between 11 and 13 years (2). Notably, the leading cause of death from external factors among children and adolescents is suicide. We questioned the reasons behind such suicidal behavior in adolescents and what measures should be taken to prevent it. After reviewing the previously conducted studies, it was established that among the multifactorial influences, poor mental health combined with an unhealthy

lifestyle comes to the forefront. This includes excessive consumption of alcohol and drugs, along with overuse of internet platforms, particularly TikTok, where instances of content that promotes suicide have been identified (3–6).

In the process of examining this issue, we discovered that adolescence is a critical period in a person's life, as it is a time of physical, cognitive, social, and emotional development with lifelong implications (7, 8). The main social factors influencing health include peers, schools, communities, and workplaces, complementing family life in shaping an individual's personality. Increased autonomy in decision-making, combined with psychosocial development, contributes to the formation of behaviors during adolescence that will impact health throughout adult life. These

behaviors include physical activity, dietary habits, disease management, and risky behaviors such as smoking, alcohol consumption, and illegal drug use. Risk-taking and breaking social rules are often considered inherent traits of adolescent behavior (9, 10). Modern neuroscience explains adolescence as a period of risk-taking and rebellion, supporting the theory of a developmental mismatch in the brain. This involves the prolonged maturation of brain regions responsible for judgment and self-regulation, in contrast to the rapid growth of areas involved in sensation-seeking and emotional processing (11-16).

Several public health studies (17) have been conducted on the econometrics of investing in adolescent health and the return on such simulated interventions. For interventions targeting physical, mental, and sexual health, investments of \$4.6 per capita annually from 2015 to 2030 yielded an unweighted average benefit-cost ratio (BCR) of over 10.0. In contrast, interventions aimed at reducing road traffic injuries achieved a BCR of 5.9 (95% CI 5.8–6.0) with investments of \$0.6 per capita annually (18, 19).

Thus, among the preventive measures for addressing suicides, behavioral risk factors, and overall health promotion of the younger generation, it is essential to consider the guiding principles for interventions based on an effective prevention strategy at three distinct levels: primary (universal), secondary (selective), and tertiary (individually indicated).

Implementing a policy of intersectoral measures that relies on legislative regulations is crucial. Of equal importance is the application of our experience in establishing and operating a Health School as an effective preventive program for promoting a healthy lifestyle among adolescents. This initiative was developed based on the Republican State Enterprise (RSE) "Alatau Children's Clinical Sanatorium" of the Ministry of Health of the Republic of Kazakhstan (hereafter referred to as the Sanatorium).

This study aimed to examine long-term trends in the prevalence of behavioral risk factors among adolescents in Kazakhstan and present a successful

example of preventive intervention, namely, the establishment of a school of health.

## Methods

As a result of the literature review and public health monitoring study, an analysis of publications covering the retrospective period from 1998 to 2024 was conducted. This study examined data on behavioral risk factor monitoring, existing trends among adolescents in Kazakhstan and abroad, and recommendations and guidelines from global health organizations. The study design was a non-systematic narrative literature review presented as a series of commentaries and an authorial synthesis of previously published information (20).

## Results

Kazakhstan has introduced behavioral surveillance systems aimed at promoting health. Several studies have addressed issues such as overweight and obesity, dietary habits, social marketing, communication with peers, friends, and parents, leisure activities, and physical activity. In recent years, significant progress has been made in the monitoring of tobacco consumption.

### *Tobacco Consumption*

The results of global surveys conducted in collaboration with the World Health Organization, Bloomberg Foundation, and Centers for Disease Control and Prevention, such as the Global Adult Tobacco Survey and Global Youth Tobacco Survey, have shown that smoking in Kazakhstan has been on a declining trend since 2007 (Figure 1) (21). According to household surveys, by 2023, tobacco consumption decreased from 27.0% to 19.4% among individuals aged 15 and older (22). The latest estimates, included in the World Health Organization's report on tobacco trends published on January 16, 2024, indicate that Kazakhstan has 2.9 million adult tobacco users (23).

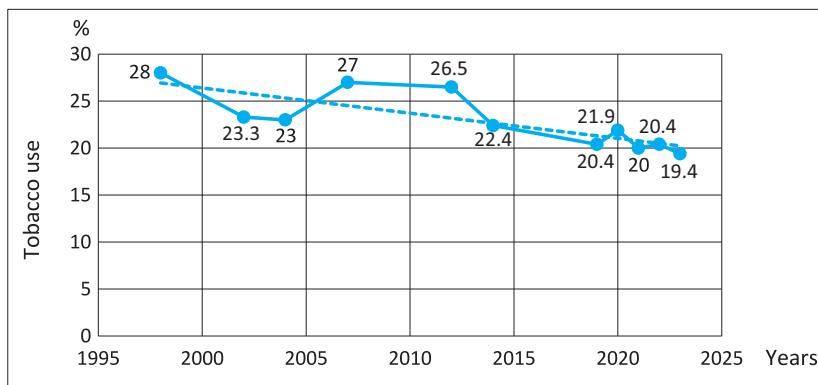


Figure 1. Tobacco consumption in Kazakhstan.

The findings revealed that 19.4% of the surveyed household members currently smoked tobacco (compared to 20.4% in 2022), with 36% of men and 8.5% of women identified as smokers. The proportion of tobacco smokers was 19.6% in rural areas and 19.3% in urban areas. Of all smokers, 92.3% consume commercially manufactured cigarettes (24).

Simultaneously, the prevalence of tobacco use among schoolchildren remains one of the most pressing socially significant issues. A comprehensive study of personal and behavioral factors and their influence on smoking status among children and adolescents represents one of the most promising directions in the system of measures aimed at reducing smoking rates among the younger generation. The study included 1,715 schoolchildren aged 13-15 years (grades 7-9 in general education schools) as part of the Global Youth Tobacco Survey (GYTS) conducted in Kazakhstan in 2014. The GYTS is a school-based survey that assesses the prevalence of tobacco use and key tobacco control indicators in a nationally representative sample. The survey is based on a standardized methodology involving a two-stage cluster sampling design of schools and classes.

The survey results indicated that 2.8% of students reported smoking tobacco. Parental smoking - whether

one or both parents smoked - was significantly associated with tobacco use among children. In addition, youth who smoked had a positive perception of tobacco use. Key motivating factors for smoking included: a) the belief that smoking helps them feel more comfortable at social gatherings, b) acceptance of peer offers to smoke, and c) the appeal of hookah smoking. As a result, it can be concluded

that effective psychological and educational interventions/programs are urgently needed, particularly those targeted at parents who smoke, as well as at school-aged children. These programs should be implemented at both the family and school levels to foster negative attitudes toward smoking and enhance support for those wishing to quit. Furthermore, decisive legislative action should be taken to establish smoke-free environments and reduce tobacco accessibility (22).

### ***Consumption of Pure Alcohol in Kazakhstan***

Figure 2 shows the average annual per capita consumption of pure alcohol in Kazakhstan (5, 6).

Kazakhstan has demonstrated a positive downward trend in alcohol abuse among its population.

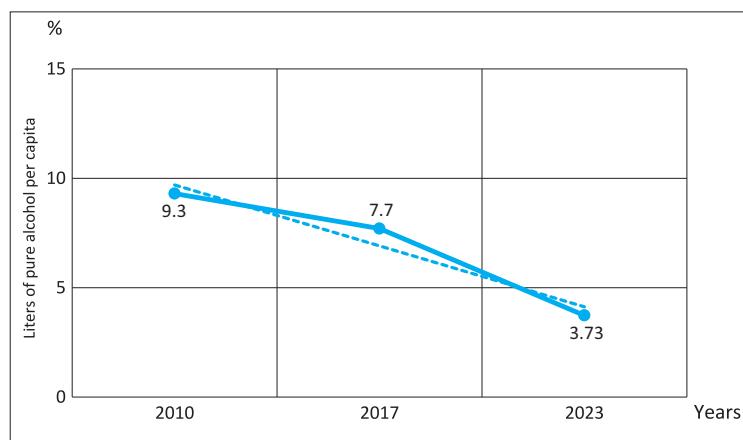


Figure 2. Alcohol consumption (liters/year) in Kazakhstan.

### ***Tried Electronic Cigarettes***

The national survey of schoolchildren in Kazakhstan, “Health Behavior in School-Aged Children”, revealed that 9.8% of adolescents aged 11–15 years had tried electronic cigarettes at least once (11.3% of boys and 8.2% of girls). These rates increase significantly with age for both boys and girls (25–29).

### ***Excess Weight***

It is important to note that the first National Survey of children aged 8–9 years to assess overweight and obesity was methodologically developed and coordinated in Kazakhstan in alignment with the World Health Organization’s European Childhood Obesity Surveillance Initiative (COSI). Monitoring results indicated that the prevalence of overweight among 9-year-old schoolchildren in Kazakhstan was 12.3%, while obesity was observed in 6.3% of children. The school environment contributes significantly to the development of overweight and obesity-related risk factors. One in three children with overweight or obesity do not attend sports or dance clubs. Moreover, nearly one-third of schoolchildren consume energy-dense and nutrient-poor foods daily.

A comparative analysis of Kazakhstan’s data with the standardized monitoring indicators of childhood overweight and obesity across several countries in the WHO European Region revealed that Kazakhstani children fall within the middle range of prevalence rates observed in European countries (30).

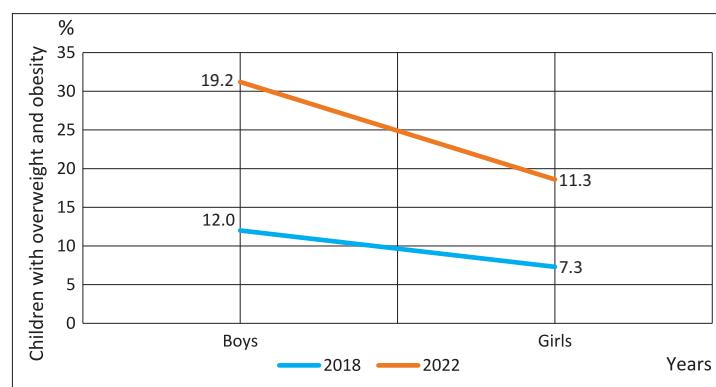


Figure 3. Children with overweight and obesity in Kazakhstan.

The indicators of behavioral risk factors were not significantly different from those observed worldwide. For instance, there has been an increase in the number of children who are overweight and obese, driven by unhealthy eating habits and a tendency towards physical inactivity. The percentage of children aged 11–15 with excess weight is shown in Figure 3 (31–35). The obtained results and their interpretation are consistent with previously published data demonstrating a temporal increase in body mass index (BMI) among children and adolescents of the same age (i.e., successive cohorts) in both rural and urban areas of each country. The authors aggregated 15 age-specific estimates, spanning ages 5 to 19, using age standardization to enable comparisons over time and between countries.

School-aged boys and girls living in urban areas had a height advantage, being taller on average than their rural counterparts. In most low- and middle-income countries, the urban BMI increased between 1990 and 2020. In contrast, high-income countries and states in Central and Eastern Europe experienced mixed trends of both increases and decreases in urban BMI, although the changes remained within a narrow range (from 0.3 to 0.6 kg/m<sup>2</sup>) throughout the entire period of analysis (36).

### ***Physical Activity Among Adolescents in Kazakhstan***

At the same time, indicators of physical activity at moderate to high intensity for at least 60 minutes per day show a declining trend (Figure 4) (37–42).

### ***Children’s Engagement with Digital Devices***

It has been found that the use of digital devices, internet engagement, TikTok, and similar activities among children has increased (Figure 5) (38, 42).

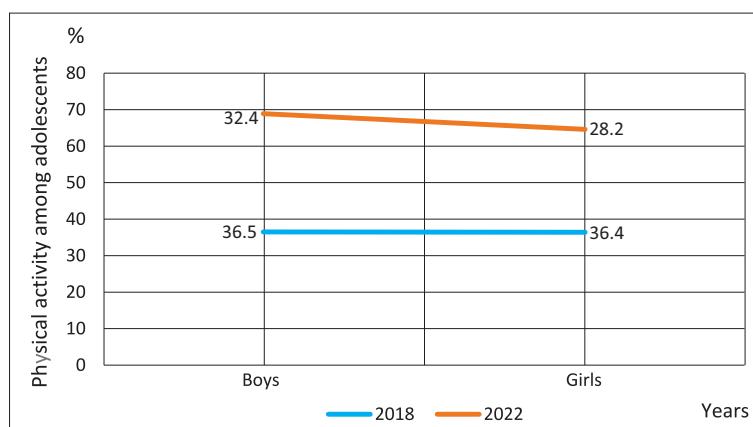


Figure 4. Trends in moderate-to-high frequency physical activity ( $\geq 60$  minutes) among adolescents in Kazakhstan.

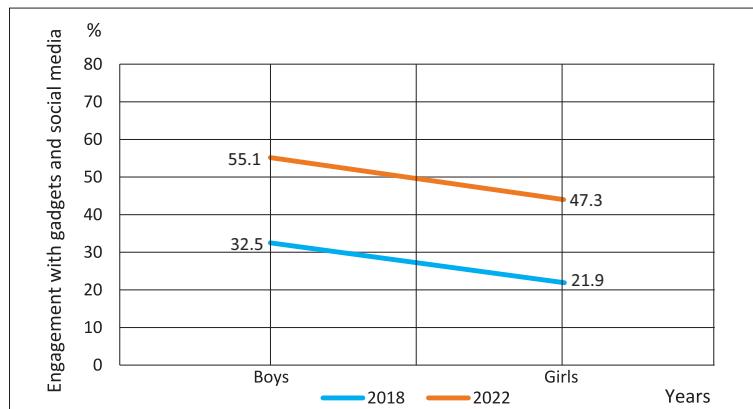


Figure 5. Trends in screen time on computers, consoles, and other gadget games ( $\geq 2$  hours per day) among adolescents in Kazakhstan.

## Discussion

Kazakhstan is one of the world's leaders in the number of teenage suicides. In this study, we approached this thorny issue to determine the causes of behavioral changes in relation to adolescent health by examining previously published data and the results of monitoring behavioral risk factors.

The main conclusions are, first, that a decrease in smoking prevalence ( $P < 0.001$ ) was reported in all age categories due to the implementation of MPOWER tobacco control measures in Kazakhstan. Second, the average annual per capita consumption of pure alcohol decreased from 9.3 liters in 2010 to 3.73 liters in 2023. Third, an

increase in body mass index and obesity in children and adolescents was established ( $P < 0.001$ ). Fourth, there are new opportunities for risky behaviors, such as vaping, cannabis use, depression, the impact of using digital devices, and social networking through smartphones (43).

Our study findings on behavioral changes towards several factors, such as the likelihood of being influenced by a fondness for digital devices, spending time playing computer games and surfing the internet, and reduced physical activity, highlight a similarity with adolescent suicide statistics. Studies published by Doku et al. (44) and Domić et al. (45, 46) concluded that tobacco, marijuana, and other unhealthy habits were more likely to be used among those who were stable in low socioeconomic status, emphasizing the impact of cumulative socioeconomic disadvantage across generations. This situation requires comprehensive further analysis of the causes of adolescent suicides, the provision of psychological support and primary prevention in

educational organizations, the application of family programs, and the training of parents and children in maintaining the values of life and health.

Globally consistent and comparable data facilitate comparative analyses across countries and territories and identify best practices. In this context, we report on the establishment of a Health School under the Ministry of Healthcare's Sanatorium, which annually serves more than 2,000 children and adolescents from 17 regions and 3 cities of republican status (Astana, Almaty, and Shymkent). This preventive initiative aims to create a comprehensive framework for the formation of healthy lifestyle habits throughout one's life.

## Strengths and Limitations of the Study

A key strength of this study lies in the authors' narrative review of representative data from the national monitoring of lifestyle indicators in Kazakhstan. The study identified specific patterns of risky behaviors among youth, particularly the increasing popularity of vaping in recent years, the early initiation of such practices among children, and the rising prevalence of electronic cigarette use.

## Future Directions

In Kazakhstan, as in the rest of the world, new opportunities for risky behaviors have emerged, including vaping, the prevalence of smoking among adolescents, cannabis use, increasing rates of mental health disorders and depression, childhood obesity, and the impact of digital device usage and social media through smartphones. Several factors influence these behavioral changes. This highlights the importance of investing in adolescent health and well-being, both now and in the long term. Therefore, a preventive intervention model has been proposed through the establishment of a Health School, highlighting the urgent need for primary prevention to promote healthy lifestyles among children.

## Conclusion

This review of behavioral risks among adolescents demonstrated a clear association between engagement in risky behaviors and the necessity of establishing health-promoting schools as a preventive intervention to facilitate behavioral change among youth toward healthier lifestyles.

### What Is Already Known on This Topic:

*In Kazakhstan, five nationally representative studies on lifestyle indicators have been conducted at five-year intervals, enabling the analysis of trends in key behavioral risk factors over time.*

### What This Study Adds:

*This study contributes to the expansion of expert knowledge through a narrative review of behavioral risks, identifying trends and contemporary characteristics of persistent health-threatening habits among the youth. Notably, it highlights the increasing use of electronic nicotine*

*delivery systems, with adolescents favoring flavored vaping products. The rapid development of modern technologies has fostered a strong attachment to digital devices, while the internet increasingly shapes public consciousness, serving as both a medium for social interaction and a major source of information. Consequently, traditional forms of communication, particularly with parents and peers, are being displaced.*

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**Conflict of Interest:** The authors declare no conflict of interest.

## References

1. World Health Organization. Report "Assessment of Suicide Prevention in Kazakhstan: East Kazakhstan and Kyzylorda Regions". Almaty: WHO; 2015. p. 23.
2. Unicef. United Nations Children's Fund. Astana: Report in Kazakhstan (UNICEF); 2024. p. 40.
3. Unicef. Study on prevalence, underlying causes, risk and protective factors in respect to suicides and attempted suicides in Kazakhstan. Astana: The UN Children's Fund (UNICEF) in the Republic of Kazakhstan; 2014. p. 104.
4. World Health Organization. Preventing suicide: a global imperative [report on the Internet]. World Health Organization; 2014 [cited 2024 Jul 9]; 89. Available from: <https://iris.who.int/handle/10665/131056>.
5. NCD Risk Factor Collaboration (NCD-RisC). General and abdominal adiposity and hypertension in eight world regions: a pooled analysis of 837 population-based studies with 7.5 million participants. Lancet. 2024;404(10455):851-63. doi: 10.1016/S0140-6736(24)01405-3.
6. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in underweight and obesity from 1990 to 2022: a pooled analysis of 3663 population-representative studies with 222 million children, adolescents, and adults. Lancet. 2024;403(10431):1027-1050. doi: 10.1016/S0140-6736(23)02750-2. Epub 2024 Feb 29.
7. Patton GC, Sawyer SM, Santelli JS, Ross DA, Afifi R, Allen NB, et al. Our future: a Lancet commission on adolescent health and wellbeing. Lancet. 2016;387(10036):2423-78. doi: 10.1016/S0140-6736(16)00579-1. Epub 2016 May 9.
8. Gates M. Advancing the adolescent health agenda. Lancet. 2016;387(10036):2358-9. doi: 10.1016/S0140-6736(16)30298-7. Epub 2016 May 9.
9. Sheehan P, Sweeny K, Rasmussen B, Wils A, Friedman HS, Mahon J, et al. Building the foundations for sustainable development: a case for global investment in the capabilities of adolescents. Lancet. 2017;390(10104):1792-806. doi: 10.1016/S0140-6736(17)30872-3. Epub 2017 Apr 19.

10. The Lancet Public Health. Investing in adolescent health and wellbeing. *Lancet Public Health*. 2024;9(9):e635. doi: 10.1016/S2468-2667(24)00193-2. Epub 2024 Aug 16.
11. Mytton OT, Donaldson L, Goddings AL, Mathews G, Ward JL, Greaves F, et al. Changing patterns of health risk in adolescence: implications for health policy. *Lancet Public Health*. 2024;9(8):e629-34. doi: 10.1016/S2468-2667(24)00125-7. Epub 2024 Jul 9.
12. Jessor R. Risk behavior in adolescence: a psychosocial framework for understanding and action. *J Adolesc Health*. 1991;12(8):597-605. doi: 10.1016/1054-139x(91)90007-k.
13. Arnett J. Reckless behavior in adolescence: a developmental perspective. *Developmental Review*. 1992;12(4):339-73. DOI: [https://doi.org/10.1016/0273-2297\(92\)90013-R](https://doi.org/10.1016/0273-2297(92)90013-R).
14. Ball J, Grucza R, Livingston M, Ter Bogt T, Currie C, de Looze M. The great decline in adolescent risk behaviours: Unitary trend, separate trends, or cascade? *Soc Sci Med*. 2023;317:115616. doi: 10.1016/j.socscimed.2022.115616. Epub 2022 Dec 16.
15. Mills KL, Goddings AL, Clasen LS, Giedd JN, Blakemore SJ. The developmental mismatch in structural brain maturation during adolescence. *Dev Neurosci*. 2014;36(3-4):147-60. doi: 10.1159/000362328. Epub 2014 Jun 27.
16. Ford CA, Boyer CB, Halpern CT, Katzman DK, Ross DA, Berg TD, et al. The Distinguished Dozen: 2023 Journal of Adolescent Health Articles Making Distinguished Contributions to Adolescent and Young Adult Health. *J Adolesc Health*. 2024;74(2):211-5. doi: 10.1016/j.jadohealth.2023.11.003.
17. Dyakova M, Hamelmann C, Bellis MA, Besnier E, Grey CNB, Ashton K, et al. Investment for health and well-being: a review of the social return on investment from public health policies to support the implementation of the sustainable development goals through the health 2020 policy framework. *Health evidence network synthesis report*, No. 51. Copenhagen: WHO Regional Office for Europe; 2017.
18. Berkley S, Bobadilla JL, editors. *World development report 1993 : investing in health (English) [report on the internet]*. Washington: World Bank Group; 2013 [cited 2024 July 8]. Available from: <http://documents.worldbank.org/curated/en/468831468340807129>.
19. Schäferhoff M, Evans D, Burnett N, Komaromi P, Kraus J, Levin A, et al. Estimating the costs and benefits of education from a health perspective. Background paper for the Oslo Summit on Education for Development. *Seek Development*; 2015 [cited 2024 July 8]. Available from: <http://www.resultsfordevelopment.org/sites/resultsfordevelopment.org/files/resources/SEEK.pdf>.
20. Green BN, Johnson CD, Adams A. Writing narrative literature reviews for peer-reviewed journals: secrets of the trade. *J Chiropr Med*. 2006;5(3):101-17. doi: 10.1016/S0899-3467(07)60142-6.
21. WHO. *Global Adult Tobacco Survey: Kazakhstan, 2019*. Copenhagen: WHO Regional Office for Europe; 2023. Licence: CC BY-NC-SA 3.0 IGO.
22. Battakova ZE, Abdrikhanova SZ, Adaeva AA, Slazhneva TI. Comparative analysis of factors motivating tobacco use among adolescents in the republic of Kazakhstan. *Proceedings of the National Academy of sciences of the Republic of Kazakhstan. Series of Biology and Medicine*. 2018;329(5):8-15. DOI: 10.32014/2018.2518-1629.2
23. WHO. *Global report on trends in prevalence of tobacco use 2000–2030*. Geneva: World Health Organization; 2024. Licence: CC BY-NC-SA 3.0 IGO.
24. Bureau of National Statistics [cited 2025 May 2] Available from: <https://stat.gov.kz/en/industries/economy/national-accounts/publications/113759/>.
25. NCD Risk Factor Collaboration (NCD-RisC). Heterogeneous contributions of change in population distribution of body mass index to change in obesity and underweight. *eLife*. 2021;10:e60060. doi: 10.7554/eLife.60060.
26. NCD Risk Factor Collaboration (NCD-RisC). Height and body-mass index trajectories of school-aged children and adolescents from 1985 to 2019 in 200 countries and territories: a pooled analysis of 2181 population-based studies with 65 million participants. *Lancet*. 2020;396(10261):1511-24. doi: 10.1016/S0140-6736(20)31859-6.
27. Branca F, Nikogosian H, Lobstein T. The challenge of obesity in the WHO European region and the strategies for response. *World Health Organization [serial on the Internet]*. 2007 [cited 2024 Sep 14]. Available from: [https://www.researchgate.net/publication/341114162\\_The\\_challenge\\_of\\_obesity\\_in\\_the\\_WHO\\_European\\_region\\_and\\_the\\_strategies\\_for\\_response](https://www.researchgate.net/publication/341114162_The_challenge_of_obesity_in_the_WHO_European_region_and_the_strategies_for_response).
28. de Onis M, Blössner M, Borghi E. Global prevalence and trends of overweight and obesity among preschool children. *Am J Clin Nutr*. 2010;92(5):1257-64. doi: 10.3945/ajcn.2010.29786. Epub 2010 Sep 22.
29. Dubois L, Ohm Kyvik K, Girard M, Tatone-Tokuda F, Pérusse D, Hjelmborg J, et al. Genetic and environmental contributions to weight, height, and BMI from birth to 19 years of age: an international study of over 12,000 twin pairs. *PLoS One*. 2012;7(2):e30153. doi: 10.1371/journal.pone.0030153. Epub 2012 Feb 8.
30. Battakova ZE, Mukasheva SB, Slazhneva TI, Abdrikhanova SZ, Adayeva AA, Akimbayeva AA. Development of national monitoring systems for school-aged children's health-related behaviors and quality of life in public health in Kazakhstan. *Medicine*. 2018;195(9):2-7. DOI: 10.31082/1728-452X-2018-195-9-2-7.
31. Battakova Z, Mukasheva S, Abdrikhanova S, Adayeva A, Akimbayeva A. Childhood obesity in Kazakhstan: behavioural health risks associated with diet and physical activity. *Public Health Panorama*. 2017;3(4):695-702.
32. Lajunen HR, Kaprio J, Rose RJ, Pulkkinen L, Silventoinen K. Genetic and environmental influences on BMI from late childhood to adolescence are modified by parental education. *Obesity (Silver Spring)*. 2012;20(3):583-9. doi: 10.1038/oby.2011.304. Epub 2011 Oct 13.

33. Keane E, Layte R, Harrington J, Kearney PM, Perry IJ. Measured parental weight status and familial socio-economic status correlates with childhood overweight and obesity at age 9. *PLoS One*. 2012;7(8):e43503. doi: 10.1371/journal.pone.0043503. Epub 2012 Aug 17.

34. Hendrie GA, Coveney J, Cox DN. Defining the complexity of childhood obesity and related behaviours within the family environment using structural equation modeling. *Public Health Nutr*. 2012;15(1):48-57. doi: 10.1017/S1368980011001832. Epub 2011 Aug 2.

35. World Health Organization. Report of the Commission on Ending Childhood Obesity [report on the Internet]. WHO; 2016:51 [cited 2024 July 7]. Available from: [https://apps.who.int/gb/ebwha/pdf\\_files/WHA69/A69\\_8-ru.pdf](https://apps.who.int/gb/ebwha/pdf_files/WHA69/A69_8-ru.pdf).

36. NCD Risk Factor Collaboration (NCD-RisC). Diminishing benefits of urban living for children and adolescents' growth and development. *Nature*. 2023;615(7954):874-83. doi: 10.1038/s41586-023-05772-8. Epub 2023 Mar 29.

37. Wijnhoven TM, van Raaij JM, Yngve A, Sjöberg A, Kunešová M, Duleva V, et al. WHO European Childhood Obesity Surveillance Initiative: health-risk behaviours on nutrition and physical activity in 6-9-year-old schoolchildren. *Public Health Nutr*. 2015;18(17):3108-24. doi: 10.1017/S1368980015001937. Epub 2015 Jul 1.

38. Kukanova GZ, Orunkhanov KK, Karaulova GS, editors. Kazakhstan Multiple Indicator Cluster Survey [report on the Internet]. Astana: The Ministry of National Economy of the Republic of Kazakhstan; 2016 [cited 2024 Jun 15]. Available from: <https://www.unicef.org/kazakhstan/en/reports/multiple-indicator-cluster-survey-mics-2015>.

39. Battakova ZE, Tokmurziyeva GZ, Skazhneva TI, Abdra-khmanova SZ. Organization of epidemiological surveillance systems for childhood obesity (international experience and actions of Kazakhstan). Collection of materials of the XII international scientific-practical conference "Scientific prospects of the XXI century. Achievements and prospects of the new century". 2015;3:18-21.

40. WHO European Childhood Obesity Surveillance Initiative (COSI). Methods of data collection [report on the Internet]. Copenhagen: WHO Regional Office for Europe; 2016:42 [cited 2024 Aug 3]. Available from: <https://iris.who.int/bitstream/handle/10665/366699/WHO-EURO-2017-5531-45296-68923-rus.pdf?sequence=3&isAllowed=y>.

41. Deville JC, Sarndal CE. Calibration Estimators in Survey Sampling. *Journal of the American Statistical Association*. 1992;87(418):376-82. DOI: <https://doi.org/10.2307/2290268>.

42. de Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ*. 2007;85(9):660-7. doi: 10.2471/blt.07.043497.

43. Battakova ZE, Mukasheva SB, Slazhneva TI. Methodology for the development of national monitoring of schoolchildren's behavior related to health and quality of life, methodological recommendations. National Center for Public Health. 2018;24.

44. Doku D, Koivusilta L, Raisamo S, Rimpelä A. Do socio-economic differences in tobacco use exist also in developing countries? A study of Ghanaian adolescents. *BMC Public Health*. 2010;10:758. doi: 10.1186/1471-2458-10-758.

45. Domić A, Tahirović H, Čižek Sajko M, Đulabić B. Marijuana smoking among school-aged adolescents in the Brčko District of Bosnia and Herzegovina: A cross-sectional study. *Acta Med Acad*. 2017;46(1):16-26. doi: 10.5644/ama2006-124.182.

46. Domić A, Tahirović H, Nikić-Damjanović J, Čižek-Sajko M. The connection of the family's socioeconomic status and consumption of cigarettes, alcohol and marijuana in adolescents of the Brčko district of Bosnia and Herzegovina. *Srpski arhiv za celokupno lekarstvo*. 2020;148(9-10):584-9. doi: 10.2298/SARH190717053D.

## Supplementary Material

### Establishment of a Health School

The purpose of establishing the Health School is to educate the population on healthy lifestyle practices, promote awareness of prevention, and empower patients to take proactive measures to address the behavioral risk factors for disease development. It also aims to enhance their competence in health-related matters and equip them with the skills needed to improve their lives and their surrounding environment independently.

Objectives of the Health School: 1) the establishment of a permanent information and education system focused on promoting behavioral changes in individuals regarding their health; 2) increasing patient awareness of behavioral risk factors for disease development and enhancing patient responsibility for maintaining their health; 3) developing patients' skills and abilities to reduce the adverse impact of behavioral risk factors on their health, including proper nutrition, physical activity, stress management, and the rejection of harmful habits such as smoking and alcohol abuse; 4) fostering a rational and proactive attitude toward health, motivating patients to improve their well-being, and encouraging adherence to medical professionals' recommendations; 5) developing patients' skills and abilities for self-monitoring their health status; and 6) developing patients' practical skills to analyze the causes and factors affecting their health and teaching them how to create a personalized health improvement plan.

Classes are held in a separate, well-lit room, where available, and facilities for therapeutic and wellness-related physical activities are also used. The room should be equipped with demonstration materials and educational training equipment, including both permanent wall displays (reference, informational, and educational materials) and portable resources for the mobile activities of the Health School, such as kits, discs, models, and simulators. Patient education is conducted according to standardized training programs in

the Health School and consists of seven lessons (modules). Each session lasts 2 contact hours (100 minutes). Groups are limited to 8–10 patients, selected whenever possible from a homogeneous demographic.

### Health School Lesson Topics

1) Physical activity - the foundation of a healthy lifestyle; 2) Healthy nutrition; 3) Prevention of tobacco smoking; 4) Prevention of excessive alcohol consumption; 5) Maintaining personal hygiene; 6) Stress prevention and development of stress-resilience skills; and 7) Communication skills.

Preventive public health interventions through the establishment of a Health School based at the Sanatorium provide an excellent example of promoting public health in Kazakhstan. This article provides a detailed account of our experience in establishing a Health School as a key area for investment. We implement interventions addressing behavioral risk factors by raising awareness and encouraging behavior change toward a healthy lifestyle through individual and group-based preventive counseling. This approach includes conducting seven health lessons.

The Sanatorium has a unique location — the protected mountainous resort area of the Ile-Alatau Medeu Park. Its exceptional therapeutic impact on patients' health is attributed to climatherapy, as the Sanatorium's location combines a range of climatic and weather factors, including temperature, humidity, altitude (1,430 meters above sea level), atmospheric pressure, cloud cover, and precipitation levels.

Climatherapy offers controlled exposure to the natural therapeutic and health-enhancing elements of the region, including aerotherapy, aero-phytotherapy, heliotherapy, and landscape therapy. These therapies are further complemented by the terrenkur method, which involves graded physical activities, such as walking and climbing along designated routes. Together, these natural factors are designed to improve the health of pediatric patients. Experienced and highly qualified specialists provide a full range of wellness treatments,

including speleotherapy, inhalation therapy, light therapy, shungite therapy, ultraviolet irradiation, ultra-high frequency therapy, magnetotherapy, electrophoresis, Bioptron therapy, quartz therapy, hydrotherapy, Charcot showers, pearl and pine baths, as well as paraffin and mud therapy.

Rehabilitation focuses on spa and resort treatments for pulmonology patients, leveraging natural factors to strengthen the body's defenses, particularly those that positively impact respiratory function. The combination of climatotherapy and balneotherapy with a hygienic dietary regimen, as well as the use of medications, physiotherapy, bronchial tree sanitation, and therapeutic exercises, effectively supports the recovery of the body from chronic nonspecific lung diseases such as bronchial asthma, pneumonia, bronchitis, allergic rhinitis, tonsillopharyngitis, sinusitis, tracheitis, pulmonary emphysema, and others.

Spa and resort treatments are excellent methods for preventing the onset of various diseases, strengthening the immune system, and mitigating long-term complications. Each year, more than 2,000 children from all regions of the country participate in a 21-day wellness program funded by the state under the national quota. For the first time, preventive interventions have been introduced to children through the Health School program.

Thus, the Health School is an organized system of tools and methods for individual and group interventions aimed at patients and the general population. Its purpose is to enhance their knowledge, awareness, and practical skills for preventing behavioral risk factors that contribute to disease development. In essence, it is a form of primary prevention focused on eliminating the conditions that lead to the onset and progression of diseases, as well as on strengthening and preserving health. The Health School serves as a type of preventive medical service in the form of group counseling.

The Health School initiative serves as a valuable tool for promoting public health among adolescents and provides a model for scaling up efforts to prevent risky behavior and foster healthy lifestyles. The National Children's Sanatorium under the Ministry of Health of the Republic of Kazakhstan has worked to establish the Health School as a "Kazakhstani" brand aimed at influencing children's lifestyles. Preventive initiatives should place greater emphasis on mental well-being, physical activity, and healthy nutrition, as adolescents are more impressionable than adults, making this a pivotal period in life for shaping their long-term health outcomes.