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## Probabilistic Standardized Risk Differences in Formation of Certain Disease Groups Among Adolescents.

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### ABSTRACT

The study of probabilistic and standardized risks of disease incidence among adolescents in Kazan and in the RT revealed high risk among adolescents only in the class of pregnancy and delivery (Preg & Del) beginning from 2004 to 2011, and the rest disease classes were at low risk level. The number of disease groups, in which their high prevalence risk among adolescents was determined, increased from one to seven. According to our data, beginning from the year of 2011, high risk of formation of classes of neoplasms (Neo), endocrine diseases (ED), injuries, poisoning and certain other consequences of external causes (INJ.), digestive diseases (DD), musculoskeletal disorders (MSD), genitourinary disorders (GUD), circulatory diseases (CD) is observed in adolescents from the cohort under study. The risk of disease prevalence in the classes of psychic disorders (PD), congenital anomalies (CA) was not determined since the year of 2011, because the index was close to zero mark. The obtained results confirm that under current conditions the comparison of the adolescent morbidity in the Republic and the city gives evidence of the possibility of unfavorable prognosis for the health of this cohort in the coming decades.

**Keywords:** high risk, low risk, moderate risk, disease classes, adolescents, morbidity

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**INTRODUCTION**

The issues of adolescent health hold a special place among medico-social and economic problems of national importance. At present there are 1.2 billion of adolescents in the world; in many countries every fifth person is an adolescent, and this fact implies investing in adolescent health, which gives a three-fold return. The health of this age group is an actual socio-demographic problem for any country, and their trends, causes and age-sex specificity are the subject of intensive study. It is due to the fact that in recent years the state of adolescent health deteriorated in all regions of the country and in the world. Marked negatives shifts in the state of adolescent health already resulted in serious medico-social consequences — deterioration of reproductive health, limitations and restrictions in obtaining professional education, employability and decrease of the number of youths fit for military service[1-4].

The aim of the study is to identify probabilistic standardized risk differences in formation of certain disease groups among adolescents in the city of Kazan and in the Republic of Tatarstan.

**MATERIALS AND METHODS**

**Methods:**

Morbidity study was carried out with application of epidemiological approaches [11]. In-depth analysis of the adolescent morbidity was carried out on the basis of annual reports (statistical form No.12) of the medical healthcare institutions in the city of Kazan and in the RT for the period from 2004 to 2015. Absolute values, intensive (per 1000 population) and extensive indices (morbidity patterns) were used to characterize the population health indices. "Methodological foundations for assessment of the population health regional risk due to the effect of unfavorable environmental factors and rationale for integrated management decisions directed towards decrease of their impact" we reused to determine differences of probabilistic standardized risks of formation of certain disease groups among adolescents [8].

Comparison of the overall morbidity indices characterizing the examined population cohorts was carried out by means of Student T-test according to the formula:

$$t = \frac{|x_1 - x_2|}{\sqrt{s(\bar{x}_1)^2 + s(\bar{x}_2)^2}}$$

$$T = x^1 - x^2$$

where,  $x^1$  and  $x^2$  = average values in compared groups  
 $\sigma(x)$  = the mean-root square error of the mean value

To determine differences in indices of a newly diagnosed disease Fisher statistics was used:

$$F = \frac{(f_1 - f_2)^2 * (n_1 - n_2)}{n_1 * n_2}$$

$f_i$  = the value of the proportional morbidity measured in radians

$n_i$  = the number of observations

Such approach is explained by the fact that recurrences may take place in one and the same person in the sampling observed in overall morbidity. Taking into consideration this peculiarity, the probabilistic characteristic of indices is constructed on the basis of Poisson distribution indicating the application of Student T-test [8].

At the next stage we compared the values of probabilistic and standardized (in respect of the city and the Republic) risks of prevalence of 18 disease groups among adolescents based on annual medical examinations in 2004-2015. The values of the first quartile of the series were chosen as the upper limit of acceptable risk. The value of the second quartile (median) served as the index of the upper limit of the moderate risk, and the value of the third quartile – as the increased risk (Table1). All calculated values of probabilistic risks exceeding the upper limit of the increased risk were referred to appropriate absolute values of high risk diseases.

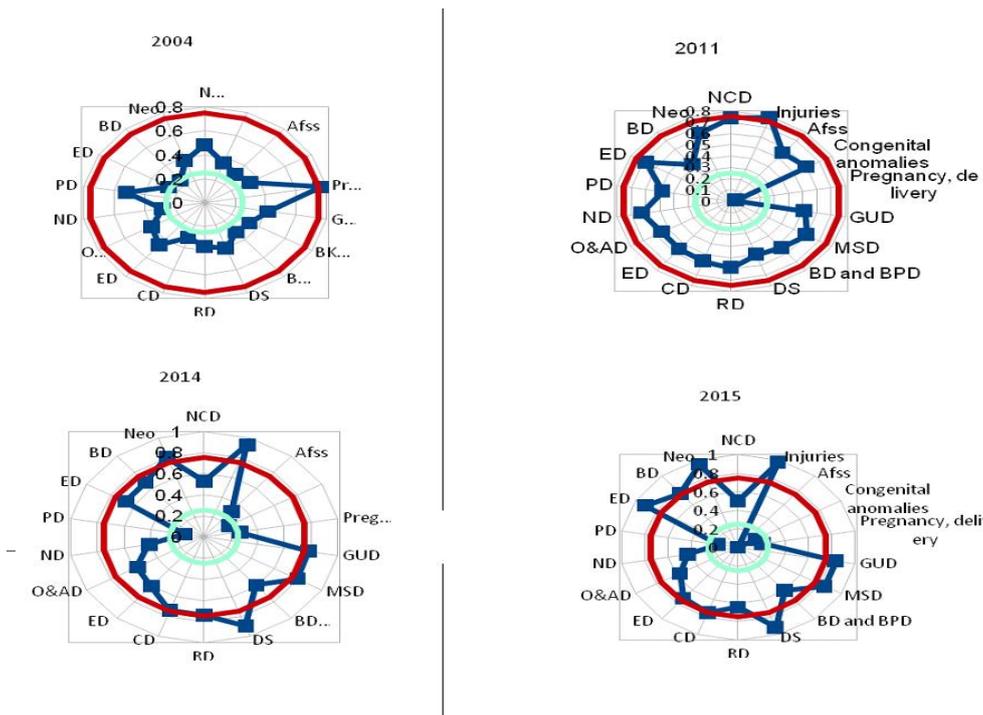
**Table 1: Scale of disease gradations**

ICD diseases	1 quartile	2 quartile	3 quartile
NCD	0,393	0,525	0,789
Neo	0,393	0,619	0,817
BD	0,393	0,604	0,712
ED	0,393	0,453	0,501
PD	0,393	0,674	0,525
ND	0,393	0,541	0,634
O&AD	0,393	0,738	0,914
Ear D	0,393	0,738	0,914
CD	0,393	0,688	0,735
RS	0,393	0,426	0,475
DD	0,393	0,679	0,891

**RESULTS**

Out of 18 groups of the studied disease classes in the Republic of Tatarstan beginning from 2004 to 2011 high risk among adolescents was observed only in the class of pregnancy and delivery (Preg & Del) (Fig.1).

**Fig 1: Probabilistic and standardized risks of disease incidence among adolescents in the Republic of Tatarstan**

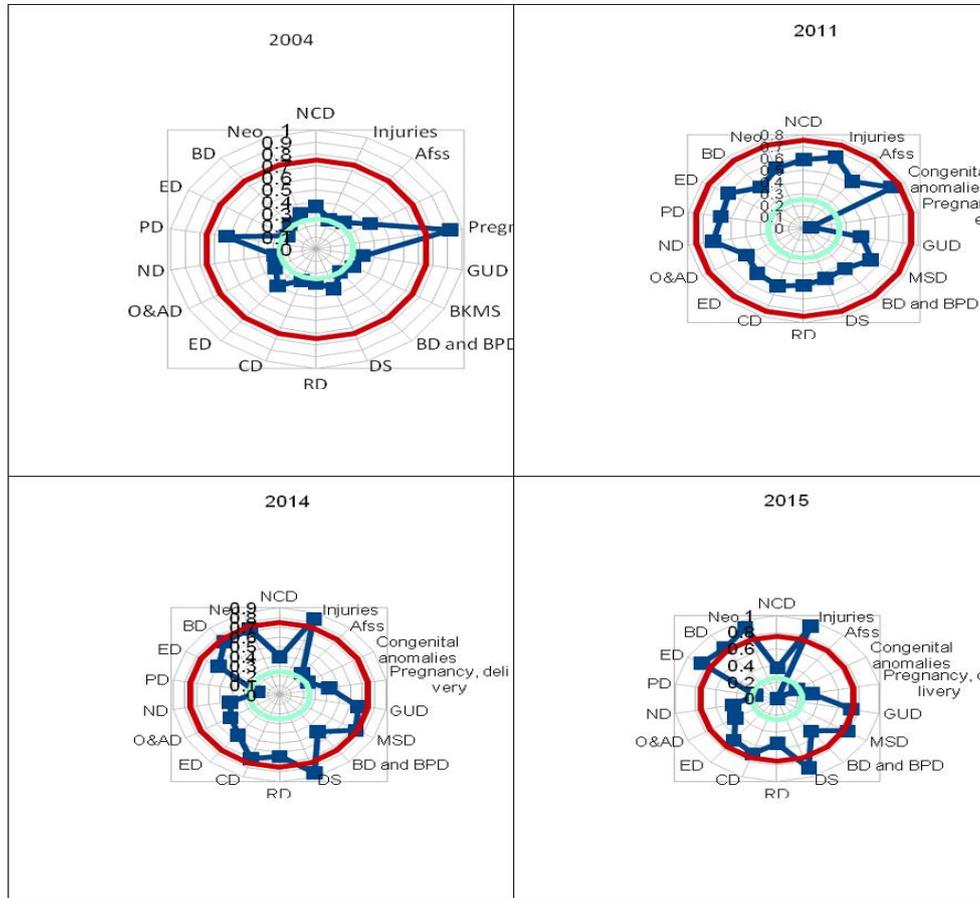


Note: 1 quartile - low risk, 2 quartile - moderate risk, 3 quartile - high risk

Those changes, which broke upon us after this period, come under notice. In the year of 2011, high risk was determined in the following disease classes: endocrine diseases (ED), injuries, poisoning and certain other consequences of external causes (INJ), infectious diseases (ID), moderate risk in classes of neoplasms (Neo), nervous diseases (ND), respiratory diseases (RD), circulatory diseases (CD), ocular and adnexal disease (O&AD), digestive diseases (DD), musculoskeletal diseases (MSD), genitourinary diseases (GUD), congenital anomalies (CA), and the class of pregnancy showed the zero ("0") mark (Fig.1). When analyzing the years of 2014-2015 the major leaders were determined in the RT: the high risk for formation of Neo, ED, injuries, DD,

MSD, GUD, and CD remained. The disease prevalence risk showed that the risk was not determined in classes of psychic disorders (PD), Preg& Del and CA was not determined, because the index was close to a zero mark.

**Fig 2: Probabilistic and standardized risks for disease prevalence among adolescents in Kazan**



Note: 1 quartile - low risk, 2 quartile - moderate risk, 3 quartile - high risk

The study of probabilistic and standardized risks for disease prevalence among adolescents in Kazan and in the RT revealed high risk among adolescents only in the class of pregnancy and delivery (Preg&Del) beginning from 2004 to 2011, and the rest disease classes found themselves at low risk (Fig.2) [5-7]. In the city of Kazan, differences concern the diseases with increased risk, which was determined only in the class of congenital anomalies in the year of 2011 (Fig.2). Among urban adolescents, high risk was identified in the classes of Neo, ED, injuries, DD, MSD, GUD, CD, and this fact coincides with indices observed in the RT (Fig.2). It should be noted that as far as classes of CA and PD, the trend remained in the same format.

### CONCLUSION

Thus, the number of disease groups, in which the high risk of their prevalence among adolescents both in the RT, and in the city of Kazan was determined, increased from one to seven by the year of 2015. According to our data, the adolescents from the examined cohorts are at high risk of developing Neo, ED, injuries, DD, MSD, GUD and CD. The growth of the class of ED and DD is associated first of all with nutrition of the cohort under study, with developed food addiction in particular and certainly with the level of adolescent material security. It is generally recognized that neo plasms (Neo) are considered to be the markers of ecological risk, being indicative and highly dependent on environmental pollution [9, 10].

Consequently, the high-priority task is the formation of adolescent health under conditions of changing socio-medical and economic problems of the territory under study. Comparison of the adolescent

morbidity in the Republic and the city gives evidence of the possibility of unfavorable prognosis for the health of this cohort in the coming decades

Health cannot be maintained and promoted only by means of optimization of one risk factor under study, for instance, nutrition, educational environment or ecological situation. An important point is that the disease spectrum, which requires taking of complex and immediate measures on the part of society, should form basic criteria, according to which we could monitor the results of work in the interests of adolescents.

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