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STUDY EXPERIENCE OF CANCER INCIDENCE AND MORTALITY IN THE COURSE OF THE SOCIAL AND HYGIENIC MONITORING IN ROSTOV REGION

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The article presents the results of the case follow-up of the frequency, structure and dynamics of the malignant tumors in the course of the regional social hygienic monitoring. We have considered the unified research principles and technologies of epidemiological type with the use of modern methods of retrospective analysis, prediction and the real risk assessment. It is shown that in the period 1999-2013 at the downward trend in cancer mortality in Rostov Region, the primary cancer incidence had a stable growth trend. Among the priority locations an unfavorable upward trend of the frequency of malignancies in children under 14 years old was formed, namely: malignant tumors of the esophagus, colon, rectum, melanoma of skin, breast, cervix and uterus, malignant lymphoma.

On the basis of the regional criteria risk of morbidity of the population in Rostov region, the amount of malignant tumors and cancer-related deaths within the period 1999-2013 years was assessed as moderate. The increased risk for a specified period was detected only in relation to cancer incidence in the cities of the regional subordination, among which are priority cities: Volgodonsk, Taganrog and Azov.

Key words: *social hygienic monitoring, malignant tumors, epidemiological risk, assessment criteria, posthoc analysis, prognosis*

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Determining the complex of marker indicators with its adapation for the social and hygienic monitoring at the regional level and level of municipal structures as well as the unification of the methods of analytical studies are the current tasks during the improvement of technologies for studying the health of population. When carrying out the social and hygienic monitoring at the regional level the formation of information resources is performed in general based on the categorized data provided in the forms of the state and industry-specific reporting. The personified accounting under the most critical nosological forms is performed at the level of some municipal structures of Rostov region, together with extension of the regional list of the accounted public health indicators, that allows for using the multidimensional statistical methods, including the factorial and cluster analysis, during the analytical studies of the cause-and-effect relations.

The number of highly informative indicators of the social and hygienic monitoring system includes the malignant neoplasms (MN) morbidity that it determined both by its high social and economic significance and the significant ethiological role of the population and individual risk factors. The assessment of real (epidemiological) risk with the calculation of particular (Wi) and consolidated (W) rated indicators which quantitatively characterize the probability of development of negative effects associated with the impact of the whole complex of natural and anthropogenic and technical factors is used together with traditional methods of epidemiological studies in Rosto region as the component of the categorized assessment of the pubic health condition since 2011. Herewith the real risk measure is the additional number of diseases and other negative reactions in the health of population stipulated by the excessive, compared to the background, common for the rated territories unfavorable impact of the living environment factors. The results of assessment of the real risk to the health of population represent the formal and statistical basis for the further analytical generalizations and expert hygienic evaluations both at the medical and hygienic ranking of administrative territories and for the dynamic observation purposes [1, 2].

The purpose of this work is to characterize the conditions and trends of oncological morbidity

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and mortality in Rostov region in relation to the middle-term forecasting and revealing the risk territories under the malignant neoplasms of priority locations. We used the representative data on the primary morbidity with malignant neoplasms of the main locations and oncological mortality provided in the annual reports No. 35 "Data on the patients with malignant neoplasms" for the 15-year period since 1999 to 2013. The assessment of the oncological morbidity and mortality of population in Rostov region is performed using the specialized program complex Turbo oncologist, version 2.01 which implements the algorithms of epidemiological analysis of the intensity, structure, dynamics and assessment of real risk.

It is established that the average long-term level of primary oncological morbidity in Rostov region in 1999-2013 is 342.4 $^{o}/_{oooo}$. Herewith the frequency of malignant neoplasms among the urban population was 1.2 times more than for rural – 369.2 and 306.8 $^{o}/_{oooo}$, respectively. The same relation is specific for the oncological mortality indicators – 188.67 $^{o}/_{oooo}$ in general for region; for the cities (196.0 $^{o}/_{oooo}$) this indicator is higher than for the rural districts (178.9 $^{o}/_{oooo}$) by 1.1 times (table 1).

T a b l e 1

Levels, structure and dynamics of oncological morbidity and mortality of population in Rostov region during 1999-2013

Item No.	Location (form) of malignant neoplasms	Morbidity with MN				Mortality from MN			
		$^{o}/_{oooo}$	%	rank	average annual rate of increase (%)	$^{o}/_{oooo}$	%	rank	average annual rate of increase (%)
1	Malignant neoplasms (total)	342,44			0,93	188,67			–0,36
	including: cities of regional subordination	369,20	100,00		0,90	196,03	100,00		–0,54
	rural districts	306,84			0,93	178,89			–0,12
2	In children in the age up to 14 years inclusive	9,52	0,44		2,86	3,17	0,28		–3,12
3	Lips	3,11	0,91	19	–5,24	0,56	0,30	20	–2,01
4	Oral and pharyngeal cavities	7,00	2,05	13	–0,12	5,24	2,78	10	–0,53
5	Oesophagus	2,80	0,82	20	1,37	2,44	1,27	16	–0,98
6	Stomach	24,41	6,80	4	–2,10	21,08	10,54	2	–2,72
7	Segmented intestine	20,46	5,97	5	2,50	12,90	6,84	4	0,50
8	Straight intestine, PCC, anus	15,78	4,61	6	1,69	11,04	5,91	5	0,21
9	Throat	4,93	1,42	17	–0,54	3,39	1,80	14	–2,02
10	Trachea, bronchi, lungs	44,51	12,68	2	–1,35	38,43	19,58	1	–1,57
11	Bones and soft tissues	3,31	0,97	18	–5,81	2,10	1,02	17	–4,12
12	Skin melanoma	6,03	1,76	14	3,51	2,54	1,40	15	3,07
13	Other malignant neoplasms of skin	49,25	14,39	1	0,32	1,33	0,73	18	3,08
14	Breast	36,68	10,86	3	1,49	18,72	9,76	3	0,40
15	Uterine neck	11,39	3,32	9	1,87	5,80	3,14	7	–0,65
16	Uterine body	13,66	4,00	8	1,25	4,21	2,26	12	1,03
17	Ovary	8,99	2,61	11	0,03	5,55	2,95	8	–2,10
18	Prostate gland	15,57	4,54	7	5,36	6,69	3,54	6	4,22
19	Bladder	10,39	3,00	10	0,49	5,37	2,85	9	–2,40
20	Thyroid gland	5,88	1,72	15	–0,33	0,96	0,50	19	0,98
21	Malignant lymphomas	7,30	2,13	12	2,98	4,15	2,20	13	0,43
22	Leukemia	5,12	1,49	16	0,73	4,28	2,27	11	–2,25

The first rank in the oncological morbidity structure in Rostov region is occupied by the malignant neoplasms of skin (14.4%), the second – trachea, bronchi and lungs (12.7%), third – breast (10.9%), the fourth and fifth places belong to the malignant neoplasms of stomach – 6.8 and 6.0% percent, respectively (table 1. fig. 1).
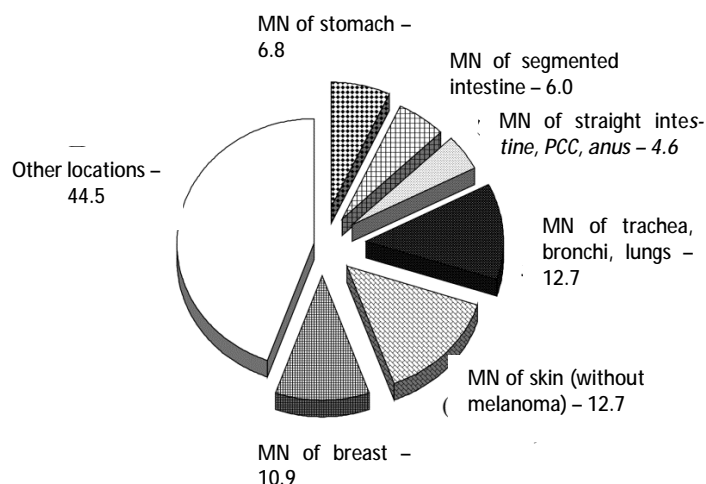
Fig. 1. The structure of oncological morbidity under the locations of process in Rostov region for 1999-2013 (%)

The qualitative and quantitative characterization of the oncological morbidity and mortality dynamics during the social and hygienic monitoring is performed based on the trend analysis results in relation to determining the average annual rates of increase and middle-term extrapolation forecasting under the theoretical lines of trends. Thus, during the studied period the primary oncological morbidity of population in Rostov region had the stable trend to growth at the average annual rate of increase +0.93%. It is necessary to pay attention to practically equal trends to the increase of MN frequency in the cities and rural districts at the average annual rates of increase +0.90 and +0.93%, respectively. At the same time, the certain trend to decrease with the average annual rate of increase -0.36% which is more expressed for urban population (-0.54%) compared to the rural (-0.12%) was formed in relation to the oncological mortality. The priority locations include the formation of negative trends to the increase of MN frequency in children in the age up to 14 years, MN of oesophagus, segmented intestine, straight intestine, PCC and anus, skin melanoma, MN of breast, uterine neck and body, malignant lymphomas. In our view, the apparent trend to the increase of registration of MN of prostate gland is stipulated primarily by the improvement of diagnostics due to the examinations for oncological markers (see table 1).

It is established that the long-term dynamics of the oncological morbidity of population in the region during 1999–2013 is more adequately described by the trend line under the exponential curve function with equation: $Yt = 313,088X^{0,048}$ at the correlation coefficient of 0.803 ($p<0.01$) that allows for calculating the middle-term extrapolation forecasting for the next two years – 358.34 $^o/_{oooo}$, respectively. It is understood that the comparison of forecasts with data obtained during the further dynamic observation can be used as the basis for assessment under the principle of inverse relationship of the efficiency of implemented preventive and recreational managerial decisions. When carrying out the social and hygienic monitoring it is necessary to execute annually the forecasts of oncological morbidity and mortality under the separate locations and administrative territories of the region (table 2, fig. 2).

The criteria assessment of oncological morbidity and mortality of population in Rostov region is performed taking into account the regional criteria which are based on the indicators of background, particular and consolidated risk calculated annually for the population of cities of regional subordination and rural districts. In order to remove the impact of differences in the sex and age structure of administrative territories on the values of regional criteria they are determined on the basis of the indirectly standardized indicators of oncological morbidity and mortality.

T a b l e 2

Middle-term extrapolation forecasts of oncological morbidity and mortality of population in Rostov region

| Item No.	Administrative territory	2014			2015		
		$^o/_{oooo}$	Δ–0,95	Δ+0,95	$^o/_{oooo}$	Δ–0,95	Δ+0,95
	Primary morbidity with malignant neoplasms						
Rostov region, total		357,31	351,69	362,92	358,34	352,72	363,96
1	MN of stomach	19,33	18,31	20,35	18,84	17,82	19,86
2	MN of segmented intestine	22,85	22,05	23,65	23,03	22,22	23,83
3	MN of trachea, bronchi, lungs	38,69	37,01	40,37	38,10	36,42	39,78
4	Skin melanoma	7,69	7,43	7,95	7,90	7,64	8,16
5	Other MN of skin	49,98	47,82	52,13	50,02	47,87	52,18
6	MN of breast	39,79	38,64	40,94	39,98	38,82	41,13
7	MN of uterine body	15,08	14,16	15,99	15,25	14,33	16,16
8	MN of prostate gland	21,81	21,11	22,51	22,59	21,89	23,29
9	MN of bladder	10,52	10,05	10,98	10,53	10,07	11,00
10	MN of thyroid gland	5,81	5,54	6,09	5,81	5,53	6,08
11	Malignant lymphomas	8,23	7,94	8,51	8,29	8,01	8,57
12	Leukemias	5,33	4,77	5,89	5,34	4,78	5,90
Cities of regional subordination		384,50	378,09	390,91	385,52	379,10	391,93
1	Azov	496,89	481,21	512,58	501,73	486,05	517,41
2	Bataysk	376,08	358,76	393,41	379,37	362,04	396,69
3	Volgodonsk	394,30	383,91	404,68	403,95	393,56	414,33
4	Gukovo	392,78	376,04	409,52	394,44	377,69	411,18
5	Donetsk	342,10	316,26	367,94	339,33	313,49	365,17
6	Zverevo	314,69	284,11	345,27	316,84	286,26	347,42
7	Kamensk-Shakhtinsky	281,12	266,29	295,95	274,36	259,54	289,19
8	Novocherkassk	357,42	331,11	383,73	360,06	333,75	386,36
9	Novoshakhtinsk	318,35	292,76	343,94	320,29	294,70	345,87
10	Rostov	371,07	359,30	382,84	370,58	358,81	382,35
11	Taganrog	497,77	486,02	509,51	501,32	489,58	513,07
12	Shakhty	404,72	397,07	412,37	408,80	401,15	416,45
Rural districts of the region		320,22	314,59	325,85	321,16	315,52	326,79
	Mortality from malignant neoplasms						
Rostov region		183,17	177,89	188,45	182,49	177,21	187,77
including cities of regional subordination		187,61	180,65	194,58	186,56	179,59	193,52
Rural districts of the region		177,14	173,53	180,76	176,93	173,31	180,54

$Yt = 313,088X^{0,048}$
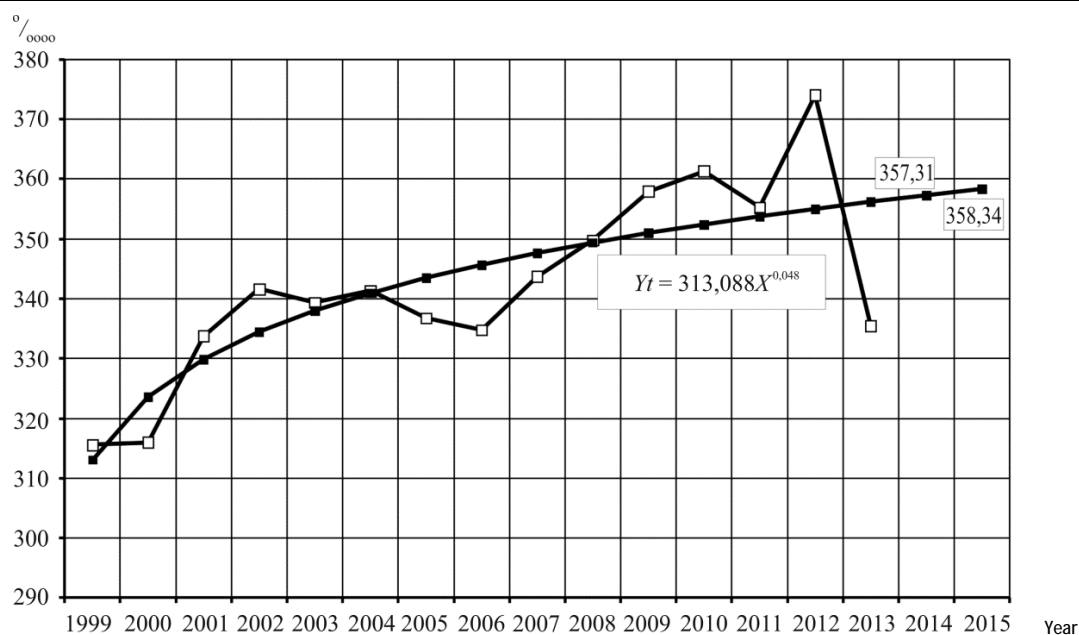
Fig. 2. Dynamics, long-term trend and forecast of primary morbidity with malignant neoplesms in Rostov region (sum of locations)

We use the regional criteria both for the dynamic observation in the system of social and hygienic monitoring (when compared to indicators under the separate territories for the reporting year) and for the hygienic ranking of territories based on the comparison to the average long-term levels of oncological morbidity and mortality (table 3).

T a b l e 3

Regional criteria for assessing the oncological morbidity and mortality of population in Rostov region for 2014

Criterial assessment of real risk	Cities of regional subordination	Rural districts of the region
PRIMARY MORBIDITY WITH MALIGNANT NEOPLASMS		
Based on the standard intensive morbidity indicators ($^o/_{oooo}$)		
Low	Less than 298,61	Less than 252,32
Moderate	298,61–368,62	252,32–308,91
Increased	368,63–438,63	308,92–365,52
High	438,64–508,65	365,53–422,13
Very high	508,66 and more	422,14 and more
Based on the indirectly standardized morbidity indicators ($^o/_{oooo}$)		
Low	Less than 239,13	Less than 202,26
Moderate	239,13–327,38	202,26–258,92
Increased	327,39–415,64	258,93–315,59
High	415,65–503,90	315,60–372,25
Very high	503,91 and more	372,26 and more
MORTALITY FROM MALIGNANT NEOPLASMS		
Based on the standard intensive morbidity indicators ($^o/_{oooo}$)		
Low	Less than 158,61	Less than 141,51
Moderate	158,61–202,76	141,51–189,91
Increased	202,77–246,91	189,92–238,32
High	246,92–291,07	238,33–286,73
Very high	291,08 and more	286,74 and more
Based on the indirectly standardized morbidity indicators ($^o/_{oooo}$)		
Low	Less than 132,44	Less than 112,66
Moderate	132,44–182,29	112,66–157,28
Increased	182,30–232,15	157,29–201,91
High	232,16–282,00	201,92–246,54
Very high	282,01 and more	246,55 and more

Based on the regional criteria the risk of morbidity for the population of Rostov region under the sum of locations of malignant neoplasms and oncological mortality during 1999-2013 is assessed as moderate. The increased risk during the specified long-term period is recorded only in relation to the oncological morbidity in the cities of regional subordination at the particular rated indicator (*Wi*) equal to 1.01. The use of methods for assessing the real risk allows for credible determination of the risk territories for reporting year and long-term period both in relation to the total oncological morbidity and under the separate locations and forms of process. Since the malignant neoplasms represent the heterogeneous group of diseases which differ significantly by frequency depending on the location of process we calculate also the consolidated real risk indicators [3] under nine priority MN locations with contrast territorial differences (stomach; segmented intestine; straight intestine, PCC and anus; trachea, bronchi and lungs; skin; breast; prostate gland; bladder; thyroid gland). Under the results of assessment of the particular and consolidated real risk we included Vogodonsk, Taganrog and Azov from a number of cities of regional subordination to the territories of the highest risk in relation to the oncological morbidity (table 4).

T a b l e 4

Analysis of morbidity under the separate territorial points

Item No.	Administrative territory	1999–2013			2013		
		W	Risk	Rank	W	Risk	Rank

	REAL RISK OF MORBIDITY WITH MN UNDER THE SUM OF LOCATIONS *Background risk of total oncological morbidity by the cities of the region – 239.13 $^o/_{oooo}$*						
1	Azov	1,72	Increased	2	2,26	High	2,
2	Bataysk	0,86	Moderate	5	1,14	Increased	6
3	Volgodonsk	2,01	High	1	2,85	High	1
4	Gukovo	0,75	Moderate	6	1,22	Increased	4
8	Novocherkassk	0,64	Moderate	8	1,01	Increased	7
11	Taganrog	1,70	Increased	3	1,75	Increased	3
12	Shakhty	0,65	Moderate	7	1,17	Increased	5
	MALIGNANT NEOPLASMS OF TRACHEA, BRONCHI AND LUNGS *Background risk of morbidity by the cities – 25.32 $^o/_{oooo}$*						
3	Volgodonsk	1,67	Increased	1	2,17	High	1
4	Gukovo	1,55	Increased	2	0,34	Moderate	8
5	Donetsk	1,47	Increased	3	1,13	Increased	2
	MALIGNANT NEOPLASMS OF BREAST *Background risk of morbidity by the cities – 28,05 $^o/_{oooo}$*						
1	Azov	0,69	Moderate	4	1,46	Increased	3
2	Volgodonsk	1,45	Increased	1	2,10	High	1
5	Taganrog	1,44	Increased	2	1,79	Increased	2
	CONSOLIDATED REAL RISK OF MORBIDITY UNDER 9 PRIORITY LOCATIONS OF MALIGNANT NEOPLASMS						
1	Azov	1,81	Increased	3	1,92	Increased	2
2	Bataysk	0,99	Moderate	5	1,56	Increased	3
3	Volgodonsk	2,39	High	1	3,29	Very high	1
11	Taganrog	1,97	Increased	2	1,13	Increased	7

The results of assessment of real (epidemiological) risk to the health of population are considered as the formal and statistical basis for the further analytical generalizations and expert hygienic evaluations.

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