

Survival rate as a measure for evaluation of cancer care for population

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Introduction

Survival rate is the most adequate measure for evaluation of effectiveness of cancer care. Study of population survival rate in various countries is rather rare. The first international study of survival of cancer patients was conducted in 1964 by National Cancer Institute of USA and included patients with a most widespread cancer from Denmark, England, France, Norway and USA. Later such studies were made by the International Agency for Research of Cancer using the data of population cancer registries of some countries provided that these data were up to standards of data quality and level of follow-up of patients was 95 % for statistical significance of the results.

Analysis of the population survival rate almost was not conducted in cancer epidemiological studies in Ukraine; as a rule, survival rate is used for comparative evaluation of various treatment methods effectiveness in clinical studies.

Creation of National Cancer Registry of Ukraine with personal records of all cancer cases in the country allowed conducting the first survival study on the population level. It should be noted that in domestic practice one-year mortality rate is used as a measure of quality of cancer care activity, while European countries and USA use for this only survival rate, which is an integral measure of quality of oncological aid to the population: diagnostics, treatment and organization of follow-up for cancer patients.

Materials and methods

Survival study has been conducted for patients with cancer of digestive organs (C15-C26) diagnosed in 2000-2006, patients with multiple cancers were excluded; this cohort consists of 146978 males and 119954 females (Table 1). Relative survival rates were calculated by the cumulative method for male and female population of Ukraine and contaminated with radionuclides after the Chernobyl accident oblasts – Vinnytska, Volynska, Zhytomyrska, Kyivska, Rivnenska, Chernigivska. The study used personal records from database of National Cancer Registry of Ukraine and current methods of statistical analysis used in oncology and descriptive epidemiology. Database records were checked as provided by principles and methods of medical informatics.

Results

Epidemiological survival study for population with cancer of digestive system (C15-C21), that amounts 25.7 % of annual new cancer cases and 28.5 % of annual deaths from cancer in Ukraine has been conducted.

It is concluded that one-year survival rate of this cohort is 42.1 % in male population and 46.3 % in female population. (Table 1, Fig. 1). In the contaminated

oblasts this rate ranges from 36.5 % in Zhytomyrska oblast to 49.8 % in Kyivska for male population. Female one-year survival rate in the contaminated territories ranges from 41.1 % in Rivnenska oblast to 53.8 % in Kyivska oblast.

Table 1. Survival rates of patients with cancer of digestive system

Administrative territory	Number of patients		1-year				5-year			
			Survival rate, %		Lost from follow-up, %		Survival rate, %		Lost from follow-up, %	
	m	f	m	f	m	f	m	f	m	f
UKRAINE	14697	11995	42.1±0,3	46,3±0,3	3,0	3,7	20,3±0,3	24,2±0,3	6,1	7,9
Vinnytska	5683	3858	42,0±1,4	48,1±1,6	0,9	1,0	19,2±1,2	23,9±1,5	2,4	3,0
Volynska	2350	1728	41,6±2,1	47,8±2,4	1,1	1,2	24,7±2,1	28,6±2,4	1,4	2,0
Zhytomyrska	4052	2830	36,5±1,6	42,5±1,9	4,3	5,6	12,1±1,3	14,9±1,6	7,9	11,9
Kyivska	6287	4820	49,8±1,3	53,8±1,5	1,0	0,9	23,8±1,3	29,8±1,5	2,9	3,9
Rivnenska	3047	2349	39,5±1,9	41,1±2,1	5,6	8,1	11,0±1,4	11,1±1,5	8,9	11,9
Chemigivska	4126	3120	43,4±1,6	48,0±1,8	1,1	1,4	21,0±1,5	26,9±1,8	3,8	6,1

5-year survival rate for male population with digestive cancer in Ukraine is 20.3 %; appreciably lower rates are in Rivnenska (11.0 %) and Zhytomyrska (12.1 %) oblasts. Similar situation is in female population: in all contaminated oblasts, but Rivnenska and Zhytomyrska, 5-year survival rate is not lower than one in whole Ukraine (24.2 %) and ranges from 23.9 % in Vinnytska to 29.8 % in Kyivska oblast.

Survival rates for patients with most frequent sites of cancer - esophagus (C15), stomach (C16), colon (C18) and rectum (C19-C21) - were also calculated.

During the period of the study cancer of **esophagus** was diagnosed in 10635 males and 1648 females (Table 2, Fig. 2). This cancer has aggressive behavior and short-length life is typical for patients with it – 70.0 % of them are died during the first year and 5-year period live 5.0-8.0 %.

Table 2. Survival rates of patients with cancer of esophagus

Administrative territory	Number of patients		1-year				5-year			
			Survival rate, %		Lost from follow-up, %		Survival rate, %		Lost from follow-up, %	
	m	f	m	f	m	f	m	f	m	f
UKRAINE	10635	1648	24,7±0,9	31,9±2,4	2,1	3,8	6,7±0,6	13,5±2,1	3,6	6,5
Vinnytska	611	60	26,0±3,6	23,5±11,3	1,1	1,7	4,9±2,1	15,3±12,0	2,5	5,0
Volynska	217	18	18,1±5,4	48,1±25,1	0,9	0,0	6,0±3,9	26,6±28,1	0,9	0,0
Zhytomyrska	469	47	21,5±3,9	16,8±11,6	1,5	4,3	4,7±2,3	7,3±9,8	3,0	6,4
Kyivska	617	72	36,7±4,0	43,4±12,3	0,6	0,0	7,8±2,5	14,7±11,2	1,3	2,8
Rivnenska	284	28	20,0±4,9	18,5±14,9	2,1	0,0	0,8±1,6	12,0±13,6	2,5	0,0
Chemigivska	371	22	32,6±5,0	49,1±22,6	0,8	0,0	6,8±3,1	5,2±13,5	2,7	4,5

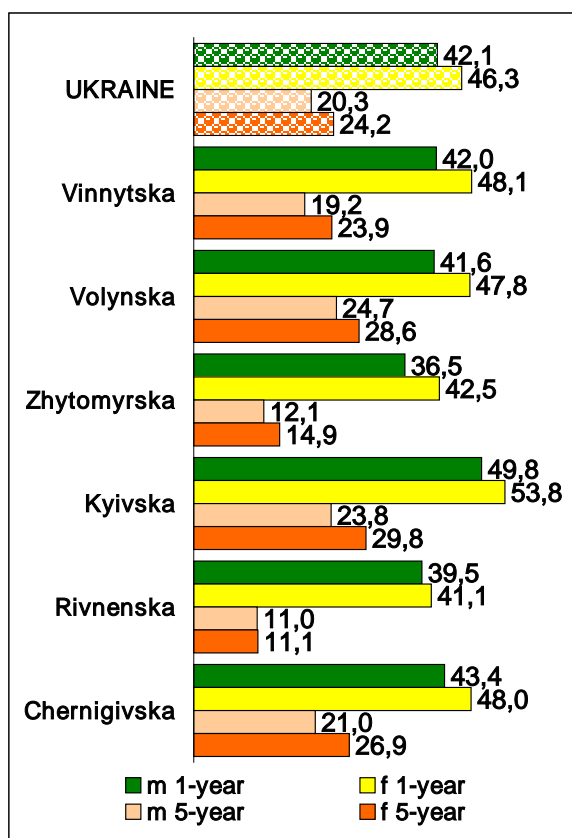


Fig. 1. Survival of patients with cancer of digestive system, %

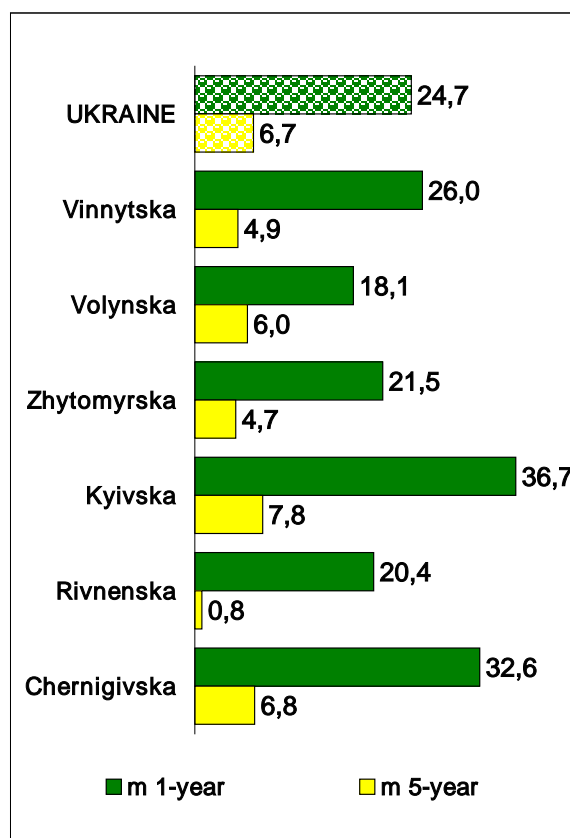


Figure 2. Survival of patients with cancer of esophagus, %

In Ukraine one-year survival rate of males with cancer of esophagus is 24.7 %, for females it is 31.9 %; in the contaminated areas the lowest rate is in Volynska oblast – 18.1 % for male population. The lowest 5-year survival rate of males with cancer of esophagus is in Rivnenska oblast (0.8 %), the highest ones, that exceed the rate for whole Ukraine, are in Kyivska and Chernigivska oblasts, but the excess is nonsignificant on account of standard error measure. Female esophagus cancer is rare and survival rates for this cohort are statistically unreliable.

Survival rate for patients with **stomach cancer** was calculated in the cohort of 53033 males and 35472 females (Table 3, Fig. 3). As it was ascertained, one-year survival rate in Zhytomyrska oblast is significantly lower than one in whole Ukraine both for males and females (30.7 % and 32.8 %, respectively). The patients of both genders in Zhytomyrska and Rivnenska oblasts have 5-year survival considerably lower than in whole Ukraine (14.8 % and 16.9 %). Both one-year and 5-year survival rates of patients of Kyivska oblast are higher than in other territories.

Table 3. Survival rates of patients with cancer of stomach

Administrative territory	Number of patients		1-year				5-year			
			Survival rate, %		Lost from follow-up, %		Survival rate, %		Lost from follow-up, %	
	m	f	m	f	m	f	m	f	m	f
UKRAINE	53033	35472	34,8±0,4	36,7±0,5	2,5	3,3	14,8±0,4	16,9±0,5	5,2	6,6

Vinnitska	2316	1323	33,4±2,0	36,0±2,7	1,0	1,1	12,9±1,6	15,0±2,1	2,6	2,6
Volynska	1042	580	33,6±3,0	32,5±3,9	0,7	1,0	17,8±2,8	15,1±3,3	1,1	1,9
Zhytomyrska	1681	975	30,7±2,3	32,8±3,1	3,1	4,3	9,9±1,7	9,6±2,3	5,8	8,8
Kyivska	2514	1701	45,3±2,1	46,0±2,5	0,8	0,9	20,4±1,9	23,0±2,3	2,4	3,0
Rivnenska	1151	786	32,5±2,9	34,8±3,5	4,2	6,5	8,6±2,0	7,8±2,3	6,7	9,5
Chemigivska	1730	1199	37,4±2,4	40,9±2,9	1,5	1,5	14,2±2,0	20,3±2,6	3,6	5,5

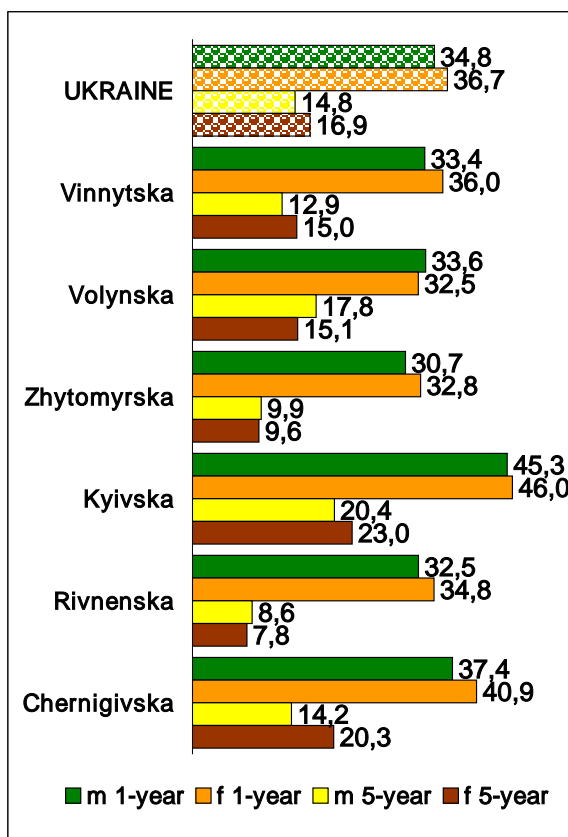


Fig. 3. Survival of patients with cancer of stomach, %

In Ukraine and most contaminated oblasts 5-year survival rate is 1.9-3.4 times less than one-year rate, but in Rivnenska oblast it is less 3.8-4.4 times.

For determining possible reasons of low level of survival of stomach cancer patients the main indices of cancer care activity for this cohort has been explored (Table 4). It has been found that in contaminated oblasts advanced stage of stomach cancer at time of diagnoses ranged from 25.6 % in Kyivska oblast to 44.0 % in Chernigivska oblast.

Table 4. Main indices of cancer care activity for patients with cancer of stomach

Administrative territory	I-II stage, %	IV stage, %	Lived less than one year since diagnosis, %	Received special treatment, %		Microscopically verified, %
				total	with radical surgery	
UKRAINE	28,7	32,7	64,4	40,5	24,4	70,2
Vinnitska	35,4	36,8	63,4	34,4	23,4	65,5
Volynska	25,8	36,6	68,5	35,7	22,3	85,1

Zhytomyrska	31,4	34,4	67,2	41,1	27,0	82,9
Kyivska	45,4	25,6	56,1	50,9	33,9	83,6
Rivnenska	29,6	31,2	64,0	41,8	24,4	63,7
Chernigivska	15,8	44,0	62,6	56,4	32,1	74,1

One-year survival of these patients is almost equal to percent of patients diagnosed in 1-2 stage of the disease in Vinnytska and Zhytomyrska oblasts, shade higher than it - in Volynska and Rivnenska, and more than twice higher - in Chernigivska oblast. In Kyivska oblast percent of patients who survive one year 4 % less than percent of patients diagnosed with 1-2 stage of the disease that may be caused with incorrect staging. It is also found that special treatment received half of the patients in Kyivska oblast and 34.4-56.4 % in other regions.

One-year survival rate of **colorectal** cancer patients of both genders is lower than in whole Ukraine only in Rivnenska oblast (Table. 5-6, Fig. 4-5). Analysis of 5-year survival of this cohort of patients showed that both in male and female populations of Rivnenska and Zhytomyrska oblasts it is 1.5-2.2 times lower than in whole Ukraine.

Table 5. Survival rates of patients with cancer of colon

Administrative territory	Number of patients		1-year				5-year			
			Survival rate , %		Lost from follow-up, %		Survival rate , %		Lost from follow-up, %	
	m	f	m	f	m	f	m	f	m	f
UKRAINE	27467	32165	58,6±0,6	58,9±0,6	4,1	4,5	37,0±0,7	36,4±0,6	8,9	10,2
Vinnytska	907	931	59,8±3,4	63,1±3,2	1,0	0,8	40,2±4,0	38,7±3,6	2,2	3,1
Volynska	318	362	65,7±5,7	65,2±5,2	0,6	1,4	51,7±7,2	47,3±6,1	0,9	1,7
Zhytomyrska	537	585	57,9±4,6	55,3±4,4	8,8	9,2	25,7±5,0	26,3±4,5	17,3	19,5
Kyivska	1009	1103	65,2±3,2	66,2±3,0	1,0	0,9	45,8±4,0	46,3±3,5	4,7	5,3
Rivnenska	485	556	51,3±5,0	49,4±4,6	10,7	11,3	21,2±4,7	16,3±3,8	15,7	16,5
Chemigivska	562	628	60,7±4,4	59,3±4,1	0,4	1,8	43,7±5,3	37,0±4,5	4,4	7,3

Table 6. Survival rates of patients with cancer of rectum

Administrative territory	Number of patients		1-year				5-year			
			Survival rate , %		Lost from follow-up, %		Survival rate , %		Lost from follow-up, %	
	m	f	m	f	m	f	m	f	m	f
UKRAINE	29347	26717	66,9±0,6	67,6±0,6	3,5	4,0	31,9±0,7	34,5±0,7	7,9	9,3
Vinnytska	1054	855	71,6±3,0	72,7±3,2	3,0	0,2	33,4±3,6	36,3±3,6	2,4	2,7
Volynska	448	499	67,8±4,8	66,0±4,4	4,8	1,4	40,8±5,9	39,4±4,9	2,2	2,2
Zhytomyrska	764	733	62,1±3,9	65,7±3,7	3,9	6,7	18,9±3,7	21,6±3,6	12,3	15,8
Kyivska	1126	1066	72,6±2,9	73,9±2,8	2,9	0,6	32,9±3,4	39,5±3,4	3,3	4,8

Rivnenska	651	544	65,6±4,1	59,2±4,5	4,1	9,2	18,8±3,9	17,0±3,8	12,9	15,3
Chemigivska	809	720	70,3±3,5	72,9±3,5	3,5	1,5	39,0±4,4	46,5±4,4	5,8	8,8

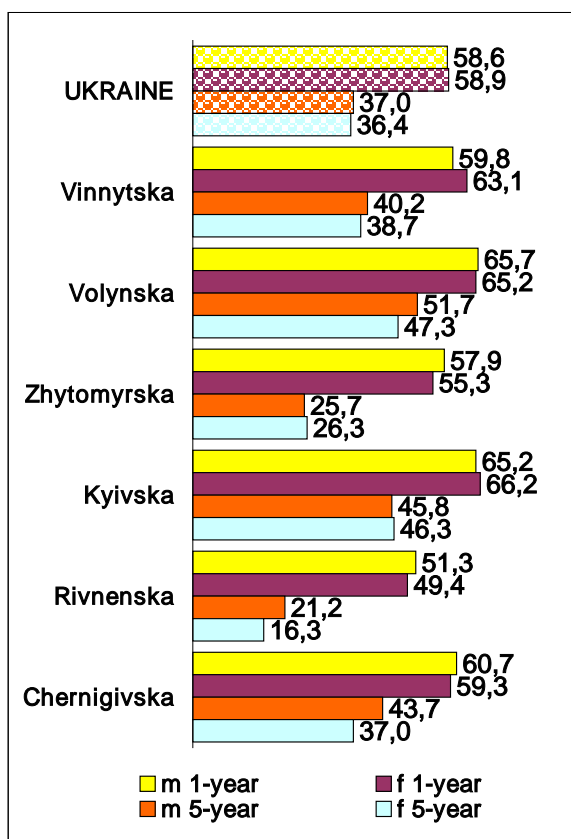


Fig. 4. Survival of patients with cancer of colon, %

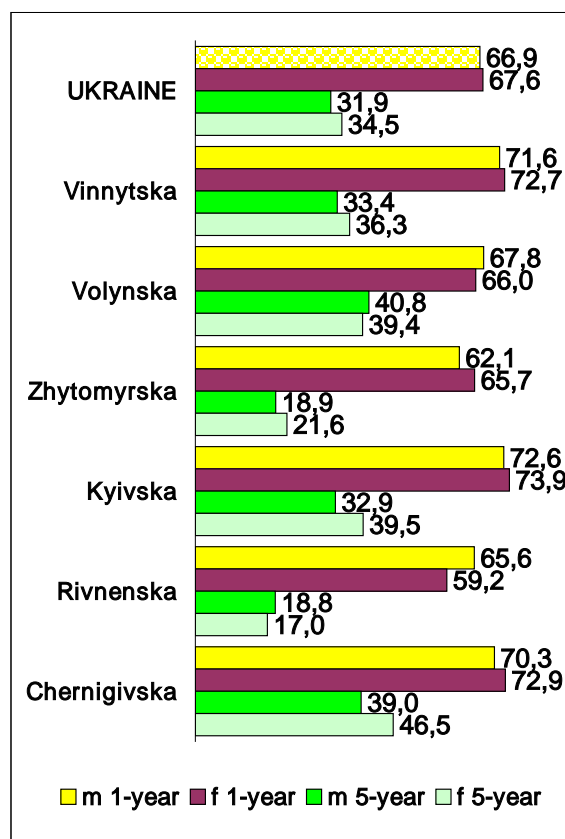


Fig. 5. Survival of patients with cancer of rectum, %

Similarly, in whole Ukraine and most areas under the study one-year survival of patients with colon cancer is 1.3-1.6 times greater than the 5-year rate, but in Rivnenska and Zhytomyrska oblasts this excess goes up to 2.1-3.0 times. In patients with rectum cancer of these regions one-year survival rates are 3.0-3.5 times greater than 5-year ones, while this relation equals to 1.6-1.8 in Volynska and Chernigivska oblasts and 2.0-2.1 – in others.

Analysis of cancer care activity indices showed that 17.8-28.4 % of colon cancers were diagnosed in 4th stage and 36.8-46.1 % patients died during the first year. That is in Chernigivska oblast number of patients with colon cancer that survive less than 1 year is 1.5 times more than number of those who diagnosed in the 4th stage of the disease, in Zhytomyrska and Chernigivska oblasts this ratio equals to 1.9-2.1 (Table 7). It was found also that 5-year survival is unreasonably low if compare it with small percent of the advanced tumors diagnosed and sufficient share of patients received special treatment.

Table 7. Main indices of cancer care activity for patients with cancer of colon

Administrative territory	I-II stage, %	IV stage, %	Lived less than one year since diagnosis, %	Received special treatment, %		Microscopically verified, %				
				total	with radical surgery					
Rivnenska	651	544	65,6±4,1	59,2±4,5	4,1	9,2	18,8±3,9	17,0±3,8	12,9	15,3
Chemigivska	809	720	70,3±3,5	72,9±3,5	3,5	1,5	39,0±4,4	46,5±4,4	5,8	8,8

UKRAINE	48,9	21,5	43,4	61,9	48,3	73,0
Vinnyska	56,4	22,4	38,9	59,9	50,9	68,1
Volynska	47,8	22,4	40,7	67,1	52,9	89,5
Zhytomyrska	51,1	22,7	42,1	67,8	53,6	78,6
Kyivska	57,6	17,8	36,8	72,0	55,1	82,0
Rivnenska	47,7	28,4	46,1	56,7	38,1	52,3
Chernigivska	45,9	28,1	42,3	70,6	50,5	80,1

Level of rectum cancer patients diagnosed in 3-4th stage is 31.0 % in Ukraine and ranges from 17.5 % in Vinnyska oblast to 32.3 % in Chernigivska oblast (Table 8).

Table 8. Main indices of cancer care activity for patients with cancer of rectum

Administrative territory	I-II stage, %	III-IV stage, %	Lived less than one year since diagnosis, %	Received special treatment, %		Microscopically verified, %
				total	with radical surgery	
UKRAINE	63,4	31,0	35,2	66,5	42,6	84,1
Vinnyska	81,3	17,5	30,1	68,4	41,0	88,1
Volynska	65,0	30,4	36,3	68,0	37,1	97,0
Zhytomyrska	69,7	28,8	36,8	68,3	36,8	90,7
Kyivska	67,4	32,3	30,0	71,0	45,1	89,0
Rivnenska	66,3	28,8	37,7	68,0	39,1	72,7
Chernigivska	63,4	31,0	35,2	66,5	58,5	84,1

The analysis of share of patients under the dispensary follow-up revealed that 0.9-8.1 % of patients with cancer of digestive organs have been lost from follow-up during the first year after diagnosis and 1.4-11.9 % - after 5 year of diagnosis, the worst rate of lost patients being in Zhytomyrska and Rivnenska oblasts. Absence of information about the vital status of more than 5 % of patients in a cohort becomes a barrier to obtaining statistically reliable survival rates and objective estimates for diagnostics and treatment activity in a region.

Summary

The study showed that calculated survival rates allowed to estimate roughly the state of cancer care activity for the population with cancer of digestive system in Ukraine and contaminated with radionuclides oblasts. It is found that one-year and 5-year survival rates remain 1.5-2.0 times smaller than ones in European countries and USA while rate of early diagnostics of this cancer is annually growing and share of the advanced tumors diagnosed is decreasing. It is ascertained that according to the 5-year survival rate the most alarming state of cancer care for population with cancer of digestive system is in Rivnenska and Zhytomyrska oblasts.

The further study is to be directed onto more detailed analysis of oncological care to the patients of this cohort depending on stage of the disease, treatment modality, profile of medical institution, etc.