

# Present State and Possibilities for Improvement of Cancer Prevention and Early Detection in the Osijek-Baranya County

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## ABSTRACT

*Cancer morbidity and mortality are on a steady increase in Croatia. Technologic possibilities for appropriate management are available for four cancer sites, i.e. cancer of the breast, cervix uteri, colorectum and prostate, and include cancer prevention and early detection in individuals yet free from manifest signs of the disease. The magnitude of the problem, the experience acquired to date, health care personnel available, and additional resources required to launch a systematic program of early detection of the disease are presented. The program should be initially launched in a county with greatest experience in early detection of cancer, where health care service is ready to immediately start its implementation. The role of family physician, gynecologic service at primary health care level, and polyclinic-consultation hospital service in program implementation is described. The following three possible options for early detection of cancer are analyzed and proposed: minimal program (early detection every 3 years), medium program (the same individuals examined every 2 years), and optimal program proposed by the American Cancer Society and other national and international organizations.*

**Key words:** cancer, prevention, early detection, Croatia

## The Problem

During the 1978–2000 period, the number of cancer patients in Croatia increased from 12,129 to 20,956 (+72.8%), the respective rise for particular cancer sites being 179.3% for colorectum, 102.4% for prostate, 86.9% for trachea, bronchi and lungs, and 11.1% for breast. The number of patients with *cervix uteri* cancer decreased by 11%, however, the rate of *cervix uteri* carcinoma *in situ* increased by 306.7% and of uterus body carcinoma by 76.3%<sup>1</sup>.

During the 1983–2000 period, the number of deaths from cancer increased from 8,974 to 11,725 (+30.7%), re-

ferring to cancer of the trachea, bronchi and lungs, colorectum and breast, while the number of deaths from cancer of the *cervix uteri* and uterine body as well as of prostate decreased<sup>2</sup>. The number of new cases of and deaths from cancer is shown in Figure 1.

In the Osijek-Baranya County, the number of cancer patients also increased during the 1988–2000 period, however, to a lower extent: from 155 in 1988 to 1,299 in 2000 (+12.5%). An increase exceeding the average was recorded for cancer of the breast (+93.7%), uterine body (+76.2%), colorectum (+71.7%), trachea, bronchi and

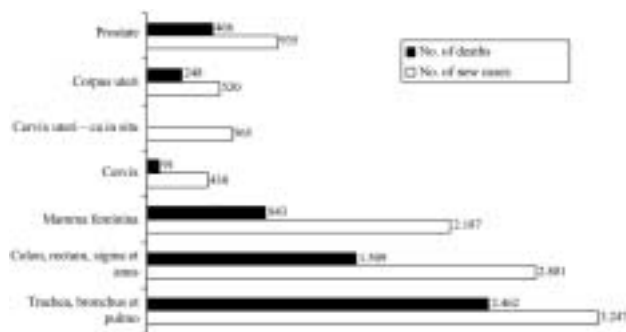


Fig. 1. Number of new cases and deaths from cancer of most common sites in Croatia in 2000.

lungs (+23.6%), and prostate (+4.9%), while the number of patients with *cervix uteri* cancer and *cervix uteri* cancer *in situ* decreased (-5.7% and -17.4%, respectively).

During the period 1983–2000, the number of deaths from cancer in the Osijek-Baranya County increased from 716 to 834 (+16.5%). The highest increase was recorded in the number of deaths from cancer of uterine body (+200%), prostate (+107.1%), colorectum (+82.4%), breast (+68.4%), and trachea, bronchi and lungs (+34%), whereas the number of deaths from *cervix uteri* cancer decreased (-25%) (Figure 2).

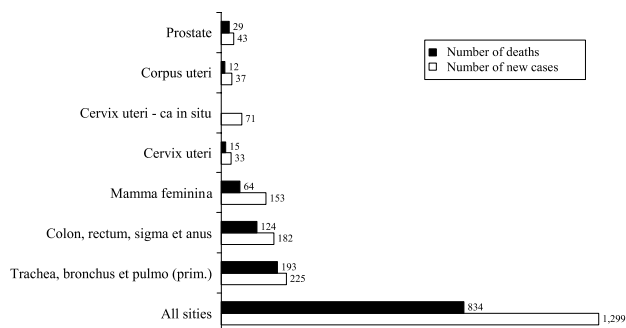


Fig. 2. Number of new cases and deaths from cancer of most common sites in the Osijek-Baranya County in 2000.

In 2000, cancer mortality accounted for 23.3% of total mortality in Croatia, whereas in the Osijek-Baranya County this rate was slightly lower (21.9%).

The data show an increase of new cases of *cervix uteri* cancer *in situ*, decrease of *cervix uteri* invasive cancer, and decrease of the ratio of invasive cancer to localized cancer from 3.3 in 1978 to 0.7 in 2000. In the Osijek-Baranya County, both types of *cervix uteri* cancer showed a tendency to decrease. Such a favorable pattern could be ascribed to more intensive measures taken for the early detection of *cervix uteri* carcinoma by Pap test in the area as compared to the average in Croatia.

The high increase in the cancer incidence and mortality in Croatia indicates that the proclaimed programs

of cancer prevention and early detection have been inadequately implemented in practice<sup>3</sup>. Obviously, the program of prevention and early detection of cancer requires a new, different approach from the local standpoint. The measures for risk factor elimination and early detection of cancer should include as many as possible individuals from the groups found to benefit from these measures. Health education has a prominent role, as it can cause the inappropriate attitudes, unhealthy habits and behaviors of the population to change and the response to early detection drives to increase<sup>4</sup>.

Results of controlled and large population based studies have clearly shown that the problem can be reduced by implementing a program of prevention and early detection of the disease in individuals yet free from alarming signs of the disease. Based on the analysis of these results, recommendations for the prevention and early detection of cancer have been developed, those issued by the following agencies being most frequently cited in the literature and used in practice: American Cancer Society (ACS)<sup>5-7</sup>, United States Preventive Services Task Force<sup>8</sup>, Canadian Task Force on Periodic Health Examination<sup>9,10</sup>, World Health Organization (WHO)<sup>11,12</sup>, and European Union Advisory Committee on Cancer Prevention<sup>13</sup>. In Croatia, the respective recommendations are issued by the Croatian National Institute of Public Health and Croatian League Against Cancer<sup>14</sup>.

The ACS has set time goals in the implementation of measures for cancer prevention<sup>15</sup>. For example, it is stated that the incidence of cancer will be reduced by 25% and cancer mortality by 50%, the quality of life (physical, mental and social) in cancer patients will improve, the number of adult smokers will be reduced by 12% and of minor smokers (age <18) by 10%, and the coverage of women aged >40 by early detection of breast cancer will rise to 90% by 2008 or 2015.

The WHO emphasizes the need of an integrated approach to the prevention of chronic and malignant diseases, and active involvement of the community, where individuals and families should in part take the responsibility for their own health, thus contributing to the development of the community as a whole<sup>16</sup>.

### Solution for the Problem: Program of Prevention and Early Detection with the Leading Role of Family Physician

The measures that should form the backbone of the program of prevention and early detection of cancer include primary prevention, individual and group counseling, and early detection of cancer, and high coverage drives that should be precisely planned and conducted.

Numerous controlled and population based studies of early detection of cancer by screening methods have indicated a significant increase in 5-year survival and a decrease in specific mortality from cancer of various localizations. If cancer had been detected in localized stage, the survival rate exceeded 95% of cases for cancer

of the breast, ovaries, uterus, prostate, thyroid and for melanoma, and 90% of cases for cancer of the colon<sup>17</sup>.

Based on these experiences, the ACS has been constantly issuing recommendations for early detection of cancer in asymptomatic population<sup>5</sup>. An overview of these recommendations for asymptomatic individuals at an average risk is presented in Table 1.

Early detection of cancer should be as a rule conducted by family physician teams in close collaboration with polyclinical-consultation service. Family physicians should take the responsibility of identifying high risk individuals who need an optimal (according to study results) examination frequency and intensive education on the early signs of disease, as specified for particular cancer types.

Assuming that a team of family physicians have a catchment population of some 700 persons aged >40, and that 60%–70% of these seek medical help at least once a year, it appears that 400–500 individuals could be relatively simply included in the program of early cancer detection. The remaining 200–300 persons should

be invited and additionally motivated to enter the program. Thus, performing only two systematic examinations *per* day, the entire population of these age groups could be examined at a family physician office over 2 years, taking ~4 hours every or every other day. Approximate times and activities of a family medicine team on the prevention and early detection of the disease with a catchment population of 1000 are presented in Tables 2 and 3.

Total cost of the program should include the costs of material, tests, facilities, diagnostic equipment, transport, professional work, and the cost of all additional diagnostic procedures in positive individuals as a separate item<sup>18</sup>.

### Experience and Possibilities for Improvement of Prevention and Early Detection of Cancer in the Osijek-Baranya County

The measures of primary prevention and early detection of cancer have neither been systematically per-

TABLE 1  
THE AMERICAN CANCER SOCIETY RECOMMENDATIONS FOR EARLY DETECTION OF CANCER IN ASYMPTOMATIC POPULATION<sup>5</sup>

Cancer site	Recommendations
Control examination for cancer	The individuals undergoing periodical systematic examination for cancer detection should receive age adjusted health counseling; general examination for cancer of the thyroid, oral cavity, skin, lymph nodes, testes and ovaries as well as for some chronic nonmalignant diseases may be included.
Breast	Women aged $\geq 40$ : clinical examination of the breast and mammography once a year, and breast self-inspection once a month. Women aged 20–39: clinical examination of the breast every 3 years, and breast self-inspection once a month.
Uterus	Cervix uteri: screening should start after 3 years of sexual activity but not later than age 21. Standard swab according to Papanicolaou once a year or every other year if a liquid-based test is used. Following $\geq 3$ consecutive normal test findings, testing can be performed every 2–3 years after age 30. In high risk individuals (HIV, immunosuppression) the physician may advise more frequent examinations. In women aged $\geq 70$ with 3 consecutive normal test findings over the preceding 10 years screening testing may be discontinued. Screening is unnecessary after total hysterectomy. Endometrium: all women should be properly informed on the risks and symptoms of endometrial cancer, and should be stimulated to visit their physician upon any unexpected bleeding or bleeding in traces. Women aged >35 with hereditary nonpolypous colon syndrome or risk of hereditary nonpolypous colon cancer (HNPCC) should be offered yearly screening (endometrial biopsy) for endometrial carcinoma, starting from age 35.
Colon and rectum	One of the following examinations is recommended in men and women aged >50: testing for occult fecal bleeding once a year flexible sigmoidoscopy every 5 years yearly testing for occult fecal bleeding and flexible sigmoidoscopy every 5 years double contrast irrigography every 5 years colonoscopy every 10 years Special programs of early detection should be developed for individuals at moderate to high risk of colorectal carcinoma.
Prostate	Digitorectal examination and determination of prostate specific antigen (PSA) once a year in individuals aged >50 and those with life expectancy >10 years. In high risk individuals, systematic examination is recommended to start at age 45. High risk groups include individuals with positive family history (occurrence of prostate cancer in two or more first grade relatives).

Adapted from: Smith R. A., V. Cokkinides, H. J. Eyre, CA Cancer J. Clin., 53 (2003) 27.

**TABLE 2**  
APPROXIMATION OF FAMILY PHYSICIAN ACTIVITIES IN PRIMARY PREVENTION (PROGRAM UNITS AND HOURS PER 1000 POPULATION)<sup>18</sup>

Measures and activities	Population (unit)	Activities per unit	Total hours/months	Other collaborators involved
Keeping up to date with professional information	Team, profession	Various	2–6	+
Work in community	Various	Various	4+	+++
Publicity and health education	Groups Public	About 4–6 hours	4	+
Counseling for groups at risk	2–4 groups	About 20 hours	4–8	+
Individual counseling (routine)	40–60/ god.	20–30 min	6–8	+

Adapted from: Jakšić Ž, Ebling Z, Peršić L, Kovačić L. Ocjena provedivosti, organizacija i način evaluacije. In: Ebling Z, Budak A, eds. Problematika raka u primarnoj zdravstvenoj zaštiti, Zagreb, 1993.

**TABLE 3**  
APPROXIMATION OF FAMILY PHYSICIAN ACTIVITIES IN EARLY CANCER DETECTION (PROGRAM UNITS AND HOURS PER 1000 POPULATION)<sup>18</sup>

Measures and activities	Population (unit)	Activities per unit	Total hours/months	Other collaborators involved
Systematic examinations				
a) preparation	150/year	Various	2–8	++
b) examination	150/year	20/month	4–10	
c) subsequent examinations	15/year	20/month	2–3	+
Routine examinations	450/year	5 min	6–8	
Documentation	600/year	3 min	3–5	

Adapted from: Jakšić Ž, Ebling Z, Peršić L, Kovačić L. Ocjena provedivosti, organizacija i način evaluacije. In: Ebling Z, Budak A, eds. Problematika raka u primarnoj zdravstvenoj zaštiti, Zagreb, 1993.

formed nor have been adequately included in the population health care program. Furthermore, an information system needed for monitoring and evaluation of the activities is lacking. The activities and results on primary prevention and early detection of cancer in the Osijek-Baranya County are briefly presented below, to possibly serve as a model for the country as whole.

### Primary prevention

At present, the legislature and social commitment to health promotion and protection are generally lacking. Safety control of foods and water supply is not systematically performed according to a preset program but on individual or occasional sanitary inspection demands, thus there are no reliable parameters on the issue.

According to sulfur dioxide, smoke and sediment levels, the Osijek-Baranya County belongs to category I (values below the recommended ones), except for one of the 16 stations falling in category II (values below the borderline ones) according to sediment values<sup>19</sup>.

Cancer prevention in school children and adolescents as part of the program of prevention, health promotion and protection has been integrated in regular elementary school curricula as well as in the elective subjects of home economics and ecology, additional courses, extra-curricular and out-of-school activities, and in the pro-

jects of Health-Promoting Schools, Eco-Schools and struggle against addictions. School medicine teams have been included in the program of prevention on the issues of inappropriate dietary habits and addiction disorders in elementary school 3<sup>rd</sup>, 5<sup>th</sup> and 8<sup>th</sup> grades and secondary school 1<sup>st</sup> grade, reinforced by individual counseling on inappropriate dietary habits and cigarette smoking during and after systematic examinations. The latter is of paramount importance, as the rate of smokers among secondary school students in Osijek increased from 32.5% in 1985 to 40% in 1995, whereas overweight was recorded in 6.03% of elementary school children and in 10.42% of secondary school 1<sup>st</sup> pupils.

In the County, the measures of prevention have also been performed by the local Leagues Against Cancer from Osijek, Beli Manastir and Našice, by well planned and continuous health education of the population in the form of lectures, brochures, books, posters, and support to respective education of health professionals on topics in oncology.

For that purpose, the Osijek League Against Cancer has issued a number of publications entitled »Fighting cancer by knowledge«, »Breast self-inspection«, »Life after breast cancer«, »With food against cancer« and »Colorectal cancer«, 20,000 copies each (in collaboration with the Ministry of Health and Croatian League

Against Cancer), »Men and cancer«, »Women and cancer« and »Prostate cancer«, 100,000 copies each; and the book »Diseases caused by cigarette smoking«, 20,000 copies.

The Osijek League Against Cancer considers that comprehensive information on cancer prevention, early detection and treatment should as soon as possible be available on the Internet, to appropriately inform the users on cancer patterns, risk factors, methods of early detection, treatment and rehabilitation, dietary recommendations, smoking cessation, physical activity, etc. The contents should be continuously revised and updated at the national level.

In an effort to allow for the widest possible access to the relevant information on the prevention and early detection of cancer, in 2001 the Osijek League Against Cancer opened their own web site on the Internet (www.prevenjaraka.net), which has been regularly updated with new information in the field.

The Osijek League Against Cancer provides continuous support to postgraduate education of physicians in oncology. A number of courses entitled »Cancer issues in primary health care«, »Family and health«, »Procedure and communication with patients in need of palliative care«, »Improvement in the patient quality of life through implementation of new skills and knowledge« have been organized, and Zagreb University School of Medicine handbooks on continuous education of physicians »Cancer issues in primary health care« (1993) and »Family and health« (1995 and 1996) have been published.

Regulations on forbidding advertising of tobacco and tobacco products, cigarette smoking at work places and in public indoor facilities, and restricting availability of tobacco products for minors have generally been implemented but seem to have been accompanied by inadequate social commitment to be fully adopted.

Health education activities aimed at restricting cigarette smoking are especially intensified around the World Nonsmoking Day. Systematic programs (individual or group) have lately appeared to help smokers quit smoking. The program had been initiated and conducted by Andrija Štampar School of Public Health, and it consisted of the general health education section; community drives, especially in schools, universities and army barracks; and individual section in the form of counseling and support to persons trying to quit cigarette smoking<sup>20</sup>.

### Early Detection of Cancer of Most Common Localizations

Early detection of lung cancer has not been performed, which is consistent with data on the inefficiency of early detection of lung cancer in asymptomatic population, with the exception of high risk groups<sup>5</sup>. The more so, as non smoking and smoking cessation have been definitely demonstrated to reduce the risk of premature

death from lung cancer, activities have been directed towards smoking cessation<sup>21</sup>.

Within the scope of the measures of early cancer prevention, the Osijek League Against Cancer has published a brochure on the need of breast self-examination entitled »Self-inspection of the breast« in 20,000 copies, while courses on breast self-inspection have been organized at the League Mammae Club in Osijek.

About 8,000 and 1,000 mammography procedures per year have been performed at the Osijek University Hospital in Osijek and General County Hospital in Našice, respectively, accounting for 14.2% of the female population aged 40–69 years. In 2000, 235 carcinoma patients were detected by mammography at the Osijek University Hospital.

#### *Early detection of cervix uteri carcinoma*

During the 1966–1995 period, 380,780 cervical swabs were examined at the Department of Clinical Chemistry, Osijek University Hospital, whereby 1357 preinvasive *cervix uteri* lesions in the form of cervical intraepithelial neoplasia grade 3 (CIN 3) were detected and 1098 women were treated at the Department of Gynecology and Obstetrics for *cervix uteri* carcinoma.

During the 1966–1971, 1972–1983 and 1984–1995 periods, 2262, 7123 and 23,474 cervical swabs were cytological examined per year, respectively, accounting for 17% of the female population aged >21.

The ratio of preinvasive to invasive lesions recorded during the 1966–1971 period was 1:7, whereas during the 1984–1995 period it was 2.8:1.

Taking cytological swabs in all women presenting for gynecologic examination during the 1993–1995 period revealed an ever increasing rate of uterine body carcinoma versus cervical carcinoma<sup>22</sup>. There was no systematic and planned early detection of cervical carcinoma in the County female population.

#### *Early detection of colorectal cancer*

A study on the early detection of colorectal cancer by testing for occult fecal bleeding performed in Osijek from 1981 till 1984, which included 7592 risk group subjects, showed the population to be highly motivated for screening, as 82% of the individuals administered the test returned it for examination. Positive test findings were recorded in 1.9% of the responders, and additional examinations revealed the presence of carcinoma in 12 individuals. The test was found to have a high sensitivity (92.8%) and high specificity (99.08%) for one-year occurrence of colorectal carcinoma<sup>23</sup>.

As early detection of colorectal carcinoma by testing for occult fecal bleeding is not included in the Program of Health Care Measures in Croatia, only some 2000 persons aged >50 undergo this examination per year on an individual basis. The resources for testing have for years been provided by the Osijek League Against Cancer program. According to the information obtained from Herbos Dijagnostika Co., only 25,000 Hemocult

tests allowing for screening of some 8500 individuals are annually distributed all over Croatia.

#### *Early detection of prostate cancer*

According to Osijek University Hospital records, early detection of prostate cancer by use of prostate specific antigen (PSA) testing is very low. At the Department of Nuclear Medicine, serum PSA level was determined in 2757 and 3336 individuals aged 50–69 in 1996 and 2000, respectively, accounting for 9% of this age group population.

During the same period, a study assessing the value of early prostate cancer detection by digitorectal examination and PSA determination, carried out at the Department of Urology, Osijek University Hospital, found prostate cancer in 4.4% of cases, with a PSA predictive value of 47%<sup>24,25</sup>.

### **Proposal to Improve Prevention and Early Detection of Cancer in the Osijek-Baranya county**

Based on the recommendations issued by the ACS<sup>5</sup> and WHO<sup>26</sup>, on our own experience, evaluation of the activities already taken and possibilities of prevention and early detection of cancer in the Osijek-Baranya County, we propose the following measures to improve the prevention and early detection of cancer of the most common localizations.

#### *Lung cancer*

As there are no adequate data on the efficacy of early detection of lung cancer in asymptomatic population<sup>5</sup>, special attention should continuously be paid to cigarette smoking reduction<sup>21</sup>, because a causal relationship of cigarette smoking not only with lung cancer but also with cancer of the oral cavity, larynx, pharynx, gastrointestinal tract, pancreas, urinary bladder and kidneys has been demonstrated. Activities related to cigarette smoking reduction should be carried out as part of a national anti-smoking campaign, thus allowing for joint activities to perform that would unify resources, procedures, participants and implementers necessary for successful program implementation in the most operative manner, and to ensure monitoring and evaluation of the success achieved. Performance of the national program for cigarette smoking reduction should be covered from budgetary sources, i.e. from the tax imposed on tobacco products. Individuals at a high risk of lung cancer should be familiarized with the collected experience and risks of early detection of lung cancer by novel technologies (spiral computed tomography, sputum cytology, fluorescence bronchoscopy)<sup>27</sup>.

The program of cigarette smoking reduction intended for school children and adolescents should be supplemented with the activities performed by these target groups themselves, thus to allow them to make their

own decisions on how to resist the pressure of their environment concerning smoking habits.

This should be accompanied by consistent implementation of legal regulations on nonsmoking in and around schools, and at public assemblies of the young.

#### *Breast cancer*

The prevention and early detection of breast cancer imply proper informing the women on the factors involved in the development of breast cancer, e.g., use of hormone replacement therapy for more than 5 years<sup>28</sup>, overweight<sup>29</sup>, and alcohol abuse<sup>30</sup>. Moderate physical activity reduces the risk of breast cancer.

The ACS recommends breast self-inspection once a month after the age of 20, whereas the Canadian Task Force on Periodic Health Examination does not recommend breast self-inspection as part of the prevention program because of its inefficiency or potentially unfavorable effects<sup>31</sup>. Until definite results of controlled studies on the value of breast self-inspection in early detection of breast cancer become available, the method of breast self-inspection should not be abandoned where it has already been included<sup>8,14</sup>. The ACS<sup>4</sup>, Swedish Cancer Society<sup>32</sup> and results reported by Ren<sup>33</sup> recommend mammography to be done yearly in women aged  $\geq 40$ , whereas results of the study by Van Asperen from the Netherlands show that there was no difference in the benefit from mammography in the 40–49 age group between one-year and two-year screening<sup>34</sup>.

According to the recommendations issued by the ACS, mammography should be done in women aged  $>40$  once a year, clinical examination in women aged 20–39 every 3 years and yearly in women aged  $>40$ , along with breast self-inspection from age 20 once a month<sup>5</sup>.

Considering the national personnel and technical resources in Croatia, the program of early detection of breast cancer should start with mammography in all women aged 50–69 every 3 years, while taking care to introduce ACS recommendations<sup>5</sup> as soon as financially and organizationally possible.

#### *Cervix uteri cancer*

The prevention of cervical carcinoma should include proper informing the women on the risk factors for the development of this type of cancer, such as sexual behavior<sup>35</sup>, sexual hygiene, and role of Pap test in the early detection of cervical carcinoma<sup>36,37</sup>.

Pap test should be done every 3 years after the age of 21, with the introduction of ACS recommendation<sup>5</sup>, i.e. Pap test once a year or less frequently following normal findings (elaborated in detail in Table 1), as soon as financially and organizationally possible.

#### *Colorectal cancer*

The measures for prevention of colorectal cancer should include informing the population at large on dietary habits (dietary counseling), i.e. on the fact that diets rich in fat, low in vegetables and fiber, and rich in

salted or nitrite-preserved meat along with inadequate physical activity increase the risk of colorectal cancer<sup>38</sup>.

Based on the experience from the Osijek program of colorectal cancer prevention and other authors' reports, testing for occult fecal bleeding should be performed by family medicine service to include 25%–50% of subjects at risk (aged >50) per year. Additional examinations including colonoscopy should be performed in the 3% of these with positive findings, which appears feasible even with the present personnel and equipment available<sup>23,39–41</sup>.

*Prostate cancer*

Although there are no definite evidence on the risk factors for the development of prostate cancer, fat rich diet is considered to increase<sup>42</sup>, and intake of tomato and soya<sup>43</sup> as well as other vegetables<sup>44</sup>, along with regular physical activity and maintaining normal body weight<sup>45,46</sup>, to reduce the risk of prostate cancer. Thus, health education and counseling should follow these directions.

Based on the ACS recommendations and taking the opinions of other scientific institutions and professional societies in consideration, we propose the PSA screening be performed in men aged 50–69 every 3 years<sup>47–51</sup>.

**Estimate of the Personnel and Cost of the Program of Early Cancer Detection in the Osijek-Baranya county**

The personnel, equipment and basic cost of the proposed measures of prevention and early detection of cancer in the Osijek-Baranya County were estimated. Three proposals have been developed for each cancer site: Proposal 1 (minimal proposal for the initial period, including screening every 3 years); Proposal 2 (extended proposal including screening every 2 years); and ACS Proposal (including yearly screening, as our ultimate goal by 2015).

Data of the Croatian Institute of Health Insurance on the number of insurees according to age groups in 2002, and data on personnel and equipment from the

**TABLE 4**  
PERSONNEL REQUIRED AND PRICES FOR THE PROGRAM OF EARLY DETECTION OF BREAST CANCER IN THE OSIJEK-BARANYA COUNTY

	Proposal 1 (every 3 years)	Proposal 2 (every 2 years)	ACS proposal (every year)
Risk group – women (age, yrs)	50–69	40–69	≥40
No. of subjects for mammography in first year	13,893	33,179	86,718
<b>PERSONNEL REQUIRED</b>			
Polyclinical-consultation level: physician specialist	2.9	7.0	18.2
Polyclinical-consultation level: college grade medical technician	2.9	7.0	18.2
<b>TOTAL COST OF PROGRAM (HRK)</b>	<b>1.106,161</b>	<b>2.641,712</b>	<b>6.904,487</b>

**TABLE 5**  
PERSONNEL REQUIRED AND PRICES FOR THE PROGRAM OF EARLY DETECTION OF CERVIX UTERI CANCER IN THE OSIJEK-BARANYA COUNTY

	Proposal 1 (every 3 years)	Proposal 2 (every 2 years)	ACS proposal (every year)
Risk group – women (age, yrs)	≥21	≥21	≥21
No. of women for Pap test in first year	43,152	64,728	129,455
<b>PERSONNEL REQUIRED</b>			
Primary health care: gynecologist	4.5	6.8	13.6
Polyclinical-consultation level: cytologist	1.6	2.4	4.9
Polyclinical-consultation level: college grade cytotechnician	4.9	7.3	14.7
<b>COST OF PROGRAM (HRK)</b>			
Primary health care: Pap test sampling	1.121,520	1.682,281	3.364,541
Polyclinical-consultation level: analysis of Pap test samples	699,494	1.049,241	2.098,469
<b>TOTAL</b>	<b>1.821,014</b>	<b>2.731,522</b>	<b>5.463,009</b>

Ministry of Health 2003 questionnaire were used as a basis to estimate the number of individuals for screening.

Wherever possible, personnel requirements and price of particular programs were estimated according to the Croatian Institute of Health Insurance standards ('Blue book'). However, we consider that these standards are incomplete or too high for particular diagnostic procedures to be applicable as screening methods in the programs of early cancer detection. As these standards imply too high personnel and equipment requirements, specific standards should be developed for such a program. Therefore, we have designed personnel and time-course standards as realistic and acceptable in the present conditions, based on the experience of physicians engaged in primary and polyclinical health care, and employing the methods of early detection of the mentioned cancer sites in the County.

The estimated personnel and equipment requirements refer to the procedures of early cancer detection,

excluding the cost of additional diagnostic procedures for positive findings.

Our estimate is as follows:

(a) A single mammography procedure with clinical examination can be performed in 20 min, implying that the minimal program screening would require 2.9 physicians and 2.9 medical technicians. The price of mammography would be 79.62 HRK (price = 20 min work + 4 x-rays films), yielding a price of 1 106 161 HRK for the complete program.

(b) Pap test (3 samples: vagina, *cervix uteri* and endometrium) can be performed in 10 min, whereas laboratory examination takes 3.6 min of the work by a cytologist and 10.8 min by a college grade cytotechnician; thus, the minimal program screening would require 4.5 gynecologists in primary health care, 1.6 cytologists and 4.9 college grade cytotechnicians. The price of a single Pap test would be 25.99 HRK and of laboratory examination 16.21 HRK, yielding 1 821 014 HRK for the complete program.

**TABLE 6**  
PERSONNEL REQUIRED AND PRICES FOR THE PROGRAM OF EARLY DETECTION OF COLORECTAL CANCER IN THE OSIJEK-BARANYA COUNTY

	Proposal 1 (every 3 years)	Proposal 2 (every 2 years)	ACS proposal (every year)
Risk group (age, yrs)	50–74	≥50	≥50
No. of subjects for Hemocult test	30,602	53,520	107,039
No. of subjects for colonoscopy (3%)	918	1,606	3,211
<b>PERSONNEL REQUIRED</b>			
Primary health care: college grade medical technician	1.0	1.7	3.4
Polyclinical-consultation level: physician colonoscopist	0.8	1.3	2.7
Polyclinical-consultation level: college grade medical technician for all colonoscopy procedures	0.8	1.4	2.9
<b>COST OF PROGRAM (HRK)</b>			
Primary health care: Hemocult tests – material and reading-off	678,446	1,186,538	2,373,055
Polyclinical-consultation level: colonoscopy	212,081	370,910	741,812
<b>TOTAL</b>	<b>890,527</b>	<b>1,557,448</b>	<b>3,114,867</b>

**TABLE 7**  
PERSONNEL REQUIRED AND PRICES FOR THE PROGRAM OF EARLY DETECTION OF PROSTATE CANCER IN THE OSIJEK-BARANYA COUNTY

	Proposal 1 (every 3 years)	Proposal 2 (every 2 years)	ACS proposal (every year)
Risk group – men (age, yrs)	50–69	50–69	≥50
No. of subjects for PSA test in first year	11 638	17 457	45 001
<b>PERSONNEL REQUIRED</b>			
Polyclinical-consultation level: university grade	0.4	0.5	1.4
Polyclinical-consultation level: college grade	1.8	2.7	7.1
<b>TOTAL COST OF PROGRAM (HRK)</b>	<b>2,525,330</b>	<b>3,787,994</b>	<b>9,764,767</b>



**TABLE 8**  
TOTAL COST OF THE PROGRAM OF EARLY DETECTION OF CANCER OF THE FOUR SITES IN THE OSIJEK-BARANYA COUNTY

Site of cancer	Proposal 1 (every 3 years)	Proposal 2 (every 2 years)	ACS proposal (every year)
Breast	1.106,161	2.641,712	6.904,487
Cervix uteri	1.821,014	2.731,522	5.463,009
Colon/rectum	890,527	1.557,448	3.114,867
Prostate	2.525,330	3.787,994	9.764,767
TOTAL	6.343,032	10.718,676	25.247,131

(c) Reading of one set of Hemocult test (3 samples/3 days) takes 3 min of a college grade medical technician's work; colonoscopy and biopsy take 80 min of work by a colonoscopist and 85 min by a college grade medical technician. As 3% of individuals are expected to be positive on Hemocult testing, and they should undergo colonoscopy and biopsy, complete screening would require 1 technician for reading Hemocult tests at primary health care, 0.8 colonoscopists and 0.8 technicians in polyclinical-consultation care. The price of the material for 1 Hemocult test would be 22.17 HRK, and of 1 colonoscopy with biopsy 231.01 HRK, yielding 890 527 HRK for the complete program.

(d) One PSA test takes 3 min of university grade professional and 15 min of college grade nurse in polyclinical-consultation care, thus the minimal program screening would require 0.4 university grade and 1.8 college grade professionals. The price of 1 PSA test would be 216.99 HRK (price of work 17.02 HRK and price of laboratory material 199.97 HRK), yielding 2 525 330 HRK for the complete program.

Considering the above mentioned estimates, the overall cost of the program for all four cancer sites would be 6 343 032 HRK in Proposal 1 (minimal program), 10 718 676 HRK in Proposal 2 (extended program), and 25 247 131 HRK in ACS recommendations.

At present, the following personnel resources are available in the Osijek-Baranya County: 17 gynecologists in primary health care, 5 endoscopists-gastroenterologists, 5 cytologists, 2 residents in cytology, 5 college grade cytotechnicians, and 1 cytotechnician on training. The equipment available includes 7 mammographs (5 at Osijek University Hospital, 1 at General County Hospital in Našice and Đakove Health Center each, and 2 at private practices) and 7 colonoscopes (5 in Osijek and 2 in Našice).

Tables 4–8 illustrate the personnel requirements and cost of early cancer detection according to the three program proposals suggested.

## Conclusion

In order to approach or even achieve the level of population coverage with the measures of cancer prevention and early detection recommended by the ACS by 2015, comprehensive programs of cancer reduction and control should be developed as the options of highest health care and social relevance. These programs should be integrated in the community health policy, thus they should be of realistic dimensions and should receive full support from the community.

Concerning financial issues, the programs proposed would not overburden health funds at short-term but would definitely result in savings at longterm; the more so, the quality of life of the population would be greatly improved.

The programs should be integrated in wide-scope programs of prevention of chronic diseases to the greatest extent possible, with clear objectives and realistic and rational plans. Additional resources should be ensured for their implementation, along with reduction in the number of patients per family physician, and development of appropriate information system to accompany the program as a basis for evaluation.

The program should be initiated in the county with greatest experience in the early detection of cancer, where health service is absolutely ready for program implementation.

Payments for the program of cancer prevention and early detection should follow the level of program implementation measured by the coverage and results rather than individual services or part of 'head allowance'.

Professionals from the Ministry of Health, Croatian National Institute of Public Health, Croatian Institute of Health Insurance, Croatian Society of Oncology and Croatian League Against Cancer should be included in the program development, thus ensuring full consensus and community support to the program.

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## SADAŠNJE STANJE I MOGUĆNOSTI UNAPREĐENJA PREVENCIJE I RANOG OTKRIVANJA RAKA U OSJEČKO-BARANJSKOJ ŽUPANIJI

### SAŽETAK

Broj oboljelih i umrlih od raka u Hrvatskoj u stalnom je porastu. Za četiri sijela raka (rak dojke, vrata maternice, kolorektalni rak i rak prostate) postoje tehnološke mogućnosti rješavanja: prevencija i rano otkrivanje raka u osoba kod kojih još nisu izraženi znakovi bolesti. U radu se prikazuje veličina problema, dosadašnja iskustva, raspoloživost zdravstvenog osoblja i sredstva koja bi dodatno trebalo osigurati da bi se započelo sa sustavnim programom ranog otkrivanja bolesti. Predlaže se program započeti u županiji koja ima najviše iskustva u ranom otkrivanju i u kojoj je zdravstvena služba najspremnija za provođenje programa. Opisana je uloga liječnika obiteljske medicine, ginekološke službe na primarnoj razini i polikliničko-konzilijarne bolničke službe u provođenju programa. Analizirana su i predložena za primjenu tri moguća rješenja ranog otkrivanja: minimalni program (rano otkrivanje svake 3 godine), program srednjeg intenziteta (pregledi istih osoba svake 2 godine) i optimalni program koji predlaže Američko društvo za rak i druge nacionalne i međunarodne organizacije.