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Breast cancer epidemiology in my country.
Comparison of epidemiological similarities and
differences with Czech Republic.

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1. Introduction:

As an Israeli that studies in the Czech Republic I would like to compare these two countries in the aspect of occurrence of breast cancer in women. I think it is important to see the differences in the incidence of cancer while considering the differences in prevention programs and the differences in mean population age and economical situation. It is interesting to see that in Israel where the population is generally younger (72% are older then 15, as compared with 85% in Czech Republic), the GDP per capita is slightly higher (28,900\$ compared to 26,800\$ in Czech Republic) and the overall parameters of the health system are somewhat better there is a significantly higher incidence of breast cancer.

1.1. Basic Facts

1.1.1.

General overview:

Breast cancer in women is a deadly disease that can be prevented if risk factors are avoided, or cured if the disease is diagnosed on an early stage. And even so breast cancer is on the rise in most developed countries like a social marker following the economic prosperity. Today breast cancer is the most frequent cancer in women in developed western countries (excluding skin). The incidence of breast cancer in women is still increasing though the good news are that the mortality is decreasing, this may be thanks to prevention, early diagnosis and better treatment possibilities, but it still remains the leading cause of death in women between 40 and 55 years old in the developed, western society.

1.1.2.

Breast cancer biology:

Breast cancers are derived from the epithelial cells that line the terminal duct lobular unit. An invasive breast cancer is one in which there is dissemination of cancer cells outside the basement membrane of the ducts and lobules into surrounding adjacent normal tissue. Breast cancers were previously classified either

as ductal or lobular types, since it was believed that ductal carcinomas arose from ducts and lobular carcinomas from lobules. It is now known that both arise from the terminal duct lobular unit. There are several factors, both endo- and exogenous, which are known to affect the risk of breast cancer in the population. These include lifestyle factors such as childbearing and number of children, breastfeeding time throughout life, type of diet, obesity, use of alcohol and tobacco. The hormonal status has a great influence as well i.e. age at menarche and menopause, oral contraceptives use, and hormone replacement therapy. Anthropometric characteristics, radiation, and genetic predisposition also play a role.

Table 1.

Staging of breast cancer according to American Joint Committee of Cancer

Staging:

Stage	(T) Tumour Size	(N) Axillary Lymph Nodes	(M) Metastasis
0	Tiny cluster of cancer cells in a breast duct (in situ)	No spread	None
I	Up to 2cm	No spread	None
II	Smaller than 2cm	Has spread to the axillary lymph nodes	None
	Between 2cm & 5cm	May or may not have spread to the axillary lymph nodes	None
	Larger than 5cm	No spread	None
III	Any size	Has spread to multiple axillary lymph nodes so that the nodes become attached to each other	None
	Larger than 5cm	Has spread to axillary lymph nodes	None
	Any size but cells have spread to skin or chest wall	May or may not have spread to the axillary lymph nodes	None
	Any size	Has spread to lymph nodes along breastbone and above/below collarbone	None
IV	Any size	May or may not have spread to the axillary lymph nodes	Has spread to other organs of the body or the skin and lymph nodes above the collarbone

1.1.3.

Risk factors:

Table 2.

Risk of breast cancer according to the Center for Disease Control and Prevention and the Global Cancer Atlas:

Increased by:	<ul style="list-style-type: none">• Oral contraceptives: current users have a risk 24% higher than that of non-users.• Hormone replacement therapy: use for 5 years increases risk by 35%.
Decreased by:	<ul style="list-style-type: none">• Childbearing: risk decreases by 7% for each birth.• Breastfeeding: risk declines by 4.3% for each 12 months of breastfeeding.
Not changed by:	<ul style="list-style-type: none">• Miscarriages.• Abortions.• Use of HRT or oral contraceptives in the past (10 years after cessation of oral contraceptives).

Risk factors and their relative risk:

Risk factor	Relative risk
*Atypical breast hyperplasia pre/postmenopausal.....	4-6
*Geographical area (North America and Europe vs. Asia).....	4-5
*Breast cancer in personal anamnesis.....	2-4
*Irradiation of the chest are in young age.....	2-4
*Nulliparity or delivery after 35 years of age.....	2-3
*Menopause after 55y.o. vs. before 45y.o.....	2
*Family history of ovarian cancer in first degree relatives.....	1.5-2
*Family history of breast cancer in second degree relatives.....	1.5-2
*Menarche before 12y.o vs. after 15y.o.....	1.5
*High socioeconomic status, BMI below 25 premenopausal and above 25 postmenopausal.....	1.5-2

From this data we can conclude that the greatest influence has the hormonal balance. Women who are exposed to high levels of estrogen throughout their lives are at a greater risk. Women who have more ovulatory cycles due to early menarche, late menopause, few or no pregnancies and short or no breastfeeding time are at greater risk. The same explanation can be implied in the case of oral contraceptives use and hormonal replacement therapy. Although there is a difference between the two; the risk from oral contraceptives increases the risk for a woman to get a breast cancer after 5 years of use by 35% and the risk persists for 10 years after cessation, while with hormonal replacement therapy the risk is increased only for women who use the therapy for a long time (10 years and more) and the risk decreases with the cessation of the therapy.

Women who suffer from obesity are also in a greater danger because the fat acts as an estrogen storage and the hormone's levels are higher in these women. As with many other cancers, breast cancer has a familial occurrence (in about 5-10% of the cases), about half of the women with hereditary breast cancer have mutations in

gene BRCA1 (on chromosome 17q21) and an additional one third have mutations in BRCA2 (on chromosome 13q12-13).

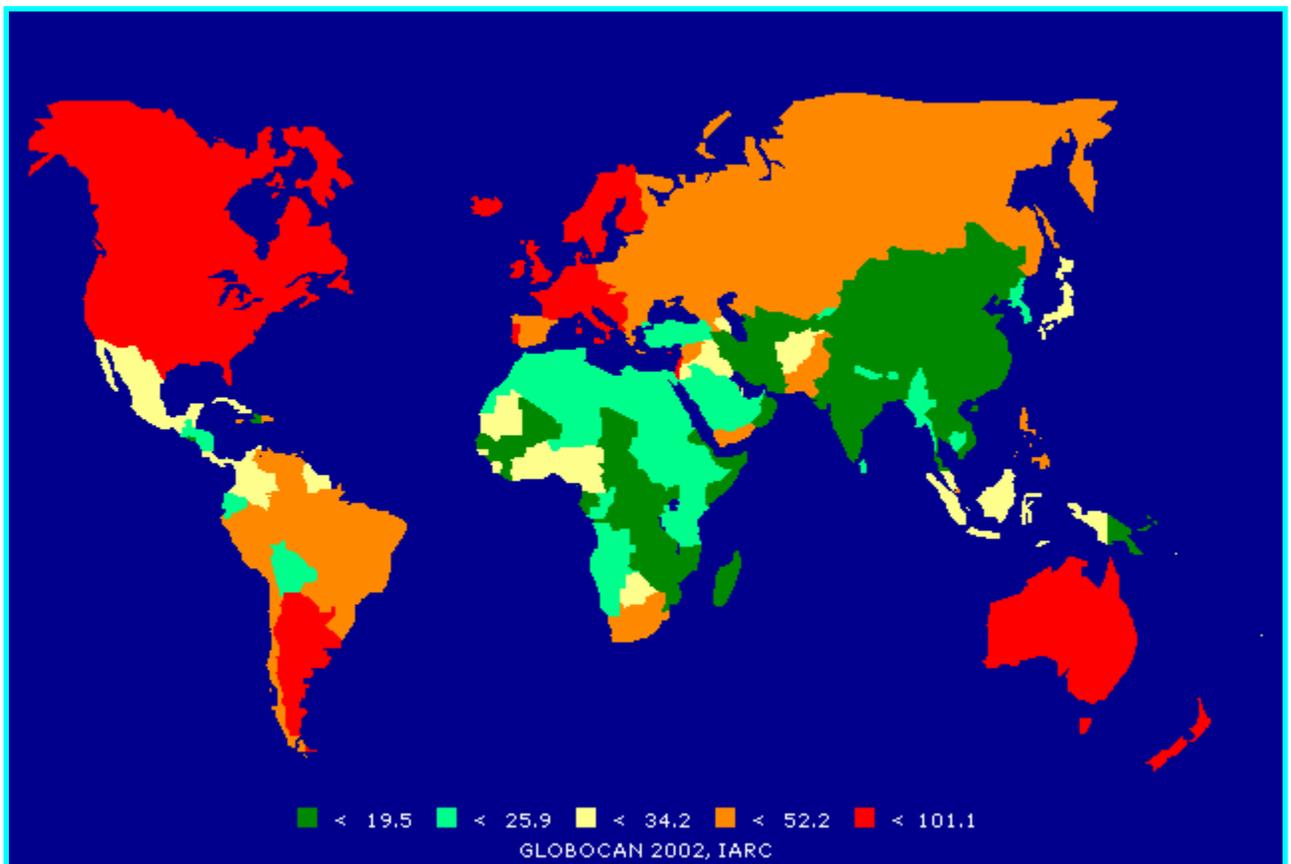
1.1.4.

Breast cancer as a global problem:

In order to fully appreciate the extent of the disease it is important to see the situation in other countries. This may provide us with a clue to understanding the different risk factors influencing the disease and the way to prevent it. As I have mentioned breast cancer seems to be a civilization disease that has greater occurrence in more developed and wealthy western countries, but there are many other factors influencing breast cancer and this is the reason for the differences in incidence between the western countries.

Fig. 1.

This map shows the worldwide incidence of breast cancer in 2002

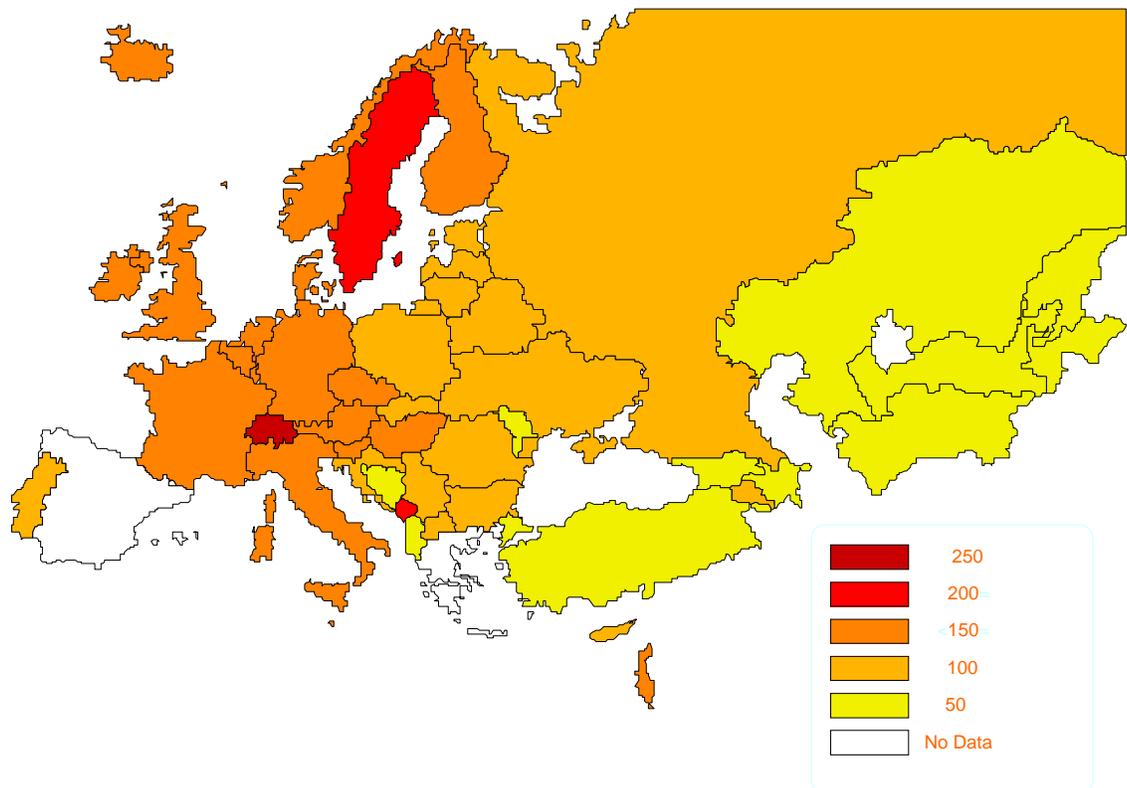


As we can see from the map indeed the most affected countries are those of Europe and North America.

But Europe is also not completely homogenous in the occurrence of breast cancer, we can see differences that clearly prove that there are other factors influencing the disease and not only the level of modernization of the society.

Fig. 2.

Map of incidence of breast cancer in Europe 2005



We can see two tendencies on this map, the first being the difference between East Europe and West Europe, this difference follows the socioeconomic explanation, the other is the exceptional situation in Sweden and Switzerland. These two countries are on comparable socioeconomic level with the other West European countries but the incidence of breast cancer there is higher.

1.1.5.

Screening and prevention:

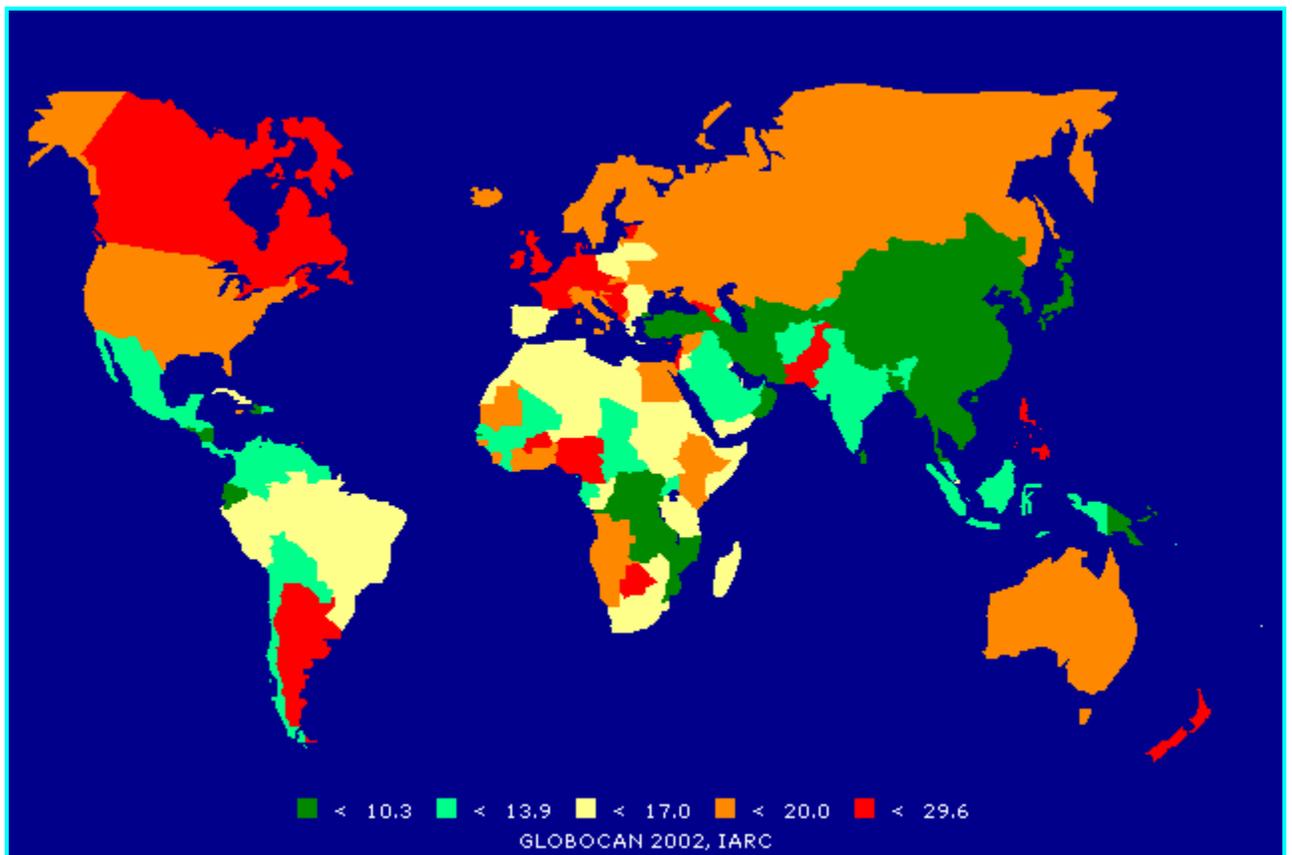
Breast cancer is a multifactorial disease and primary prevention in this case is quite complicated. Prevention should focus on avoiding the risk factors. The main preventable risk factors are: hormonal disbalance, obesity, smoking, excessive alcohol consumption, high fat diet, and low-dose irradiation. Other risk factors like genetic predisposition and geographic location are very important for secondary prevention and early detection but not for primary prevention. The prevention of hormonal disbalance is achieved by limiting the use of oral contraceptive pills and the alteration of their composition. The new contraceptives contain much less estrogens and are less dangerous. Obesity and diet risk factors are addressed by the primary physicians and by specialists that advise and promote healthy life style. Same is true for smoking and alcohol consumption, a big effort is done on both personal and state levels to limit smoking. As for radiation it is a rather rare problem and good preventive measures are usually taken in industrial, scientific and medical facilities where ionizing radiation is present.

Very important is the secondary prevention that focuses on early detection of breast cancer. Early detection and therapy are the factors that make the mortality rates decrease in the face of growing incidence. The screening can be done on different levels, by the women themselves as self examination (although recent research shows that self examination has very low predictive value), next level is the general practitioner or the ambulatory gynecologist that can provide more adequate examination and direct the woman to the specialized clinic that provides mammography and ultrasound. It is very important to invite women to their regular breast examination. This means that the state or the insurance companies must cover the expenses of screening and the women must be notified that they are supposed to show up for the examination. Women without increased risk of breast cancer are advised to come for mammography once a year after the age of 45.

Women that are in increased risk group, for example those that have relatives (especially first degree relatives) that have had breast cancer, or women that have had some fibrocystic changes in their breasts or those that already had cancer and were operated, or women that were exposed to irradiation, all these cases should start going for preventive checkups much earlier.

Fig. 3.

Map that shows the worldwide standardized death rate from breast cancer.



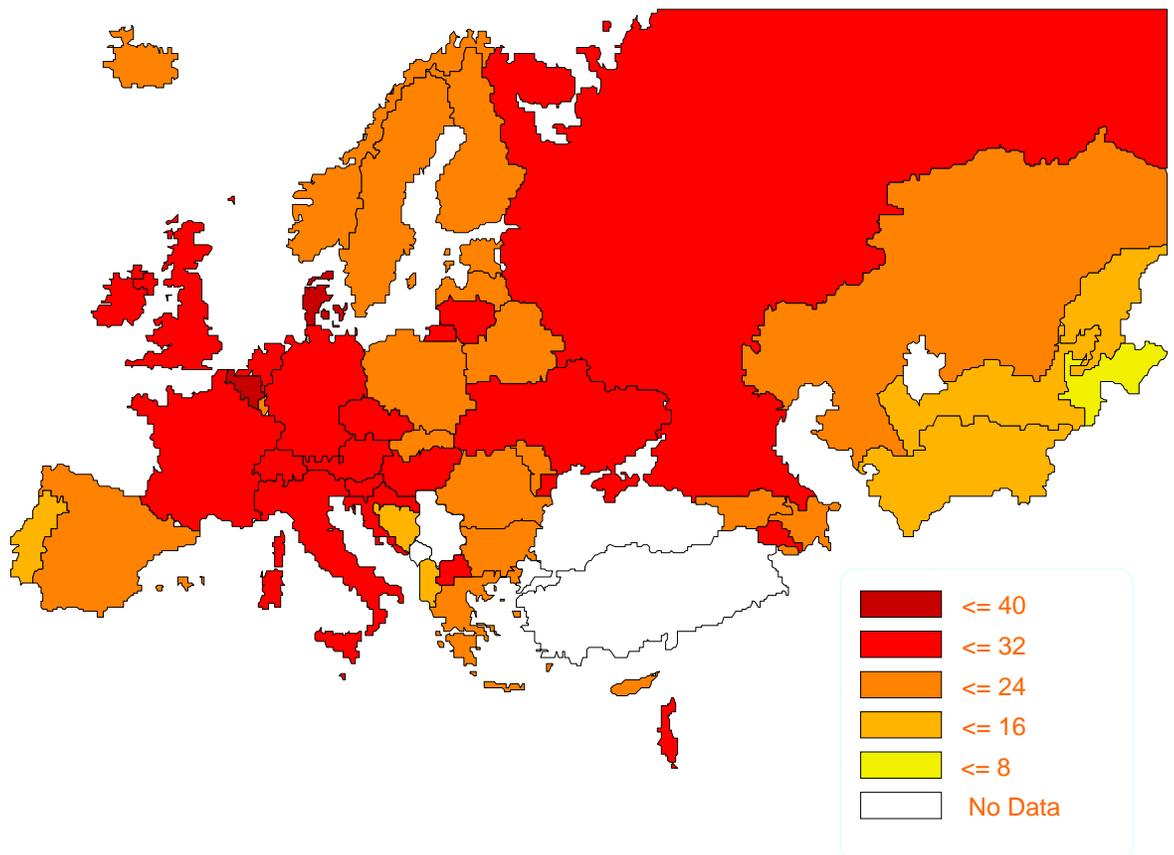
If we examine this map and consider the worldwide incidence of breast cancer (Fig. 1.), we can see the direct effect of screening. Countries like the United States and Sweden that have very high incidence have a lower mortality rate than countries

with higher incidence. This is thanks to the screening programs and the better treatment.

The same phenomenon can be demonstrated in Europe, countries that have higher incidence of breast cancer but invest considerable effort in secondary prevention (screening) and treatment have lower mortality rate than countries that have lower incidence and worse screening.

Fig. 4.

Standardized mortality rate from breast cancer in Europe 2005.



We can see that Sweden that has very high incidence has lower mortality rate, than can be attributed to their screening program.

2. Methods and Literature:

I will compare incidence and death rate in different age groups. I will examine different methods of prevention and their efficiency in each population and age group. I will also examine the different risk factors and how they seem to influence each population.

This work uses literature and publications that describe the incidence of breast cancer in Czech Republic and Israel. I also use international publications that compare the two countries and other countries in the aspects of risk factors evaluation and prevention. I use the WHO - Health For All database; Center for Disease Control and Prevention - Global Cancer Atlas; Israel Cancer Association database; National Cancer Institute – Surveillance Epidemiology and End Results; Institute of Health Information and Statistics of the Czech Republic and other articles and publications concerning these issues.

3. Aim of research:

The aim of this research is to compare the epidemiologic data concerning breast cancer from the Czech Republic and Israel. I will try to determine if there are any differences in risk factors and what influence they have on the occurrence of breast cancer in each population. Such comparison could point out the differences in life styles and exposure to risk factors that bring about the difference in occurrence of breast cancer and thus show us which risk factors are of greater importance.

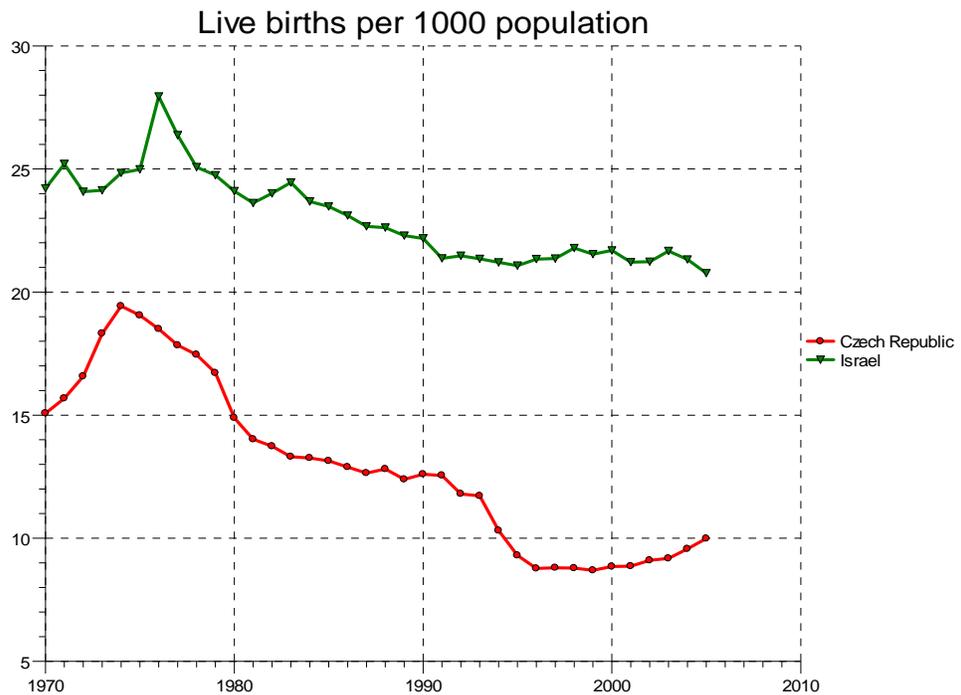
Another topic I will relate to is the prevention of breast cancer in the two countries, I will compare primary and secondary prevention in the Czech Republic and in Israel and try to make conclusions where the prevention program is better and in what way it could improve.

4. Results:

Comparison of parameters in Czech Republic and Israel:

As I have mentioned above childbearing and multiparty has a protective effect on the women regarding breast cancer so I should demonstrate the demographical differences between Czech Republic and Israel in this aspect.

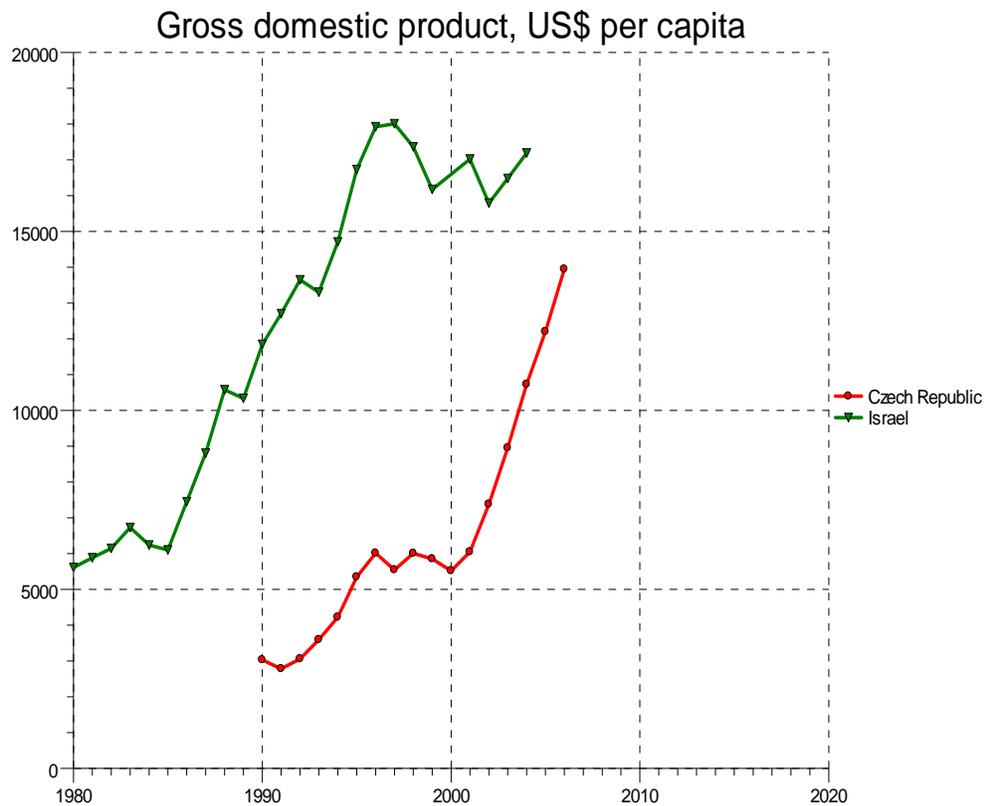
Fig. 5. Comparison of live births per 1000 population in the Czech Republic and Israel.



The above data shows that Israel has a significantly higher birth rate than the Czech Republic and that this difference has been stable for the last years.

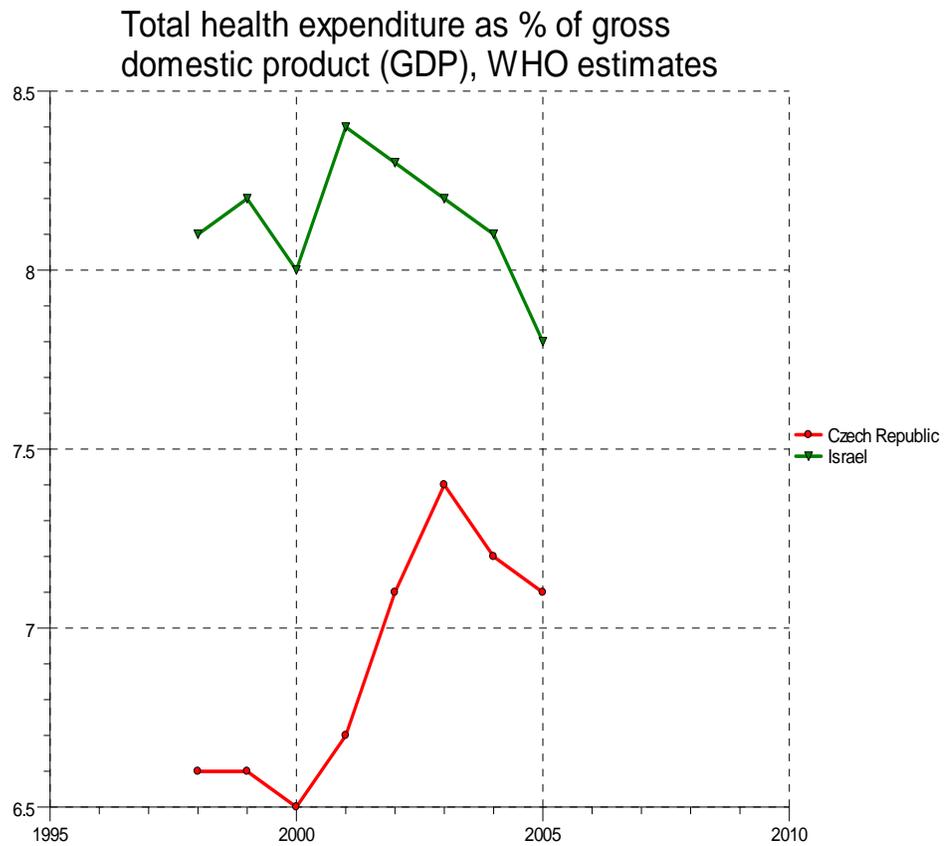
I would also like to demonstrate the socioeconomic differences between the Czech Republic and Israel in order to the overall prosperity and healthcare.

Fig. 6. Comparison of the GDP per capita in the Czech Republic and Israel.



The above graph and table show that although the Czech economic level is increasing very fast, Israel has still stronger economy and what is more significant for this research is that Israel has had an economical advantage over the Czech Republic in the last years.

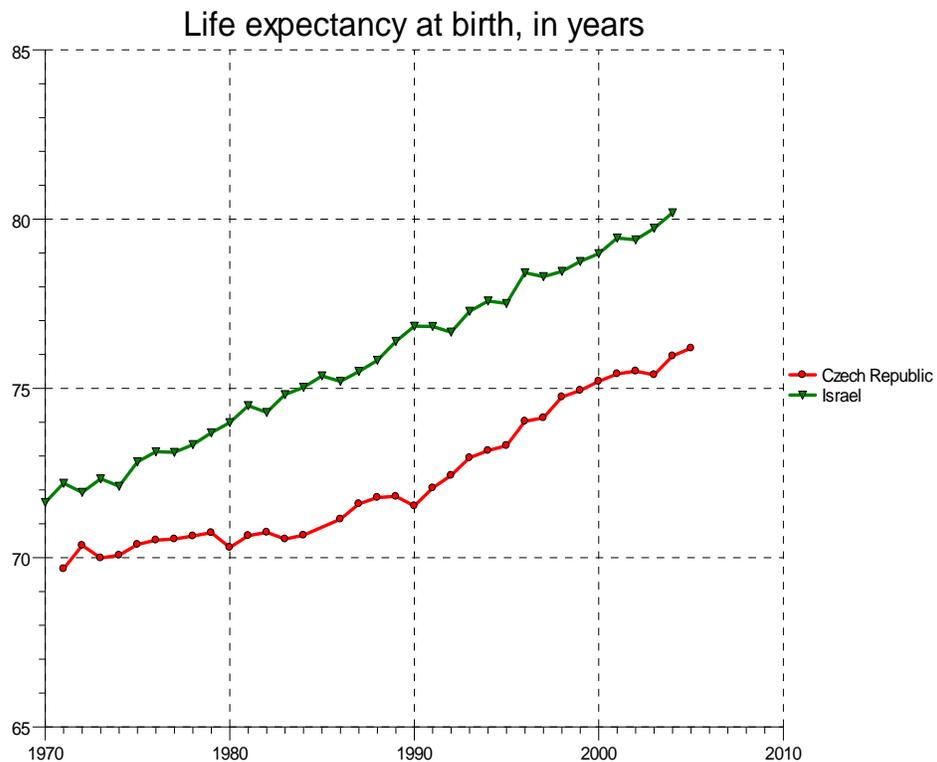
Fig. 7. Comparison of the percentage of gross domestic product spent on health, in the Czech Republic and Israel.



This figure shows that not only the GDP is higher in Israel but also a greater percent of it is spent on the health system. With such investment we could expect that the health indicators in Israel would be better than those in the Czech Republic.

In order to compare the overall success of the healthcare system I would like to present the graph of life expectancy in Czech Republic and in Israel.

Fig. 8. Comparison of the life expectancy in years in the Czech Republic and Israel.

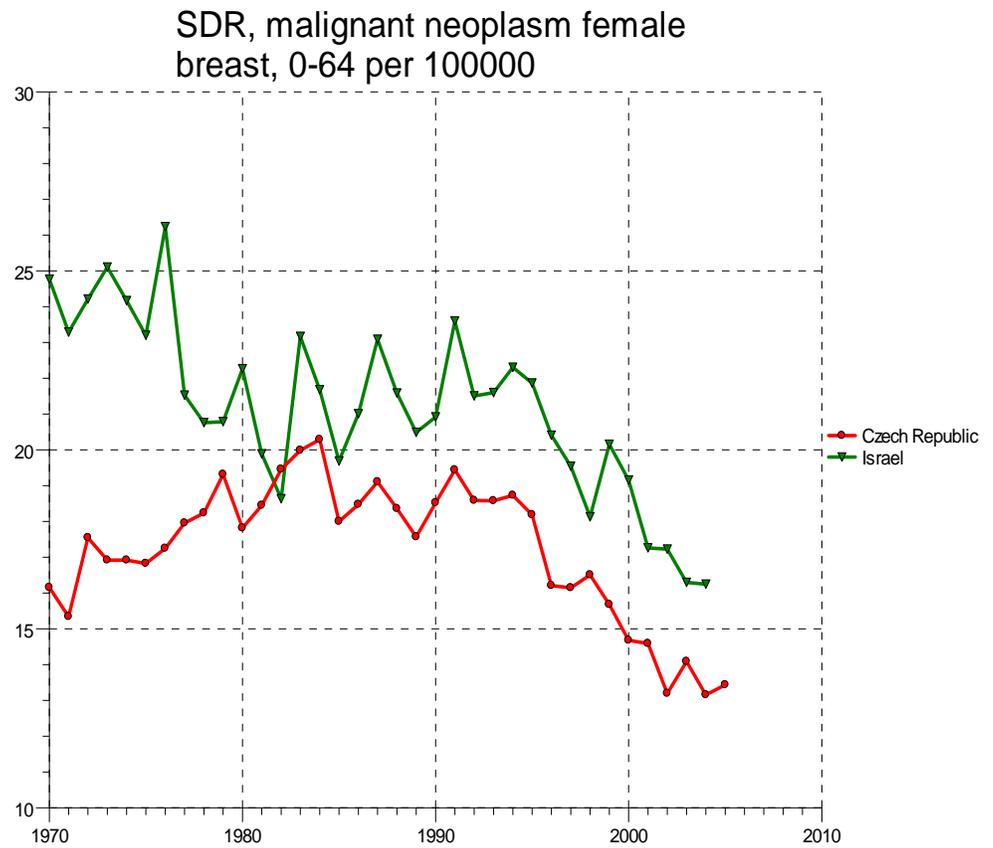


From the above data we can conclude that the general health indicators in Israel are slightly better than in the Czech Republic and have been that way at least since 1970.

Taking into consideration these facts we could expect that the rate of breast cancer in Israel would be lower, but the opposite is the truth. The rate of breast cancer in

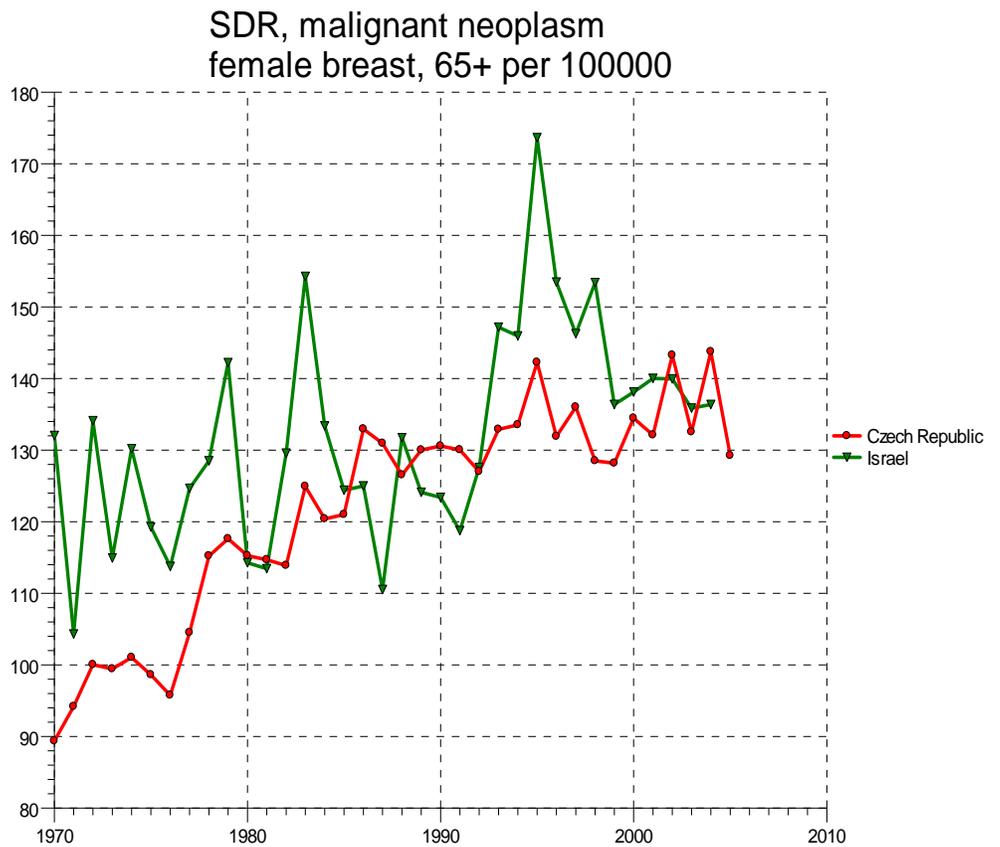
Israel is significantly higher than in the Czech Republic and has been that way since 1970.

Fig. 9. Comparison of standardized death rate due to malignant neoplasm of the breast in young females (0-64 years old) per 100 000.



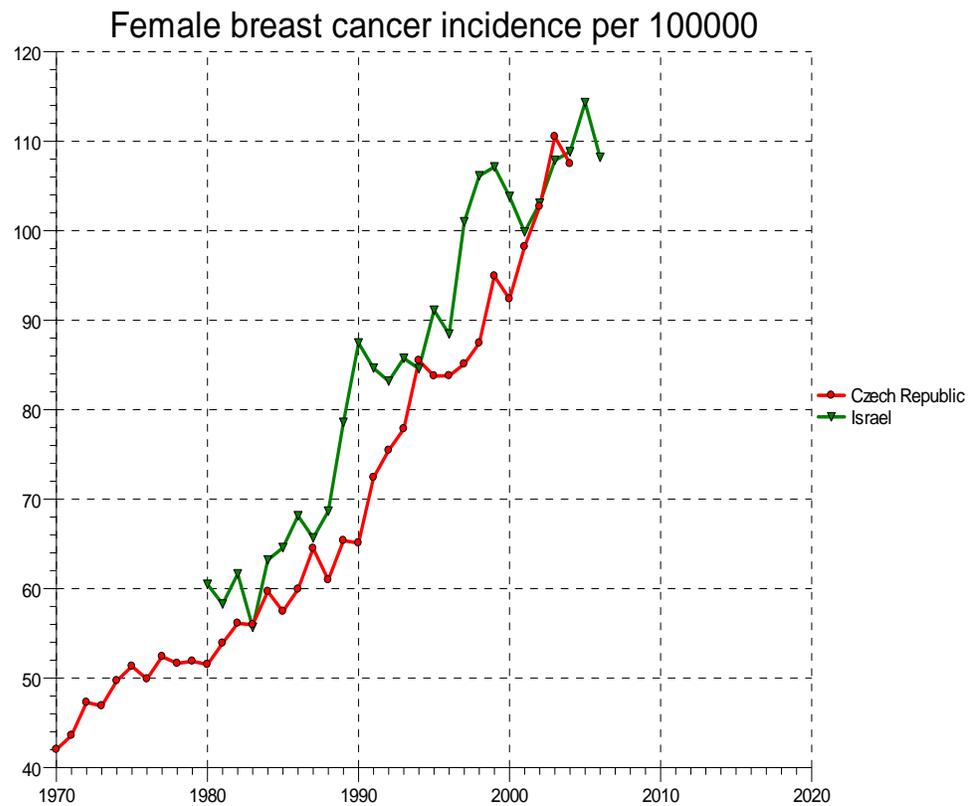
The graph shows that in Israel the death rate from breast cancer in young women has been consistently higher than in the Czech Republic in the last years.

Fig. 10. Comparison of the standardized death rate due to malignant neoplasm of the breast in elderly females (65+ years old) per 100 000.



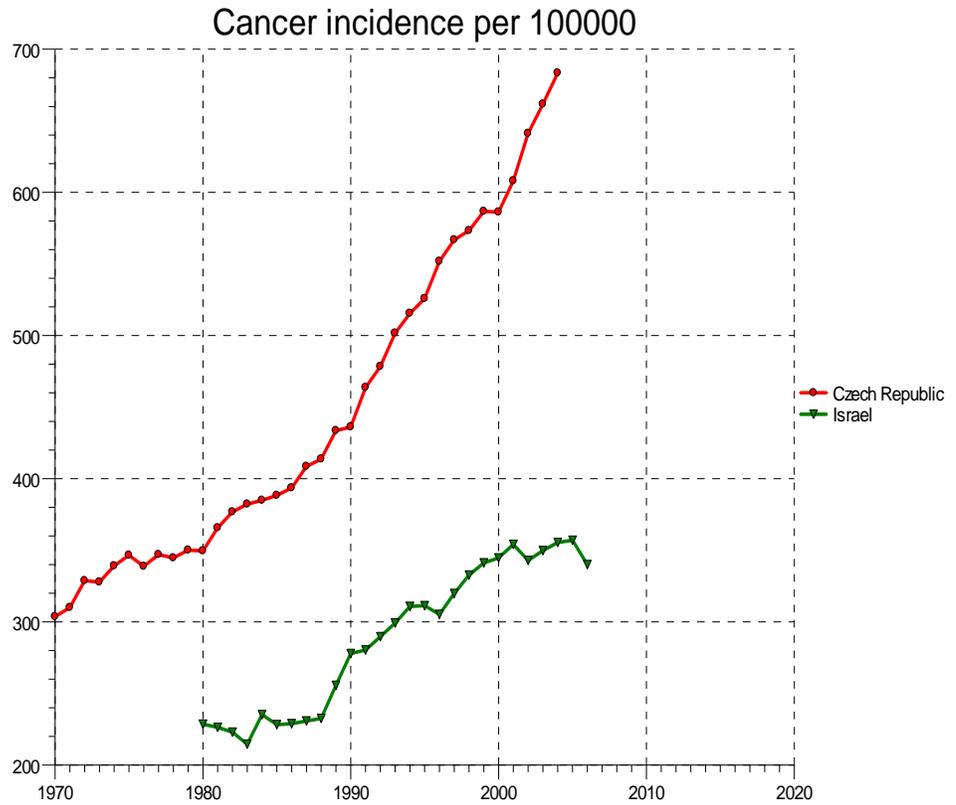
From this graph we can see that the death rate among elderly women due to breast cancer is higher in Israel than in the Czech Republic. But the difference is not as great as among young women (Fig. 4.).

Fig. 11. Comparison of incidence of breast cancer in females per 100 000. In the Czech Republic and Israel.



This figure shows that in both countries has been a continuous rise in the incidence of breast cancer in women. The inclination of the two curves is very similar which means that the incidence increases in the countries with the same speed, although Israel had initially higher incidence and is still leading.

Fig. 12. Comparison of incidence of all cancers per 100000, in the Czech Republic and in Israel.



From this graph we can see that generally there incidence of malignancies is higher in the Czech Republic. This fact shows the contrast between breast cancer and the other types of cancer. It means we have to look for a specific factor that differs breast cancer occurrence, as it does not follow the common traits of other cancers.

5. Discussion:

From the information presented above we can learn breast cancer incidence increases although the general health systems in both countries is improving and the socioeconomic situation is improving as well. This can support the claim that breast cancer is a civilization disease. The modernization on our societies has a big impact on our life styles and habits. Women in modern, western society are more career oriented and give birth to less children if at all. Modern women also have their first child at later age, usually when they have finished their education and have established a career. Women in the western society often try to return to their jobs as soon as possible after giving birth and this may shorten the breast feeding period. More and more women use the oral contraceptive pills that contain estrogens. The popularity of hormonal replacement therapy for symptoms of menopause is also increasing and these replacement therapies are based on estrogens. Obesity as well follows western civilization and is becoming epidemic problem in our societies. All these factors as well as continuously decreasing age of menarche expose women in modern society to high levels of estrogens throughout their lives. As research shows hormonal influence is the most important risk factor for developing breast cancer and thus the women in western countries are exposed to increasing risk. This may explain why the incidence is increasing in both countries. The fact that the Czech Republic was lagging behind Israel in a few socioeconomic parameters combined with the general attitude that is more supportive of young mothers in the Czech Republic, in the aspect of longer maternity leaves that promotes breast feeding, may explain why the occurrence of breast cancer in Czech Republic is still lower. However there may be other explanations too. Although the genetic factor in developing breast cancer is only 10% it of course still plays its role. The Israeli population is much more heterogeneous from genetic point of view than the Czech one and some of the ethnic groups in Israel, especially the Ashkenazi Jews are known to carry the mutations predisposing to breast cancer. Geographic factors seem also to play a great role; an epidemiological survey of breast cancer worldwide has shown that the incidence of breast cancer among Japanese women

who live in Japan is about 8 times lower than that of American women living in the United States, but when the researchers checked the population of Japanese immigrants in the United States they learned that the incidence of cancer among them was comparable to that of the American women. The mortality from breast cancer decreases constantly worldwide thanks to the advances in therapy and the development of screening programs that allow early detection of the cancer. When breast cancer is diagnosed early enough, before it had metastasized and spread to distant organs it is possible to cure the patient.

At the end of this discussion I would like to present two more figures that show an increase in the trend of breast feeding in the Czech Republic. Unfortunately, it seems that Israeli health authorities do not follow this trend or do not submit their data.

Fig. 13.

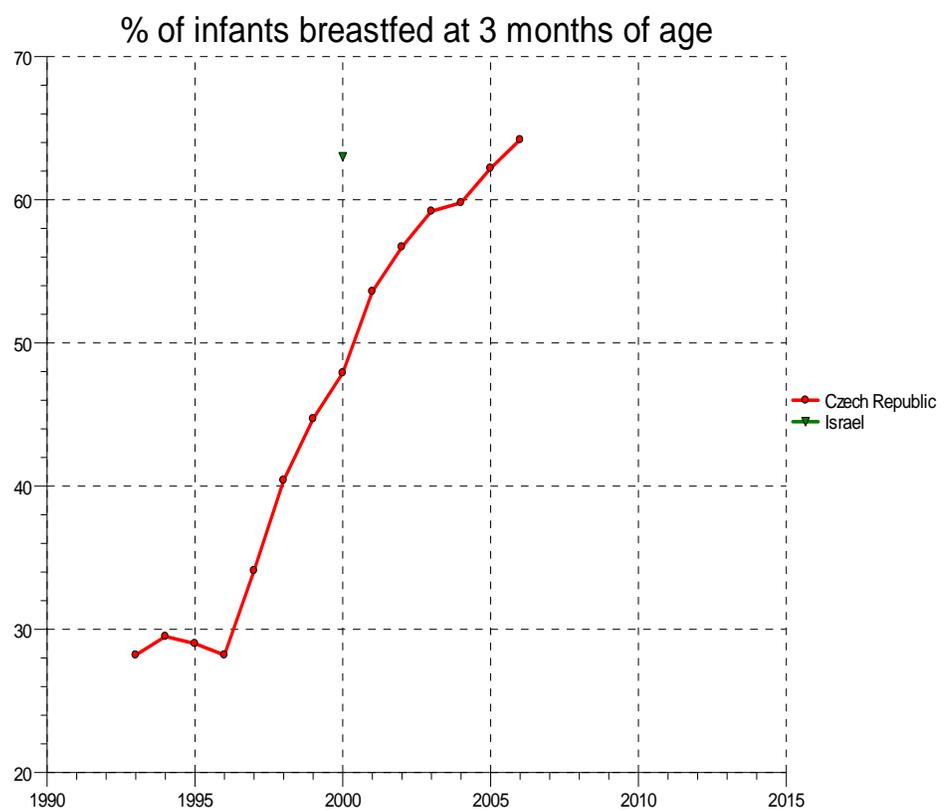
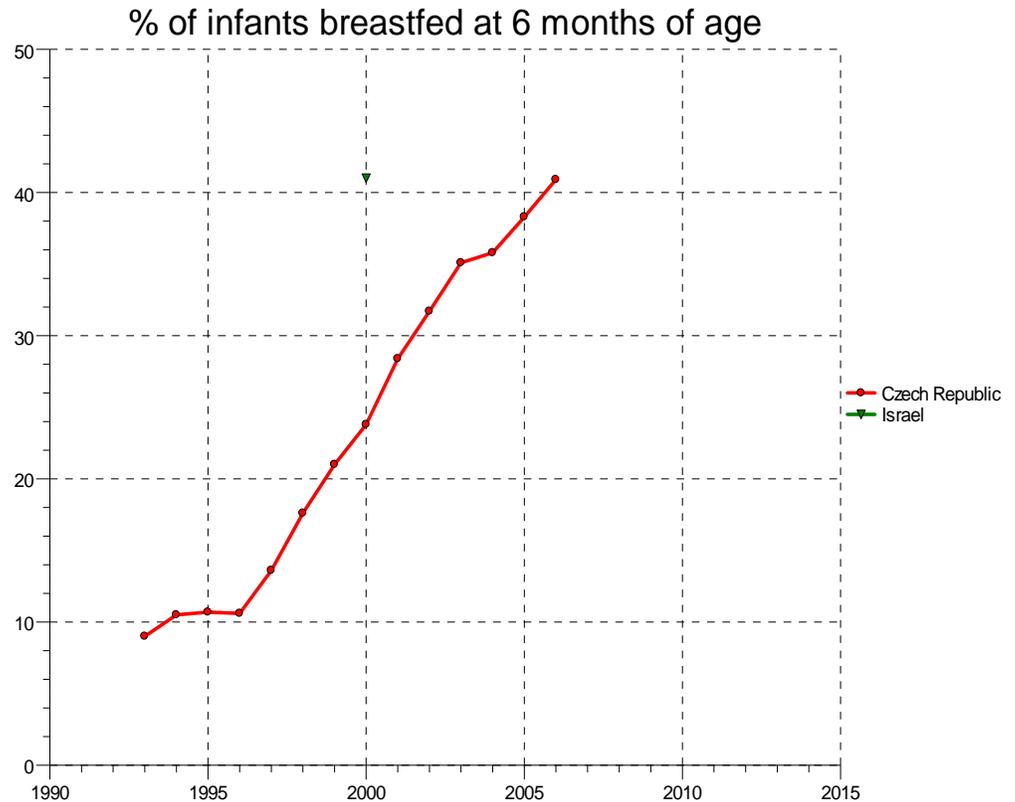


Fig. 14.



From these two graphs we can clearly see that there is a great increasing tendency in the pattern of breast feeding in the Czech Republic. This fact could be seen as a contradiction to the assumption that breast feeding is a protective factor and indeed there is an ongoing discussion among physicians if to consider breast feeding protective. The main argument against considering breast feeding as a protective factor is that there is not enough significant statistic data supporting such assumption. The main argument of those who consider breast feeding as protective is based on the knowledge that breast cancer is influenced by women's hormonal cycles. And breast feeding postpones the return of the menstrual cycles after delivery thus shortening the life time exposure to the hormones, especially estrogen. The actual reason behind the increase in breast feeding in the Czech Republic could be the encouragement and explanation of the gynecologists and pediatricians about

the different benefits of breast feeding for the child and for the mother. Since the data is only from 1993 I think it is too early to expect a significant change in breast cancer occurrence as a result of increased breastfeeding. If there will be no decrease in breast cancer incidence in the next years we could probably conclude that breastfeeding is not a protective factor against breast cancer or that it is insignificant.

6. Conclusions and Recommendations:

From the data and discussion presented above I can conclude that although the mortality from breast cancer has continuously decreased in the last years in both the Czech Republic and in Israel thanks to advances in treatment and early detection, Breast cancer remains the most common cancer in women in the western, modern countries and a leading cause of death in middle aged women. According to contemporary research the most important risk factor for developing the disease is the increased exposure to estrogens throughout the woman's life. In modern society, the life style and social habits predispose women to higher estrogen levels. This happens through higher number of ovulatory cycles (early menarche, late menopause, few or no children, short duration of breastfeeding, late age at first delivery), oral contraceptive pills and hormone replacement therapy. The differences between the Czech Republic and Israel indicate that Israel which is on higher economic and general health level has significantly more cases of breast cancer among young women. These differences have probably several causes: genetic difference between the populations, different geographical conditions, but as the strongest risk factor for developing breast cancer is hormonal dysbalance we can suspect that the differences in this disbalance in the two populations are the main cause of the difference in incidence of the disease. Such hormonal disbalance is caused by modern life style and social habits.

It is hard to recommend a change in life style like "to have more children at early age", but some changes can be achieved relatively simply. Such changes like more

control over oral contraceptives and encouragement to use them for shorter periods of time, wiser use of hormonal replacement therapy, encouragement of women to breastfeed for at least 6 months can be achieved with cooperation of general practitioners and specialists. Early detection is extremely important as well and screening programs should continue to be sponsored, women should be referred for screenings by their general practitioners and gynecologists and the costs should be covered by the state or the insurance. The screening program in the Czech Republic is very good but still it can be improved by opening more mammography centers or introducing mobile units, this will make it easier for women who would like to be examined but can not travel to the nearest center that can be quite far. The Israeli screening program could learn from the Czech as well and decrease the age for state sponsored mammography to 45 or 40 (since the incidence in Israel is higher). The education and encouragement of women in the field of self examination and early referral to screening is also very important. Both the Czech Republic and Israel are taking these steps and this is one of the reasons for the decreasing mortality.

7. Summary:

In this paper I have examined the differences between the Czech Republic and Israel in the occurrence of breast cancer in women. I have compared the two countries health systems and general socio-economic situation. I have also examined the different risk factors common for the two countries and the prevention efforts. The comparison shows that although seemingly the general health indicators in Israel are better than those of the Czech Republic, the incidence of breast cancer in women is still significantly higher in Israel. I will show that breast cancer is apparently a civilization disease and is rising in all the western, developed countries together with the improvement of economy and health care. As research shows the major risk factor for breast cancer is hormonal dysbalance caused by higher exposure to estrogens. This higher exposure is connected with the modernization process and the changing life style of women in western countries. Thus it is possible to say that living in a modern society in the western countries carries a higher risk for women to develop breast cancer. Although it is also clear that breast cancer is a multifactorial disease and there are certainly factors that we do not know yet that influence the incidence worldwide. Both countries are making a considerable effort mainly in the field of secondary prevention (screening) but there are still things that could be improved.

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