

Risk factors connected with the appearance of chronic diseases and cancer in the Republic of Slovenia

Dražigost Pokorn

University of Ljubljana, Medical Faculty, Institute of Hygiene, Slovenia

The article shows the most frequent risk factors in the Republic of Slovenia that the author could gather on the basis of available sources in Slovenia. We could conclude that relatively high incidence and prevalence of chronic and degenerative diseases (cardiovascular diseases and cancer) in the Republic of Slovenia or their permanent increase, if compared with western countries, where it is lower and decreasing already for several years, is a consequence of a much too intensive presence of risk factors in the Republic of Slovenia. Only after a change in the policy of nutrition, environmental protection, medical education and a changed medical welfare service in general, it will be possible to decrease the incidence of these diseases in the newly established state of Slovenia.

Key words: neoplasms-epidemiology; chronic disease-epidemiology; risk factors; Slovenia

Introduction

With their endeavours to prolong the life expectancy (Table 1) during the last twenty years the Slovenians stayed considerably behind their neighbouring countries. In Slovenia, the main reasons for premature mortality are the same as in other European countries; undoubtedly Slovenia is one of the countries where its inhabitants lose their lives because of injuries and suicides.¹ Slovene patients with cardiovascular diseases and cancer, representing 69.1% of all causes of death, are dying earlier as similar patients in the neighbouring countries. Since 1970, mortality from ischaemic heart diseases has been growing in Slovenia similarly as in

other countries of Central and Eastern Europe, while the trend in the developed countries of Northern Europe² is opposite (Figure 1). During the last few years a slight decrease in premature mortality from heart- and coronary diseases can be observed (Figure 2).^{1,3} Cancer incidence (1950–1987) is also growing (Figure 3).⁴

The Slovenians contract these diseases because of worse primary prevention, consequen-

Table 1. Life expectancy in 5 European countries, 1970, 1980, 1988.¹

Country	1970		1980		1988	
	Men	Women	Men	Women	Men	Women
Austria	66.3	73.4	69.0	76.1	72.1	78.7
Germany	67.2	73.6	69.6	76.8	72.3	79.1
Italy	68.6	74.7	71.0	77.6	72.7	79.2
Sweden	72.3	77.4	72.8	79.0	74.2	80.4
Slovenia	65.0	72.3	67.4	75.2	67.6	76.8

Correspondence to: Prof. Dražigost Pokorn, PhD, MD, Institute of Hygiene, Medical Faculty, Zaloška 4, 61000 Ljubljana, Slovenia.

UDC: 616-006.6-036.2-02

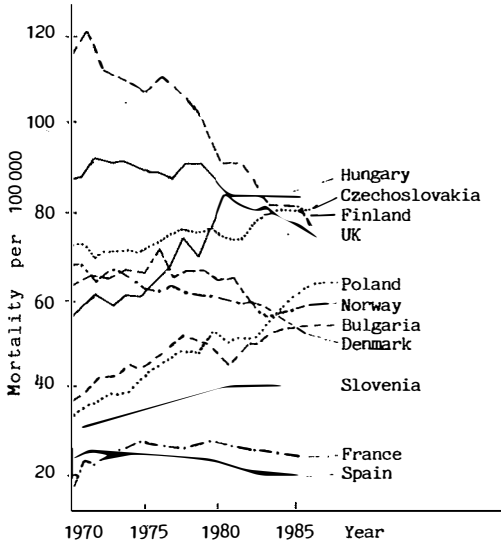


Figure 1. Premature mortality from ischaemic heart diseases. Standard mortality rate for men and women, 0–64 years of age, per 100000.^{1, 2}

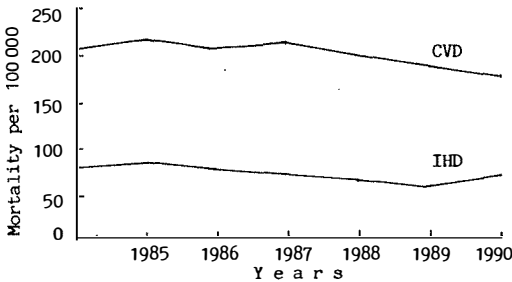


Figure 2. Premature mortality from cardiovascular (CVD) and ischaemic heart diseases (IHD) in Slovenia. Standard mortality rate for men and women, 35–64 years of age, per 100000.^{1, 3}

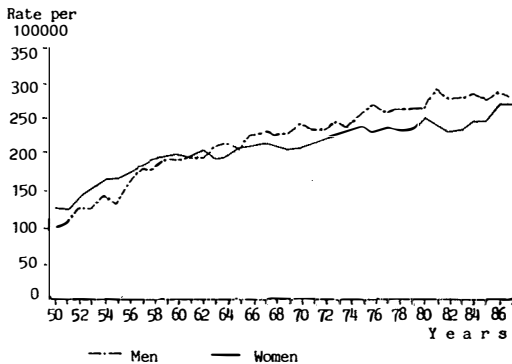


Figure 3. Cancer incidence in Slovenia, 1950–1987.⁴

tly larger prevalence of risk factors, or these illnesses are discovered later and treated less successfully.

The main purpose of this article is to try to show the most frequent risk factors in the Republic of Slovenia on the basis of available sources in Slovenia.

The quoted data can serve only as an orientation for a survey of risk factors associated with the appearance of chronic diseases in a country that has only started with the prevention of cardiovascular diseases and cancer.

Material and method

The data on dead inhabitants according to the causes of their death, sex and hospital admissions due to the diseases of resident population by international classification of diseases (ICD) are based on the Medical Statistical Annual of Slovenia, 1991, published by the Institute of Health of the Republic of Slovenia,¹ collecting health statistics. From the same source we also took the data on diseases detected in specialized out-patient departments and on gastrointestinal diseases for 1969–1991 and 1977–1989. Data on age-standardized mortality for men and women (for the age 0–64 years per 100.000 inhabitants) were specially prepared for this survey by the Institute for Health (Personal Report 1992). We incorporated them into the figure showing mortality from ischaemic heart diseases in Central, Eastern and North Europae (E. Helsing).² The data on annual cancer incidence, crude incidence rate per 100.000 inhabitants in the Republic of Slovenia, and on annual incidence rates of stomach cancer were obtained from the Central Cancer Register of Slovenia at the Institute of Oncology in Ljubljana.⁴ Data on the production, transport and sales of food and on the annual consumption of food and beverages per household member for 1965–1988 and 1970–1990 were derived from the Statistical Annual of the Republic of Slovenia, which is published regularly by the Statistical Office of the Republic of Slovenia.⁵

The energetic value of an average daily meal and the nutrient ratio: protein, fats, carbohy-

drates and dietary fibers in a meal were calculated on the basis of the data for annual consumption of food and beverages per household member in the Republic of Slovenia according to the inquiry on the consumption in households, performed by the Statistical Office of the Republic of Slovenia for 1965–1988 and 1970–1990 every five years,⁵ and by the help of plates with nutritional values of the food, Zagreb 1990.⁶ In 1988 the pattern of a five-year inquiry included 3.250 households: 56 rural, 811 mixed and 2.383 nonrural households, chosen according to the method of random selection.

The Statistical Office of the Republic of Slovenia was also the source of data on the production of cigarettes. Data on the emission of sulphur dioxide into the air by consumers of fuel and raw materials in the Republic of Slovenia are – on the basis of analyses made by the Institute for Hydrometeorology of the Republic of Slovenia⁵ – also gathered by the Statistical Office of Slovenia.

The analyses of samples of drinking water as to their bacteriological and chemical irreproachability are regularly performed by regional institutes of hygiene and social medicine in the Republic of Slovenia. Data on irreproachability of drinkable water were obtained from the Report of these microbiological laboratories.¹ The analysis of the magnesium content of drinkable water in Slovenia in 79 at random chosen water sources (of open and closed type) was in 1981 and 1982 performed by the Center for Mineral Water Research in Maribor, Republic of Slovenia.⁷

The data on individual risk factors (smoking, obesity, hypertension, hypercholesterolemia) were obtained from the latest epidemiologic researches in Slovenia: Berger et al,⁸ Accetto and Javornik;⁹ Pokorn;¹⁰ Srebot et al;¹¹ Fortič¹² and Strgar;¹³ Gradišek et al;¹⁴ Jezeršek et al;¹⁵ Radisavljević et al.¹⁶

The daily nutritional pattern and the content of salt and dietary fibrins in the daily food pattern of the older population was taken from the study of Pokorn et al.¹⁷

Results with discussion

It is interesting that although chronic diseases affect different organic systems and differ completely also as to their etiopathogenesis, the risk factors for some of them are very similar. For example: the development of arteriosclerosis is advanced by numerous factors, the effects of which should not only be added up, because they intensify each other.¹⁸ Therefore it is extremely difficult to explain the influence of food on heart and coronary diseases, if important risk factors for the appearance of arteriosclerosis such as physical activity and cigarette smoking of the population are not known.

As important risk factors for the appearance of heart and coronary diseases and cancer among the population of Slovenia, we took into account some nutritional factors, alcohol abuse, and polluted environment, which are systematically collected by the state institutions, and also some other available risk factors – smoking, elevated blood pressure, and plasma concentration of cholesterol.

Among the risk factors for the appearance of chronic diseases it is food that may be one of the most important risk factors.^{19, 20} With the average consumption of food and beverages per household member in the Republic of Slovenia (1965–1988) a rise in the consumption of individual groups of food – with the exception of fats – can be observed. The variability of

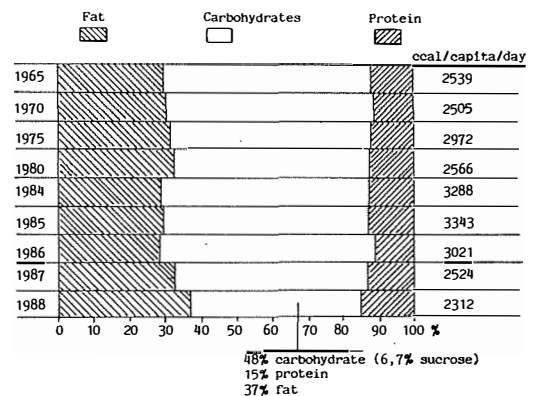


Figure 4. The proportion of fat, carbohydrates and protein in the total energy supply in Slovenia, 1965–1988.⁵

consumption of individual food types is relatively large, which could be attributed to different and insufficiently accurate methods of households inquiring.

After 1965 an obvious fall in the food consumption can be observed, which can be seen also from the average energetic and nutritional value of an average daily meal (Figure 4). From 1965 to 1985 the energetic value of an average daily meal was growing from 2539 to 3343 Kcal. Afterwards it started to fall and in 1988 it ranged at 2312 Kcal/day when an average meal of a Slovenian contained more than 35% of fats and approximately 15% of proteins in respect to the energetic value of the consumed food. The ratio between the animal and vegetable fats was decreased (Table 2). The share of

Table 2. The proportion of animal and vegetable fat in the total fat supply in Slovenia, 1979–1989.⁵

Year	Animal fat (%)	Vegetable fat (%)	Olive oil (%)
1979	21	78.9	0.1
1984	23	76.8	0.2
1989	14	85.8	0.2

olive oil, which is supposed to have also an important protective influence on the appearance of arteriosclerosis,¹⁹ is extremely low. A bigger share of vegetable oils in everyday nutrition can be partly proved also by the increasing production of this food in the Republic of Slovenia. The increased production of eggs, meat, milk and fish during the last twenty years (Figure 5) caused a rise of the percentage of proteins in the daily nutrition and probably also of saturated fats.

The quantity of the consumed table sugar per household member was falling extensively from 1975 to 1988, while the quantitative trade with sugar and candy production are both increasing, which means that the consumption of sugar products, chocolate, cakes, etc. is on the increase. Together with a lower consumption of table sugar there is also a fall in caries incidence (Figure 6). The cause for a lower caries rate in the Republic of Slovenia can not be found only in the lower consumption of table sugar, but also in the improved mouth hygiene and better teeth fluoridation.²¹

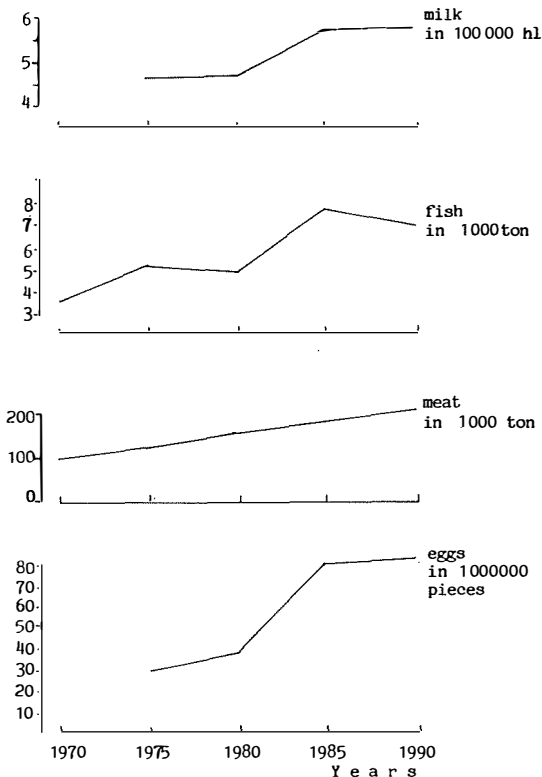


Figure 5. Production of protein food in Slovenia, 1970–1990.⁵

The quantity of the consumed fruit and vegetables has been falling since 1979–1989 (Table 3). Because of the low quantity of daily consumed fruit and vegetables and cereal products, especially wholegrain cereals, the content

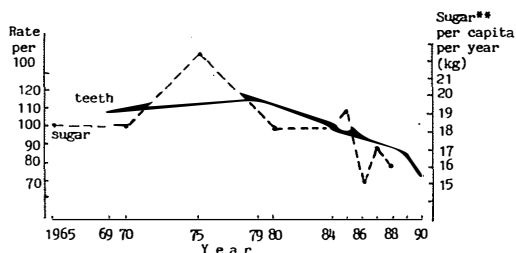


Figure 6. Treatment* in general dental clinics by HC domicile, Slovenia, 1969–1990 and available supply of sugar in Slovenia, 1965–1988.^{1, 5}

* Teeth filling with and without treatment, surgical treatment (extracted teeth and other treatment).

** Sugar consumption per persona per year in Slovenia.

Table 3. Per capita consumption of fruit, vegetables and dietary fiber in Slovenia, 1979–1989.⁵

	Unit	1979	1984	1989
Vegetables	kg/day	31.6	16.6	15.7
Fruit	kg/year	56.8	32.7	31.2
Dietary fiber	g/day	16.4	16.0	15.1

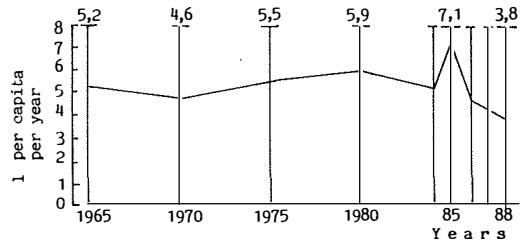
of dietary fibers in the daily nutrition has also been decreasing – in the same period it ranged between 16.4 and 15.1 g/day. Together with a low consumption of fruit and vegetable there is also a lower consumption of protective substances and this can be an important risk factor for the appearance of cardio-vascular diseases and cancer.²²⁻²⁷

An extremely low value of daily consumed fibers in the daily nutrition of Slovenian population was established also with the analysis of 56 at random chosen patterns of daily meals in the city of Ljubljana. The value of fibrins ranged between 3.5–21.9 g/day (7.7 +/– 3.9 g/day).¹⁷

A lot of eggs, fats, sugar, meat and milk products and a low quantity of fruit and vegetable (dietary fibrins) can also be a risk factor for the appearance of gallstones,^{28, 29} which is also on the increase (Figure 5).

We lack data on salt consumption in households, but we do have data on the quantitative wholesale trade with food (salt). Between 1970 and 1990 the trade with salt increased strongly. An analysis of 56 daily meals showed that the daily salt content ranged between 4.6 and 16.6 g salt/day (8.7 +/– 2.9 g/day), which exceeds the protective food recommendations.^{17, 22}

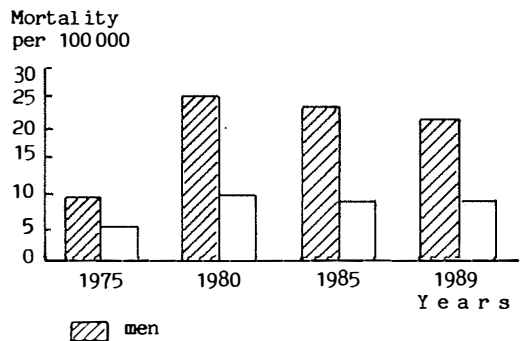
Serum levels of vitamins A and E, which are also important factors in the prevention of cardiovascular diseases and cancer, were analysed in 189 randomly selected and examined persons, aged over 60 years and living in Ljubljana (Figure 7). We did not observe an obvious lack of these three nutrients, which could be partially proved by a menu pattern containing a relatively varied combination of fruit, vegetables, cereals and milk. Approximately 90% of the examined persons had a standardized plasma vitamin E, and over 30 µM/mM of cholesterol. Only with approx. 41% of all examined

**Figure 7.** The annual average alcohol (100 vol %) consumption in Slovenia, 1965–1988.⁵

persons the plasma vitamin A exceeded 2.1 M/l, according to Gey et al,²⁴ this represents the normal preventive concentration of vitamin A and of the standardized vitamin E in the plasma of the examined persons.

Because magnesium content in drinking water can, to a certain degree, also be important for the prevention of cardiovascular diseases,³⁰ we give a substantial and up till now the only epidemiologic study of magnesium content in drinking water of the Republic of Slovenia. Among 79 randomly chosen samples of drinking water we found 20 samples of water with a low magnesium content.

In the period 1970–1990, an increase was noted also in the field of quantitative trade with alcoholic beverages. In the period from 1965 to 1985, the quantity of consumed pure alcohol, obtained from the consumption of food in households,⁵ ranged between 5.2 and 7.1 l per year and person. Afterwards, the consumption of alcohol was steadily decreasing until in 1988 it achieved only 3.8 l per year and person (Figure 7). Lower consumption of alcohol could be

**Figure 8.** Cirrhosis mortality in Slovenia, 1975–1989.¹

connected with the lower mortality from liver cirrhosis³¹ observed during the last years (Figure 8). This has been proved also by a less frequent appearance and hospitalization of alcoholic liver cirrhosis in the period from 1977 to 1989.

Simultaneously with the increased production of beer we can observe a rise of rectal cancer (Figure 9). Although some epidemiological stu-

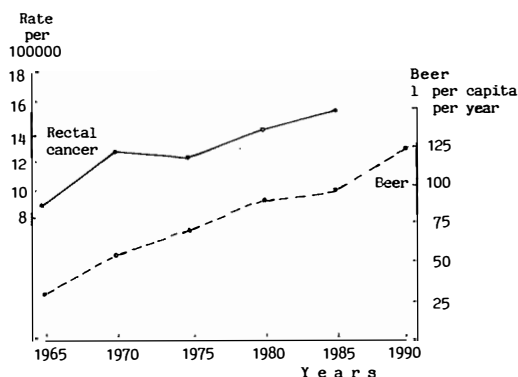


Figure 9. Average annual crude incidence rates of rectal cancer (male) and production of beer in Slovenia, 1965–1990.^{4, 5}

dies clearly point out a connection between consumption of beer and rectal cancer, there are others which cautiously deny that.^{20, 32-34} Causes for such a high annual incidence of rectal cancer in Slovenia could also be due to inappropriate nutrition, smoking and some other causes.^{20, 32-35}

Our survey of risk factors includes some known environmental pollutants, which can also play an important role in the appearance of chronic diseases: polluted air, drinking water, smoking of cigarettes and equipment of individual households with refrigerators, all these are orientational indicators of less spoiled food among the population.

The emission of sulphur dioxide into the air by individual consumers of fuel and raw materials in Slovenia had been steadily increasing until 1987. Afterwards, it obviously began to fall, especially due to stricter legislation measures. This could also be the cause for a less frequent appearance of lung diseases during the last years (Figure 10).³⁶

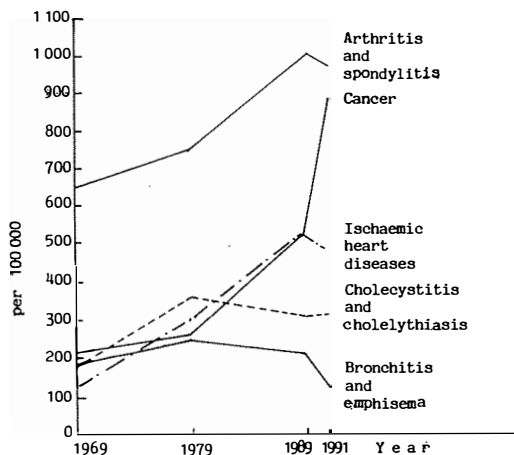


Figure 10. Diagnostic statistics in the out-patient specialist clinics, Slovenia, 1969–1991.¹

From 1965 till 1984, a steep increase in cigarette production is characteristic. Afterwards, an obvious fall can be observed (Figure 11). Different studies on smoking habits of the Slovenians, performed between 1987 and 1992, including more than 18,000 of inquired persons aged between 15 and 101 years, showed that up to 40% of men and up to 29% of adult women within the inquired population were smokers; among the youth aged from 15 to 17 years, there were 17.9–27.8% of smokers (boys and girls together). In comparison with other countries where smoking is already strongly restricted, having as a consequence a lower

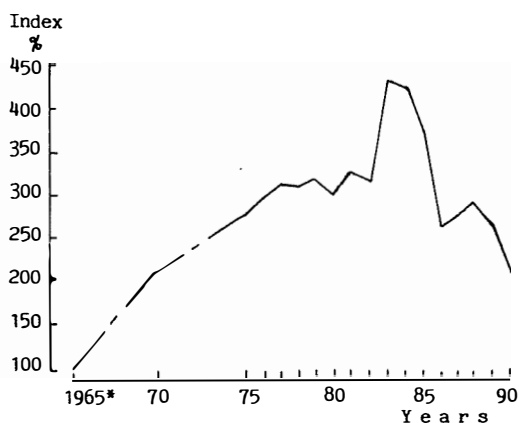


Figure 11. Production of cigarettes in Slovenia, 1965–1991.⁵

incidence of chronic diseases, the percentage of smokers in Slovenia is still very high.

A relatively rough indicator of hygienic irreproachability of food is the availability of refrigerators in households. Food kept in refrigerators is less prone to perishing and has a lower content of nitrites which are an important factor for the appearance of nitrosamines.^{37, 38} The availability of refrigerators in households in 1978 was almost 79%, and rose in 1988 to almost 94%. This could be one of the reasons for a lower incidence of stomach cancer in the Republic of Slovenia. Chemical and microbiological pollution of our waters is still very high.

Increased serum cholesterol is an important risk factor for the development of atherosclerosis. Other risk factors (hypertension, smoking, diabetes, obesity, physical non-activity, behaviour pattern) are often connected with the hypercholesterolemia, but play a minor role in the case of its absence.¹⁸ Cholesterol must achieve the value of 5 mmol/l to cause the development of atherosclerosis. Other risk factors do not play such an important role (18). Table 4 shows the rate of persons with total plasma cholesterol exceeding 5.2 mmol/l among the total of 4695 adult subjects from 5 wide

Table 4. Incidence of elevated plasma cholesterol levels in Slovenia (>5.2 mmol/l).

Place of research	% subjects			Age groups
	Men	Women	No	
Zgornja Ščavnica (8)	79.3	76.3	1132	25-64
Brnik (8)	58.6	54.1	743	25-64
Ljubljana (14)	67.0	60.0	1692	25-64
Ljubljana (9)	47.9	67.8	696	60-94
Ljubljana* (10)	17.1	30.7	432	60-101

* institutionalized subjects

Table 5. Incidence of elevated blood pressure (mm Hg) in Slovenia.

Place of research	% subjects				Age groups
	Men	Women	Together	No	
Ljubljana Šiška (15)	-	-	18.9	2965	40-70
Zgornja Ščavnica (8)	17.6	22.9	-	1132	25-64
Brnik (8)	17.0	17.1	-	743	25-64
Ljubljana (14)	47.3	30.9	39.1	1692	25-64
Ljubljana (9)	37.9	51.2	46.1	695	60-94
Ljubljana* (10)	37.1	50.2	47.9	822	60-101

* institutionalized subjects

epidemiologic studies performed in the Republic of Slovenia. The results show that more than a half of the examined subjects have an important and basic risk factor for the development of atherosclerosis – but these results cannot be generalized for the whole Slovene territory.

Six studies, published in Slovenia between 1987 and 1992, which included 8049 examined subjects (Table 5) showed that the population aged between 25 and 70 years had a relatively different prevalence of hypertension, which is also an important factor for the appearance of cardiovascular and cerebrovascular diseases. Such variability of results can also be a consequence of different methods for blood-pressure measurements.³⁹⁻⁴¹

In five epidemiological studies which included 7572 subjects aged from 7 to 101 years we could observe excessive body weight and obesity in 9.6% of the examined men aged between 25 and 64 years, and 22.2-41% of the examined women. Among children aged between 7 and 15 years there were only 2.8-4.7% of boys and 4.8-7.7% of girls with excessive body weight (Table 6). Relatively high body weight of the subjects, although their daily energy consumption is relatively low, can be a consequence of insufficient physical activity and of too high a content of fats in the daily nutrition.^{42, 43}

Conclusion

We could conclude that a relatively high incidence and prevalence of chronic and degenerative diseases in the Republic of Slovenia, or their constant increase, – if compared with western countries where it is lower and has been decreasing for several years already, – is

Table 6. Obesity in men and women in Slovenia.

Place of research	Indices of obesity	% *		No	Age groups
		Men	Women		
Ljubljana (14)	BMI	49.0	41.0	897	25-64
Ljubljana (9)	Q	69.9	61.9	699	60-94
Zgornja Ščavnica (8)	RTM	9.6	22.2	1132	25-64
Brnik (8)	RTM	19.2	23.0	743	25-64
Maribor (16)	RTM	4.7	7.7	1033	7
	RTM	6.3	4.6	1107	11
	RTM	2.8	4.8	928	15

BMI = body mass index (kg/m²); * > 2.7

RTM = relative body mass (%); * > 120

Q = Quetelet's index (body mass/body height² (g/cm²)); * > 2.57

a consequence of a much too intensive presence of risk factors in the Republic of Slovenia. Only after a change of the policy concerning nutrition, environmental protection, medical education and a changed medical welfare service in general, it will be possible to lower the incidence of these diseases in Slovenia.

References

- Health Statistics Annual – Slovenia, 1991. *Zdrav Var* 1992; (Suppl 2): 1 – 488.
- Helsing E. *Food Policy*. 1991; **16** (5): 371 – 82.
- Berger DM, Turk J, Florjančič M. Nekaj pomembnih podatkov o boleznih srca in ožilja v Sloveniji. *Zdrav Var* 1992; **31**: 57-61.
- Kirn PV, Žakelj PM, Ferligoj A, Škrk J. *Atlas of Cancer Incidence in Slovenia 1978-1987*. Onkološki inštitut, Ljubljana 1992; 3-105.
- Statistični letopis R Slovenije 1985, 1991*. Zavod R Slovenije za, Ljubljana 1991; 21-659.
- Rak KA, Antonić K. *Tablice o sastavu namirnica i pića*. Zavod za zaštitu zdravlja SR Hrvatske, Zagreb 1990; 3-143.
- Zaveršnik H, Ozim V. Magnezij v naših pitnih vodah. *Zdrav Vestn* 1983; **52**: 179-82.
- Berger MD, Ravnikar B, Jezeršek P, Lovše B. Razširjenost nekaterih znanih dejavnikov tveganja za bolezni srca in ožilja v zgornji Ščavnici in Braniku. *Zdrav Var* 1992; **31**: 63-70.
- Accetto B. Zdravstveno stanje starejših ljudi na področju Ljubljane. UKC Medicinska fakulteta. Raziskovalno poročilo, Ljubljana 1987; 1-145.
- Pokorn D, Accetto B. Nutritional status of the elderly in Ljubljana, 1985-1987. In E. Ancona et al. *Problems in Aging: Epidemiology, Health and Social Care*. Alps-Adria Community Symposium, University of Padua, Padua 1989; 80-93.
- Srebot RM, Javornik A. Kajenje med srednješolci v Kranju. *Zdrav Vestn* 1989; **58**: 289-90.
- Fortič B. Razvada kajenja pri slovenskih zdravnikih in njene posledice – preliminarni rezultati študije 3595 zdravnikov z dobo opazovanja od 1972 do 1986. *Zdrav Var* 1988; **27**: 227-34.
- Strgar E. Razširjenost kajenja med slovenskimi srednješolci. *Zdrav Var* 1991; **30**: 67-70.
- Gradišek A, Šoln D, Tršan V, Zakotnik J. Študija dejavnikov tveganja za nastanek kroničnih nalezljivih boleznih v Ljubljani. *Zdrav Var* 1992; **31**: 71-7.
- Jezeršek P, Dolenc P, Jezeršek B. Epidemiologija arterijske hipertenzije. *Zdrav Vestn* 1990; **59**: 153-7.
- Radisavljevič T, Turk MD, Nikolić T. Epidemiološka študija debelosti šolskih otrok in mladostnikov v Mariboru. *Zdrav Vestn* 1992; **61**: 621-3.
- Pokorn D, Gregorič B, Poklar T, Eržen N. Ocena prehrane v domovih za starejše občane v Ljubljani. *Zbornik Biotehniške fakultete v Ljubljani* 1991; **57**: 259-71.
- Carleton RA. Report of the Expert Panel on Population Strategies for Blood Cholesterol Reduction. A Statement from the National Cholesterol Education Program, NHLBI, NIH. Special Report. *Circulation* 1991; **83**: 2154-232.
- Ulbricht TL, Southgate DAT. Coronary heart disease: seven factors. *Lancet* 1991; **338**: 985-92.
- Rogers AE, Longnecker MP. Biology of Disease. Dietary and Nutritional Influences on Cancer: A Review of Epidemiologic and Experimental Data. *Laboratory investigation* 1988; **59**: 729-61.
- Vrbič V, Premik M. Prevalence of Dental Caries in the Population of Slovenia. 10. Conferenza Di Aggiornamento Dell Ambito Della Comunita "Alpe-Adria", Portorož 1993; **16**: (Abstracts).
- WHO. *Healthy Nutrition: Preventing Nutrition – Related Diseases in Europe*. Nutrition Unit Copenhagen, July 1986.
- Ziegler RG. Vegetables, fruits, and carotenoids and the risk of cancer. *Am J Clin Nutr* 1991; **53**: 2518-98.

24. Gey KF, Brubacher BG, Stahelin HB. Plasma levels of antioxidant, vitamins in relation to ischemic heart disease and cancer. *Am J Clin Nutr* 1987; **45**: 1368-77.
25. Trout DL. Vitamin C and cardiovascular risk factors. *Am J Clin Nutr* 1991; **53**: 3228-58.
26. Block G. Vitamin C and cancer prevention: the epidemiologic evidence. *Am J Clin Nutr* 1991; **53**: 2708-828.
27. Fraser GE, Beeson WL, Philips RL. Diet and Lung Cancer in California Seventh-day Adventists. *Am J Epidemiol* 1991; **133**: 683-93.
28. Heaton KW. The sweet road to gall stones. *BMJ* 1984; 1103-4.
29. Thijs C, Knipschild P, Leffers P. Is Gallstone Disease Caused by Obesity or by Dieting? *Am J Epidemiol* 1992; **135**: 274-80.
30. Schroeder HA, Brattleboro W. Relation between mortality from cardiovascular disease and treated water supplies. *JAMA* 1960; **172**: 1902-8.
31. Mezey E. Alcohol liver disease: roles of alcohol and malnutrition. *Am J Clin Nutr* 1980; **33**: 2709-18.
32. Breslow NE, Enstrom JE. Geographic Correlations Between Cancer Mortality Rates and Alcohol-Tobacco Consumption in the United States. *J Natl Cancer Institute* 1974; **53**: 631-9.
33. Vitale JJ, Gottlieb LS. Alcohol and Alcohol-related Deficiencies as Carcinogens. *Cancer Research* 1975; **35**: 3336-8.
34. Hinds MW, Kolonel LN, Lee J, Hirohata T. Associations between cancer incidence and alcohol/cigarette consumption among five ethnic groups in Hawaii. *B. J. Cancer* 1980; **41**: 929-40.
35. Haenszel W, Correa P. Developments in the Epidemiology of Stomach Cancer over the Past Decade. *Cancer Research* 1975; **35**: 3452-9.
36. Sunyer J, Anto JM, Murillo C, Saez M. Effects of Urban Air Pollution on Emergency Room Admissions for Chronic Obstructive Pulmonary Disease. *Am J Epidemiol* 1991; **134**: 277-86.
37. Ames BN. Dietary Carcinogens and Anticarcinogens. *Science* 1983; **221**: 1256-63.
38. Tannenbaum SR, Wishnok JS, Leaf CD. Inhibition of nitrosamine formation by ascorbic acid. *Am J Clin Nutr* 1991; **53**: 2478-509.
39. Hypertension and coronary heart disease: classification and criteria for epidemiological studies. First report of the expert committee on cardiovascular diseases and hypertension. Technical report series No. 168. Geneva: World Health Organization, 1959.
40. National high blood pressure education program working group report on risk and high blood pressure. An epidemiological approach to describing risk associated with blood pressure levels. *Hypertension* 1985; **7**: 641-52.
41. Rocella EJ, Bowler AE, Horan M. Epidemiologic considerations in defining hypertension. *Med Clin North Amer* 1987; **71**: 785-802.
42. Lissner L, Levitsky DA, Strupp BJ, Kalkwarf HJ, Rol AD. Dietary fat and regulation of energy intake in human subjects. *Am J Clin Nutr* 1987; **46**: 886-92.
43. Astrad PO. Physical activity and fitness. *Am J Clin Nutr* 1992: 12318-69.