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*Zofia Mielecka-Kubień**

SOME ECONOMIC AND SOCIAL CONSEQUENCES OF ALCOHOL ABUSE AND SMOKING IN POLAND

The paper presents theoretical considerations and numerical estimates concerning some of economic and social consequences of alcohol abuse and smoking, such as: additional health care costs and number of premature deaths occurred as a result of addictive behaviour of some members of Polish society. The number of premature deaths is divided into potentially productive and non-productive age, which could allow for estimating the range of further potential economic losses. The additional health care costs are compared to alcohol and tobacco tax revenue in Poland. Finally, a comparison between the considered consequences according to the kind of addictive behaviour is presented. It can be stated (among other things) that the additional health care costs are higher for smokers than for alcohol abusers.

INTRODUCTION

One of the most important issues connected with alcohol abuse and cigarette smoking is the problem of estimation of the range of their economic and social consequences.

The consequences can be considered from the point of view of:

- individual alcohol abuser or smoker
- their family
- their employer
- state budget
- society.

The most popular approach is a comparison of the costs connected with addictive behaviour of some members of the society to the state revenue resulted from taxes imposed on alcohol and tobacco. Among the social losses often considered are: the number of premature deaths due to alcohol abuse or cigarette smoking in society and the number of lost years of lives of those members of the population who died prematurely.

The main purpose of the presented paper is to compare some of the costs and losses that have resulted from alcohol abuse or heavy smoking in Poland, that is: the number of premature deaths of members of society caused by

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alcohol drinking or smoking, divided according to professionally active and non-active years of life, and the additional costs of the health service.

The estimation was performed with the use of indirect method proposed by W. F. Forbes and M. E. Thompson (1983). Forbes and Thompson estimated the costs of additional health care for smokers in Canada in 1980, and the author applied the method to estimate the additional costs of health service and some other consequences of alcohol drinking and smoking (Mielecka-Kubień 2001 and 1988) in Poland.

Forbes and Thompson's method is a cohort study where the empirical, living population is compared to a hypothetical one, constructed under the assumption that in a society there were no smokers (or alcohol abusers), so a period of several years is considered.

1. THE COMPARISON OF SOME COSTS AND LOSSES RESULTING FROM ALCOHOL ABUSE OR HEAVY SMOKING

The results, and specially the number of premature deaths due to addictive behaviour of some members of society during the life of the cohort, are hardly comparable to the actual mortality level of the empirical population. The author's idea (Mielecka-Kubień 2001) was to perform the analysis for shorter periods of time – in this case for one year, which can be specially useful for practical purposes, where a comparison of the estimated additional costs and number of premature deaths in one year to their empirical values for that year could be more convincing; the hypothetical populations in the presented considerations were constructed under the assumption that there were no alcohol abusers (P_{na}) or no smokers (P_{nt}) in the given year.

To build both hypothetical populations, it was necessary to accept some assumptions, first of all the following:

- to construct a hypothetical non-drinking population, it was assumed that the considered, empirical population consists exclusively of alcohol abusers and abstainers,

- to create a hypothetical non-smoking population it was assumed that the considered, empirical population consists exclusively of heavy smokers and non-smokers.

Let:

m_i - denote general mortality rates observed in the population in gender/age class i ,

m_{ni} - general mortality rates for alcohol abstainers or non-smokers,

p_i - share of drinking or smoking persons in class i ,

γ_i - ratio of the observed to expected number of deaths of alcohol abusers or heavy smokers.

General mortality rates for alcohol abstainers or non-smokers can be estimated as follows (Mielecka-Kubieñ 2001, on the basis of Forbes and Thompson):

$$m_{ni} = \frac{m_i}{1 + (\gamma_i - 1) \cdot \rho_i} \quad /1/$$

The considered costs in relation to one non-drinking or non-smoking person can be estimated by the formula:

$$k_{ni} = \frac{K_i}{\gamma_i P_i + P_{ni}} \quad /2/$$

where:

k_{ni} - costs per non-drinking or non-smoking person in the class i ,

K_i - observed, total costs in the class i ,

P_i, P_{ni} - estimated numbers of – respectively - alcohol abusers (heavy smokers) and abstainers (non-smokers) in that class.

Let additionally:

P_{ei} - denote the size of the observed population in the class i ,

P_{0i} - denote the size of the observed population in that class on the December 31. of the previous year,

ΔP_i - be the number of premature deaths due to alcohol abuse or heavy smoking in the considered year,

K_{hi} - cost in the hypothetical non-drinking or non-smoking population,

ΔK_i - additional cost due to alcohol abuse or heavy smoking in the class i .

The number of premature deaths due to alcohol abuse or heavy smoking in the considered year in class i can be estimated by the following formula (Mielecka-Kubieñ 2001, pp. 213–215):

$$\Delta P_i = P_{oi} \cdot m_i - P_{ni} \cdot m_{ni} \quad /3/$$

The additional cost due to alcohol abuse or heavy smoking in the class i can be estimated as follows:

$$\Delta K_i = K_i - K_{ni} \quad /4/$$

$$K_{ni} = P_{ni} \cdot k_{ni} \quad /5/$$

The basic empirical population was the Polish adult society in 1993, that is:

- persons between the ages of 20-79 in the case of alcohol, and
- persons between the ages of 35-79 in the case of smoking considerations.

The coefficients γ_i describing the ratio of the observed to expected number of deaths of alcohol abusers or heavy smokers were never estimated for the Polish population, so there were applied estimates presented in:

- (Schmidt, de Lint 1972) in the case of alcohol abusers, and
- (Collishaw, Tostowaryk, Wigle 1988) in the case of heavy smokers.

In the presented paper, population of alcohol abusers is understood in broader sense than the one considered in Schmidt and de Lint 's study, so the estimates, in the case of alcohol abuse, should be treated as the upper limits of the magnitude of the consequences of alcohol abuse.

The range of the estimates of the coefficients γ_i limited the age interval of the below considered populations.

The rates ρ_i that is the share of drinking or smoking persons in class i were estimated in the case of alcohol drinkers on the basis of the distribution of numbers of the first admissions to hospitals for alcoholic psychosis (Institute of Psychiatry and Neurology, Warszawa), and in the case of smokers the base were the survey data of Department of Cancer Control and Epidemiology, The Maria Skłodowska-Curie Memorial Cancer Center and Institute of Oncology in Warsaw.

The distribution of the empirical health care costs among gender and age classes was estimated on the basis of the distribution of the number of deaths in those classes in 1993 in Poland.

Figures 1 and 2 present the observed general mortality rates and the estimated with the use of formula /1/ mortality rates for alcohol abstainers and non-smokers respectively in women and men populations. It can be noticed that both kinds of estimated mortality rates are much lower than the observed ones.

The differences are bigger in the case of the male population which can be explained by the fact that men in Poland drink about 80–90% of alcohol consumed, and the rate of heavy smokers was in the considered period of time much higher in the male population than in that of women: about 47.3% compared to 24.8% (data of Department of Cancer Control and Epidemiology, The Maria Skłodowska-Curie Memorial Cancer Center and Institute of Oncology in Warsaw).

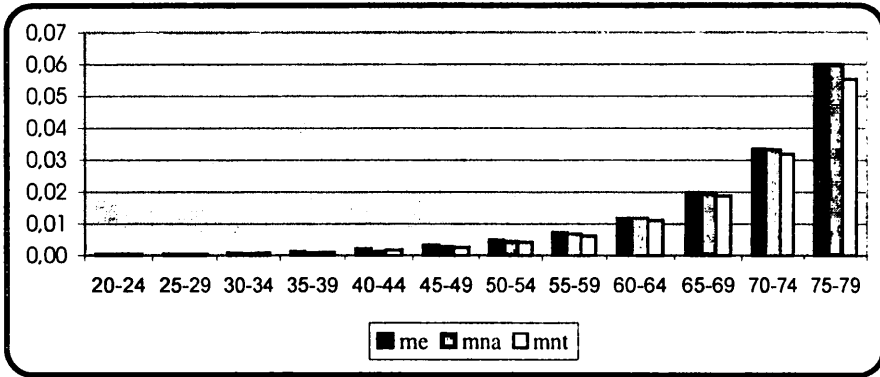


Figure 1. General, empirical mortality rates (me), estimated mortality rates for alcohol abstainers (mna), estimated mortality rates for non-smokers (mnt) in the Polish female population, 1993

Source: author's own calculation

The other important observation is that the differences between empirical and each of the both kinds of estimated mortality rates in the most of gender/age classes are much bigger in the case of comparison to the non-smoking population than in the case of comparison to the non-drinking one, which means that smoking affects the mortality level of the population to a higher degree. It should be noticed, however, that the supremacy of smoking influence on mortality occurs only in the older parts of the populations (over 45 years of age), while in the younger parts of the both subpopulations the influence of alcohol abuse on mortality level is more visible than the influence of smoking.

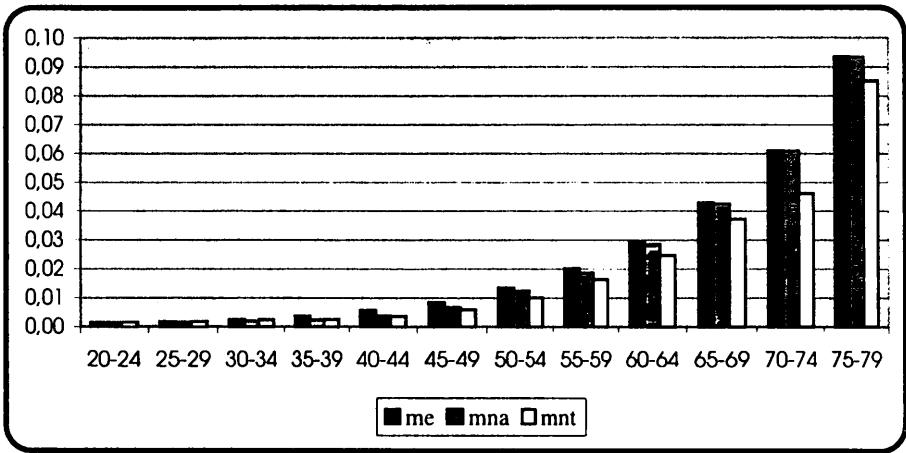


Figure 2. General, empirical mortality rates (me), estimated mortality rates for alcohol abstainers (mna), estimated mortality rates for non-smokers (mnt) in the Polish male population, 1993

Source: author's own calculation

Figures 3 and 4 present the empirical and the two estimated hypothetical populations, respectively for women and men. As the distribution (according to age) of each population depends on its mortality rates, the results of the comparison are similar to that described above.

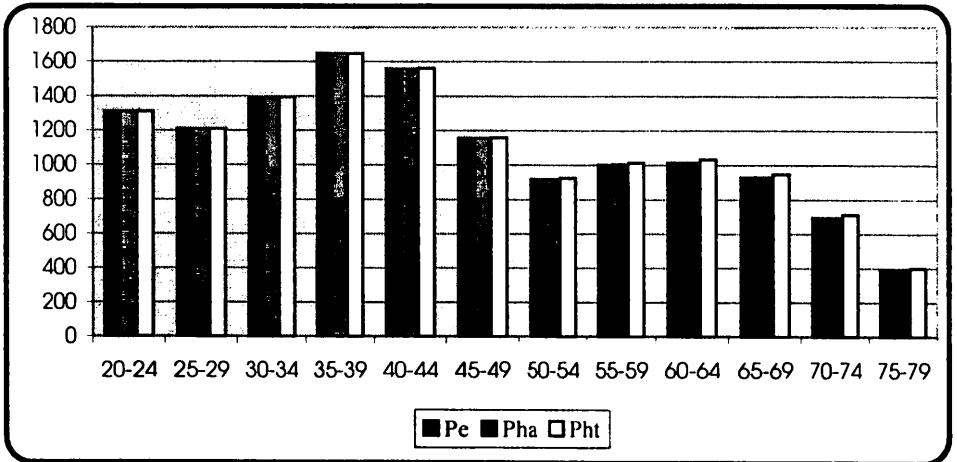


Figure 3 Empirical population (Pe), hypothetical populations constructed under the assumption that in 1993 there were no alcohol abusers (Pha), or no heavy smokers (Pht) in the Polish female population

Source: author's own calculation

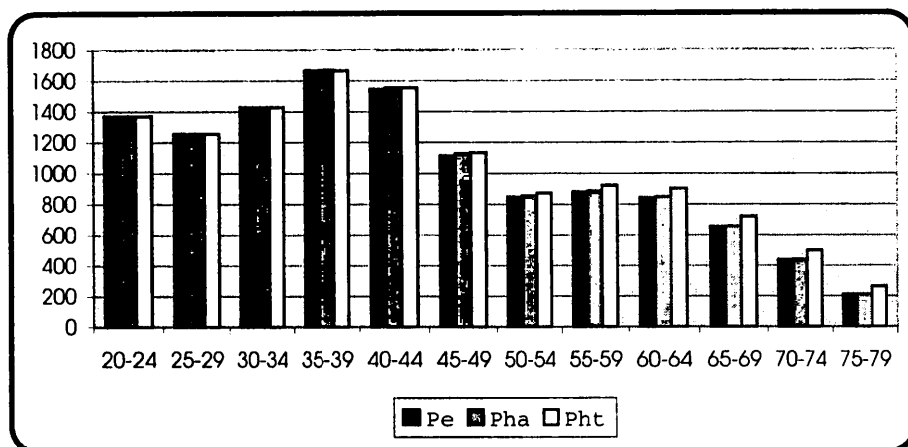


Figure 4 Empirical population (Pe), hypothetical populations constructed under the assumption that in 1993 there were no alcohol abusers (Pha), or no heavy smokers (Pht) in the Polish male population

Source: author's own calculation

The surplus numbers of the hypothetical populations over the observed ones in each gender/age class i are the estimates of the numbers of premature deaths, caused by smoking or by alcohol abuse.

Table 1 presents estimated numbers of premature deaths caused by alcohol abuse or heavy smoking (illustrated by figures 5 and 6) in the age interval of labour activity, and estimated numbers of hypothetically employed, under the assumption that there were no premature deaths in the population (figures 7 and 8).

Table 1

Estimated numbers of premature deaths caused by alcohol abuse or heavy smoking, and estimated numbers of hypothetically employed under the assumption that there were no premature deaths

Age	Number of premature deaths				Number of hypothetically employed			
	Men		Women		Men		Women	
	Alcohol	Tobacco	Alcohol	Tobacco	Alcohol	Tobacco	Alcohol	Tobacco
Total	11094	17949	3275	4481	7826	10596	2282	2017
20-24	98	-	12	-	34	-	3	-
25-29	276	-	80	-	229	-	50	-
30-34	594	-	268	-	494	-	166	-
35-39	2070	1803	656	542	1712	1490	478	395
40-44	3107	3205	1248	622	2569	2649	909	452
45-49	1920	2665	603	882	1409	1956	387	566
50-54	989	2929	335	646	726	2150	215	415
55-59	1328	3365	433	1090	425	1077	75	189
60-64	712	3982	-	699	228	1274	x	x

Source: author's own calculation

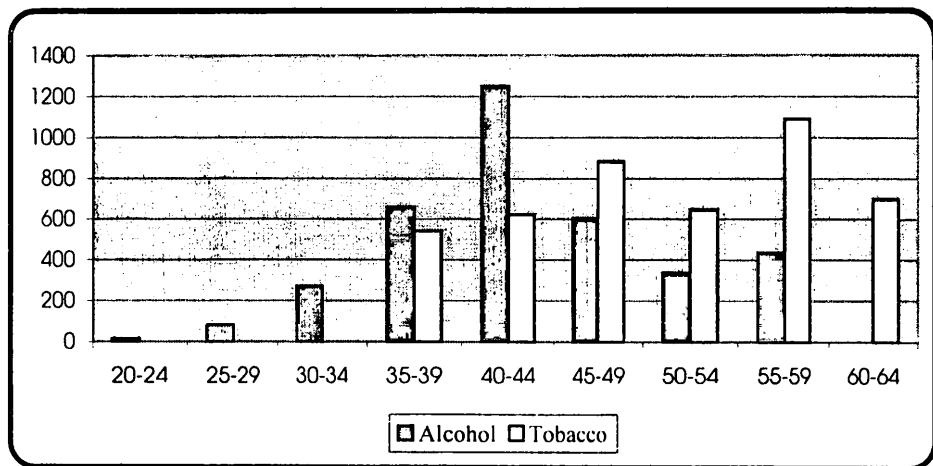


Figure 5. Estimated numbers of premature deaths due to alcohol abuse or heavy smoking in the Polish female population, 1993

Source: author's own calculation

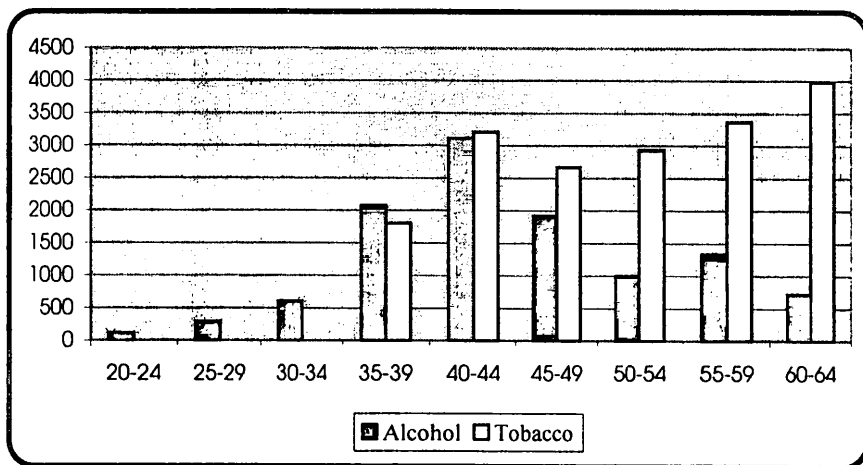


Figure 6. Estimated numbers of premature deaths due to alcohol abuse or heavy smoking in the Polish male population, 1993

Source: author's own calculation

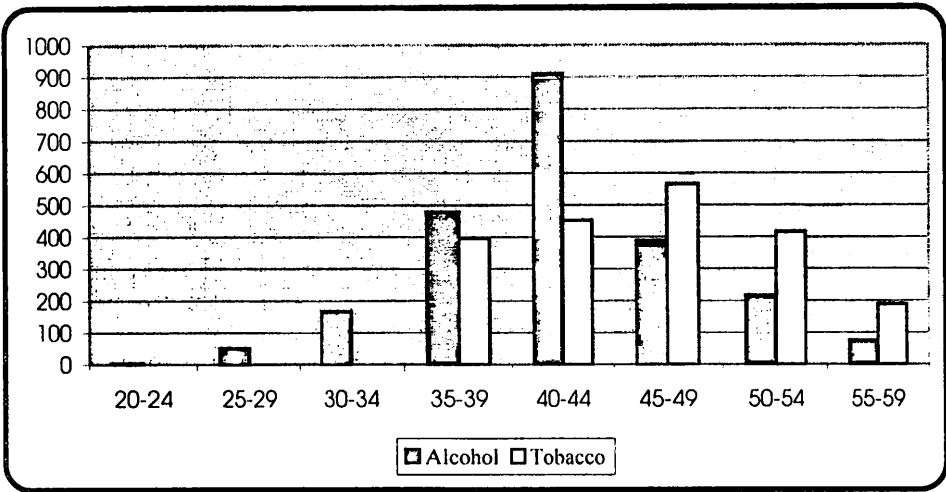


Figure 7. Estimated numbers of hypothetically employed women in Poland in 1993 under the assumption that there were no alcohol abusers or no heavy smokers
 Source: author's own calculation

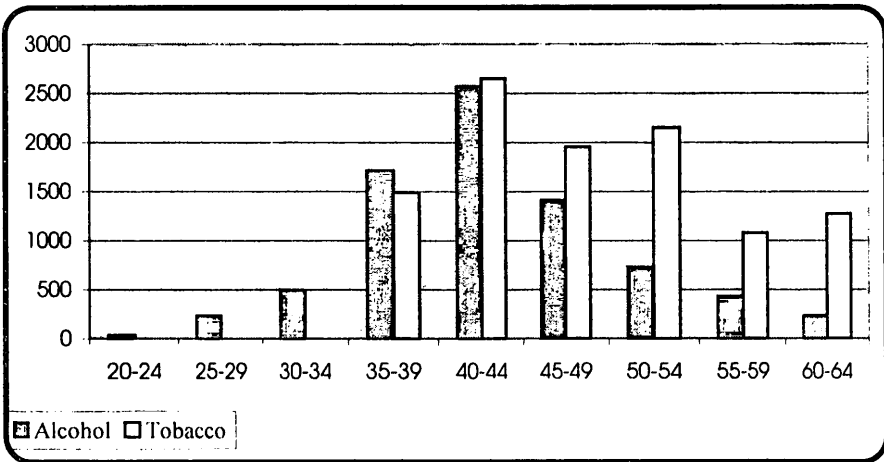


Figure 8. Estimated numbers of hypothetically employed men in Poland in 1993 under the assumption that there were no alcohol abusers or no heavy smokers
 Source: author's own calculation

The estimation of the number of persons hypothetically employed was realized taking into account labour market conditions in Poland in 1993, i.e.:

- rates of labour activity in every gender/age group,
- rates of unemployment in every class *i*,
- age of retirement (60 for women, 65 for men).

It was also assumed that the above conditions are valid for the population of hypothetically employed.

It can be noticed that the estimated number of premature deaths in the age interval of labour activity due to alcohol abuse was equal to 14.369 persons and a similar number according to smoking can be estimated as 22.430 persons, that is about 56% more than in the case of alcohol drinking. The influence of smoking on mortality compared to the influence of alcohol abuse is higher for men (by about 62%) than for women (by about 37%).

It can also be noticed that nearly 79% of premature deaths in the considered age interval occurred in the population of men.

Assuming that the labour market conditions would be stable, generally over 63% of prematurely dead men and over 55% of prematurely dead women could have been employed in Poland in the next year, that is over 70% of men who died prematurely because of alcohol abuse, and about 59% of men who died prematurely because of smoking (respectively nearly 70% and 45% in the women population).

The differences between significance of alcohol abuse and smoking can be explained by the differences in the estimated mortality rates – the influence of alcohol on mortality is higher in younger age groups, while the influence of smoking is higher in older age, when some of the prematurely dead would be already retired.

Taking into account the results presented in table 1 and life expectancy evaluation for the Polish population in 1993 in the considered gender/age classes (*Trwanie...* 1994, p.1), it could be estimated how many years of lives of the members of the Polish society - in the taken into account interval of age, as well as in the age of potential employment - was lost due to smoking or alcohol abuse in 1993 in Poland. The results could be understood as estimates of wasted potential social benefits.

Tables 2 and 3 present mutual relations among subpopulations consisted of persons who died prematurely due to smoking or alcohol abuse.

Table 2

Share (%) of the number of the lost years of life in the age of potential employment to the total number of the lost years of life in different subpopulations

Subpopulation	Share (%)		
	Total	Men	Women
<i>Total</i>	43.77	49.96	26.86
Smokers	38.98	44.46	21.96
Alcohol abusers	49.67	57.23	31.78

Source: author's own calculation

It could be observed that the potential employment losses are higher for alcohol abusers than for smokers, which is the result of already described differences in mortality rates for the both subpopulations, and the losses are much higher for men than for women, which could be in turn explained by lower employment rate for women in Poland in 1993 (44.8% compared to 60.1% in population of men (*Rocznik...* 1994, p. 111)), and their lower age of retirement.

Table 3 presents relations of the lost years of life among persons, who died prematurely due to smoking or alcohol abuse in the subpopulation of persons in the age of potential employment and in the whole considered population of persons who died prematurely.

Table 3

Share (%) of the number of the lost years of life in different subpopulations in relation to the population of potentially employed and to the total population of prematurely dead

Population	Share (%) in population of:	
	Potentially employed	Total
<i>Total</i>	100.00	100.00
Men	83.58	73.23
Women	16.42	26.77
<i>Total</i>	100.00	100.00
Smokers	49.05	55.09
Alcohol abusers	50.95	44.91

Source: author's own calculation

It can be observed that within the population of potentially employed and within the total considered population the share of the number of the lost years of life in the male population is much higher, as compared to that of women, while the differences between smokers and alcohol abusers are more balanced.

Table 4 presents estimated (formula /4/) additional health care costs caused by alcohol abuse or heavy smoking in Polish society in 1993. The results are illustrated in figures 9 and 10.

Table 4

Estimated additional health care costs caused by alcohol abuse or heavy smoking in Poland (in millions of zlotys)

Age	Additional health care costs					
	Alcohol abuse			Smoking		
	Men	Women	Total	Men	Women	Total
Total	211.21	41.96	253.17	545.71	156.41	702.12
20-24	1.80	0.12	1.92	-	-	-
25-29	5.09	0.63	5.72	-	-	-
30-34	10.97	2.26	13.23	-	-	-
35-39	38.23	7.33	45.56	33.29	10.97	44.26
40-44	57.38	14.48	71.86	59.19	13.18	72.37
45-49	35.46	6.42	41.88	49.20	16.28	65.48
50-54	18.27	3.39	21.66	54.08	11.93	66.01
55-59	24.53	4.34	28.87	62.14	20.12	82.26
60-64	13.16	0.0	13.16	73.52	12.90	86.42
65-69	4.22	0.84	5.06	67.39	17.30	84.69
70-74	1.31	1.17	2.48	113.52	19.43	132.95
75-79	0.79	0.98	1.77	33.38	34.30	67.68

Source: author's own calculation

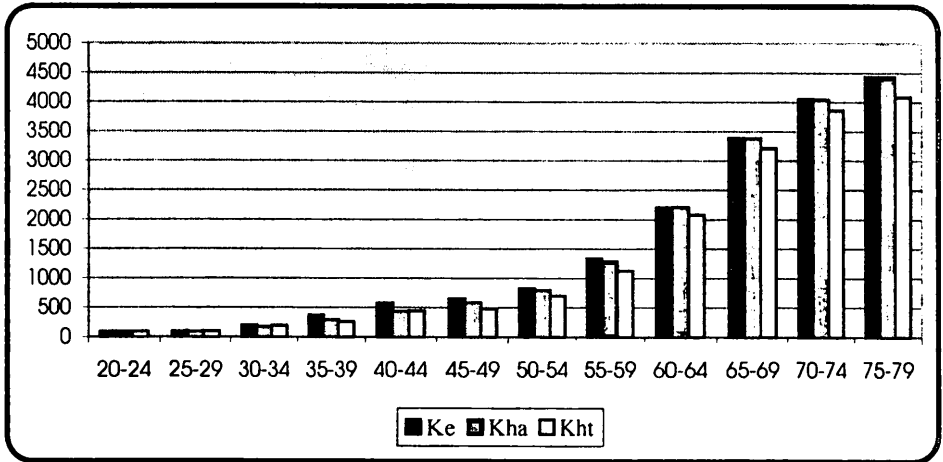


Figure 9. Empirical health care costs (Ke), hypothetical health care costs under the assumption that in 1993 in the Polish female population there were no alcohol abusers (Kha) or no heavy smokers (Kht) in millions of zlotys

Source: author's own calculation

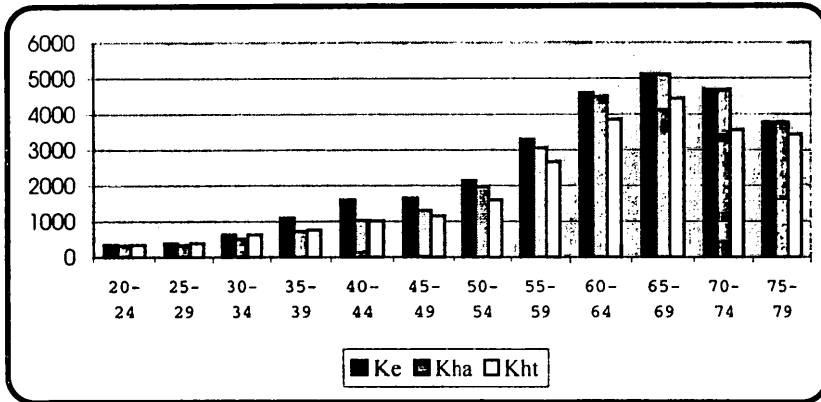


Figure 10. Empirical health care costs (Ke), hypothetical health care costs under the assumption that in 1993 in the Polish male population there were no alcohol abusers (Kha) or no heavy smokers (Kht) in millions of zlotys

Source: author's own calculation

It can be noticed that in the considered age interval, most (about 73.5%) of the additional health care costs arise in the smokers population, which can be explained by the fact that smoking affects the health status after many years of smoking (usually at older age) and additionally the health care costs are in general higher for older persons; in the case of alcohol the death can occur after a much shorter period of abuse (for instance as a result of an accident under the influence of alcohol).

The estimated magnitude of additional health care costs caused by smoking constituted about 9.7% of total empirical health care costs in Poland in 1993, while the additional health care costs caused by alcohol abuse was about 3.5% of the total costs, which gives about 14.7% of the empirical health care costs at the age 20-79 for smokers and about 5.3% of such costs for alcohol abusers.

CONCLUSION

The above estimates can be compared to the state tax revenue – it can be evaluated that the additional health care costs caused by alcohol abuse and smoking alone constituted about 23.6% of state tax revenue from taxes imposed on alcohol and tobacco in 1993 in Poland.

The considered additional health care costs are only part of several kinds of costs and losses caused by alcohol abuse and smoking. As it was estimated for instance for Australia (Collins, Lapsley 1991, p. 5), the additional health care

costs constituted about 29.3% of total tangible costs connected with alcohol consumption and smoking. Assuming that their share in the total costs was similar in Poland in 1993, it can be expected that the total tangible costs and losses caused by alcohol abuse and smoking were in our country higher than the state tax revenue from alcohol and tobacco.

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- Statistical Yearbook, 1994, Central Statistical Office, Warsaw
- Statistical Yearbook of Demography, 1993, 1994, Central Statistical Office, Warsaw
- mentioned in the text sources of data and positions of references.

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