Recent Trends in Coronary Risk Factors in the USSR

RICHARD COOPER, MD, AND ARTHUR SCHATZKIN, MD, MPH

Abstract: The Soviet Union has experienced an increase in the incidence of coronary heart disease over the last 15 years sufficient to result in an overall deterioration in the health of adults. The distribution of coronary risk factors, and the secular trends in diet and cigarette consumption, provide a potential explanation for the upsurge in death rates. The animal fat content of the Soviet diet has been steadily enriched since the 1950s and cigarette production increased 72 per cent from 1959 to 1980. The post-Stalin orientation of the Soviet economy toward a policy of motivating the work force primarily through the provision of consumer goods, in a pattern comparable to western capitalist countries, appears to have laid the basis for these developments. Given the central control of Soviet society, the negative impact of current economic policy on the public health could be viewed as paradoxical. Our analysis suggests that the paradox is only apparent, however, and that the basis for the widespread occurrence of coronary heart disease is similar in the Soviet Union and western societies. (*Am J Public Health* 1982; 72: 431–440.)

Introduction

The incidence of coronary heart disease in a population bears a clear-cut and consistent relationship to lifestyle.[1–6] Most of the observed variation among populations appears to be related to the three major risk factors: diet (and related levels of serum cholesterol), cigarette smoking, and uncontrolled hypertension.[1–7] These epidemiological relationships have been demonstrated in population studies based on international comparisons as well as in secular trends within a country or region.[1–12] In the early decades of this century, soon after the link between diet and coronary heart disease (CHD) was recognized, European physicians traveling in the Far East noted the relative rarity of CHD and appreciated the role of diet.[13,14] Secular trends in CHD within a population in response to changing patterns of coronary risk were first described as a result of food shortages in Scandinavia during World War II.[15,16] Since those initial reports, an extensive body of data has become available confirming the relationship between diet and CHD on a population basis and extending the observation to trends in cigarette smoking and the control of hypertension.[17–21]

Over the last decade, the Soviet Union has experienced a significant upturn in adult mortality, primarily as a result of rising CHD rates.[22–28] This paper relates trends in coronary risk factors in the USSR to the recent mortality experience, as previously described.[22]

Address reprint requests to Richard Cooper, Division of Cardiology, Department of Medicine, Cook County Hospital, Chicago, IL 60612. Dr. Cooper is also with the Department of Medicine, Northwestern University Medical School; Dr. Schatzkin is in the Department of Epidemiology and Biostatistics, Boston University School of Public Health, Boston, MA. This paper, submitted to the Journal October 5, 1981, was revised and accepted for publication January 18, 1982.

Editor's Note: See also related editorial, p 425 this issue.

Data Sources

Although significant deficiencies still exist in the sources of Soviet data, a wide range of material has become available in recent years. The Soviet mortality data given below were obtained from various volumes of the standard Soviet statistical publication *Vestnik Statistiki*. The system of the International Classification of Diseases is used in the USSR, although the precise application of specific sub-codes has not been described to our knowledge.[29] (It appears that when multiple causes of death are present, preference may be given to hypertension rather than CHD in assigning the cause of death.) Despite these limitations, the mortality data exhibit a high degree of internal consistency and are well supported by data from secondary studies (i.e., local epidemiological studies, autopsy reports, etc.).[27,28,30–37] Although it is not possible to make direct international comparisons regarding trends in the absolute rate of CHD, we feel confident that the published data on trends within the USSR are reliable. A more extensive report on Soviet mortality has been published elsewhere.[22]

Dietary data were obtained from the Food Balance Sheets of the Food and Agricultural Organization of the World Health Organization and the Organization for Economic Co-operation and Development.[38,39] Data from the Food and Agricultural Organization were coded and analyzed for nutrient content with a computer program as previously reported.[40] The estimates derived by this method are of course approximate and reflect "food disappear-

TABLE 1—Death Rates from CHD, Men and Women, Age-Specific, USSR, 1966–67—1971–72* per 100,000

Year	Age Group 30–39	40–49	50–59	60+
		Men		
1966–67	19.3	69.3	231.6	1466.1
1967–68	21.1	76.6	247.0	1526.2
1968–69	23.7	84.1	270.0	1602.3
1969–70	24.2	87.4	281.5	1683.5
1971–72	26.4	96.6	292.1	1737.5
Increase in Rate, 1966–67 to 1971–72	7.1	27.3	60.5	271.4
Per Cent Change, 1966–67 to 1971–72	36.8	39.4	26.1	18.5
		Women		
1966–67	3.3	13.0	72.9	1160.5
1967–68	3.3	13.5	78.3	1208.2
1968–69	3.6	14.8	85.2	1265.1
1969–70	3.9	15.6	87.3	1341.9
1971–72	3.8	17.5	92.3	1390.7
Increase in Rate, 1966–67 to 1971–72	0.5	4.5	19.4	230.2
Per Cent Change, 1966–67 to 1971–72	15.2	34.6	26.6	19.8

*1970–71 not available.
SOURCE: Ref. #48

ance", i.e., food available on the market, rather than actual per capita consumption. Previous experience has demonstrated the usefulness of this method as a guide to national patterns of food intake.[40] Again, despite any uncertainty about absolute levels, trends over time are readily apparent. Data on tobacco consumption were derived from multiple sources.[41–44] An estimate of annual cigarette consumption per person was obtained by dividing output, corrected for imports, by the population over the age of 15.[29,41,42] Soviet alcohol data were obtained from the work of Treml.[45,46]

Results

Mortality Trends

After a half century of rapid decline, death rates in the USSR turned sharply upward in the mid-1960s. The rate of increase in the death rates was particularly steep for persons who were middle-aged. Trends in all-causes mortality, 1958–59 to 1975–76, are presented in Figure 1 for the age group 15–59. Mortality worsened dramatically for men from 1964 to 1970 with little change for women; a second upturn began in 1973 where data are only available for both sexes combined. From 1964 to 1975, an 18 per cent increase in age-adjusted mortality rates was recorded in the Soviet Union for the entire population.[22]

From 1964 to 1975 an 18 per cent increase in age-adjusted mortality rates was recorded in the Soviet Union for the entire population.[22] In previous reports it was noted that the majority of this increase can be accounted for by cardiovascular diseases, particularly CHD.[22,23,27–29] Age-specific data by cause are available for a shorter time period and confirm these trends.[47] For the five years from 1966–67 to 1971–72, cardiovascular diseases among men account for 31 per cent, 36 per cent, 64 per cent and 99 per cent of the increase in total death rates for the age groups 30–39, 40–49, 50–59, and 60+, respectively.[47] Deaths in the CHD categories contributed 33.7 per cent of the increase in total death

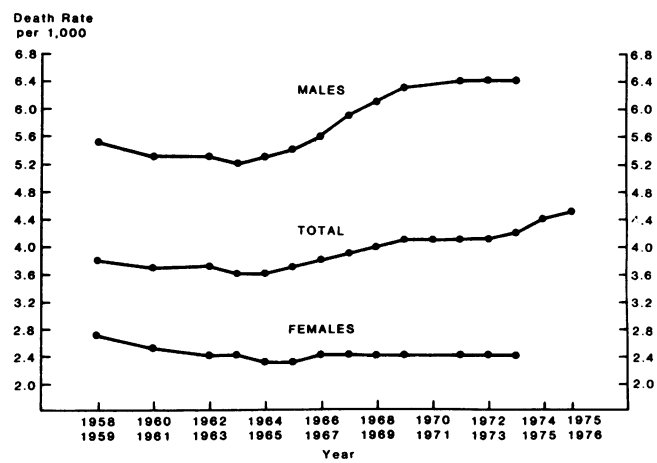

FIGURE 1—Trends in All-Causes Mortality, USSR, 1958–59 to 1975–76, Ages 15–59

TABLE 2—Trends in Food Consumption, USSR, 1965 and 1977 (Kg per year)

Food Items	Year		Per Cent Change 1965–1977
	1965	1977	
Meat*	41	57	+ 39.0
Milk & Milk Products‡	251	322	+ 28.2
Eggs (piece)	124	224	+ 80.1
Fish and Fish Products	12.6	17.7	+ 40.5
Vegetable Oil	7.1	7.9	+ 11.3
Sugar**	34	42	+ 23.5
Vegetables and Melons	72	89	+ 23.6
Potatoes	142	122	− 14.1
Grain Products‡‡	156	140	− 10.3

*Including meat products, animal fats and subproducts in physical units.
‡In milk equivalents.
**Rounded to nearest kilograms.
‡‡Bread, baked goods, noodles (in flour equivalents), groats, flour, and leguminous grain.
SOURCE: Ref. #39

rates for the age group 50–59 and 73 per cent of the increase over the age of 60, also for men.[47] The pattern was similar for women, with a slightly greater contribution from CHD. Since the great majority of deaths occur among older persons, CHD is by far the single most important contributor to the upturn in overall mortality. Trends in age-specific death rates from CHD are presented in Table 1. The percentage increase was greater for the younger age groups and roughly equal for men and women after age 40. The pattern of increase is likewise consistent year-by-year, a finding which tends to argue against the influence of trends in the method of coding the death certificate. The rate of rise over this period is approximately 4 to 5 per cent per year and is steep relative to other international experience.[48–50]

TABLE 3—Food Disappearance Data, USSR, 1964–66 and 1975–77*

Nutrient Item	Disappearance per Person per Day	
	1964–66	1975–77
Total Calories	3309.2 KCal	3425.0 KCal
Macronutrients		
Protein	98.2 gms	109.0 gms
Carbohydrate	536.4 gms	511.1 gms
Total fatty acids	60.3 gms	81.9 gms
Saturated fatty acids	25.5 gms	36.3 gms
Polyunsaturated fatty acids	13.1 gms	11.0 gms
Dietary cholesterol	291.1 mgs	368.3 mgs
Macronutrients, per cent of calories		
Protein	11.9 %	12.7 %
Carbohydrate	64.8 %	59.8 %
Total fatty acids	20.4 %	25.4 %
Saturated fatty acids	6.9 %	9.5 %
Polyunsaturated fatty acids	3.6 %	2.9 %
Food groups, calories		
Dairy	250.4 KCal	296.4 KCal
Beef, veal and lamb	97.5 KCal	204.0 KCal
Pork	138.0 KCal	128.8 KCal
Poultry	9.6 KCal	19.2 KCal
Grains, starchy vegetables	1855.1 KCal	1635.1 KCal
Fruits, non-starchy vegetables	66.9 KCal	110.7 KCal
Simple sugar	478.4 KCal	554.2 KCal
Food groups, combinations, per cent of calories		
Meat, poultry, dairy	15.0 %	19.0 %
Grains, legumes, fruits, vegetables	57.1 %	50.9 %
Ratio, polyunsaturated:saturated fatty acids	0.52	0.30

*Excludes alcohol
SOURCE: Ref. #38

TABLE 4—Serum Lipids of Men in Leningrad and Moscow, Ages 40–59, 1975–77 (median, mg/dl), and of Children in Moscow, Ages 12–13, 1978 (mean, mg/dl)

Serum Lipids of Men	Age Group 40–49	50–59
Total cholesterol	219	222
Triglycerides	100	104
High Density Lipoprotein-Cholesterol	53	51
Serum Lipids of Children	**Sex Boys**	**Girls**
Total Cholesterol	183	165
Triglycerides	78	70

SOURCES: Data on men, Ref. #33; data on children, Ref. #31

Diet and Serum Cholesterol

Consumption of food groups high in saturated fat and cholesterol has increased consistently in the Soviet Union over the last several decades. In the most recent period, meat, dairy products, and eggs have continued their long-term rise, while the proportion of calories from complex carbohydrate, i.e., potatoes and grain, has decreased (Table 2). In Table 3 it can be seen that between 1964–66 and 1975–77 the nutrient content of the diet as a whole was influenced primarily by the increase in animal products. An increase in calories from total fat took place with a rise in saturated fat and a decline in polyunsaturated fat. Dietary cholesterol intake rose from 291 mgs per day to 368. A 20 per cent increase in calories from meat and dairy products was accompanied by a similar decline in calories from grains, legumes, and vegetables. Based on the Keys equation, which estimates the effect of changes in dietary lipids on serum cholesterol, a mean increase in serum cholesterol of 9.4 mg/dl could be expected in the Soviet population based on these data.[51] Despite the increased availability of animal products, however, the fat content of the Soviet diet remains moderate by comparison to other industrial societies. In the period 1975–77 total fat accounted for only 25.4 per cent of calories, with 9.5 per cent provided by saturated fat. It must be noted, however, that these data are derived from union-wide estimates; within the USSR a wide range of dietary patterns exists and in the Slavic areas the diet contains significantly more animal products than in many of the other regions.[39]

Previous Soviet studies have documented the frequent occurrence of hypercholesterolemia.[30–33,52] Unfortunately, population-based trend data are not available. The most extensive set of recent data are provided by the US-USSR Collaborative Lipid Research Clinics (LRC) Program where rigid standardization of laboratory methods make the data comparable to those reported in the US.[33] Values derived from population surveys in Moscow and Leningrad, for adult men and children of both sexes, are presented in Table 4. Levels of serum cholesterol are in the range commonly found in the US and Europe.

Cigarette Smoking

Tobacco consumption in the USSR increased 59.7 per cent from 1960 to 1977 (Table 5); throughout this period the USSR remained a net tobacco importer. The production of cigarettes rose from 243.4 billion in 1959 to 413.3 in 1980.[44] In the period 1974–77 data are available on cigarette production with international comparison; a modest increase, roughly 1 per cent per year, was recorded (Table 6). Combining estimates of cigarette consumption and the size of the adult population yields an annual per capita figure of approximately 2,600 cigarettes in 1974 (Table 7), making the consumption rate similar to Europe.[41]

Local population surveys from Slavic regions of the USSR over the last decade have demonstrated smoking rates of 44–69 per cent in the adult male population.[31,34,53,54] Based on a recent survey in Moscow it was reported that 44.2 per cent of men and 10.1 per cent of women over the age of 16 smoked cigarettes.[54] In the age group 20–29, 60.4 per cent of men and 16.8 per cent of women smoked, while the highest cigarette consumption rate was in the 40s age group with men smoking an average of 18.1 cigarettes per day and women 14.7.[54] According to baseline data in a multifactorial intervention study involving six major Soviet cities and over 15,000 men, ages 40–59, 48.2 per cent of the participants

TABLE 5—Trends in Tobacco Production and Consumption, USSR and Selected Countries, 1960 and 1977 (Thousand metric tons dry weight)

Country	1960 Production	1960 Consumption	1977 Production	1977 Consumption	Per Cent Change in Consumption
US	805	714	782	604	−15.4
USSR	160	226	270	361	+59.7
Japan	109	204	156	220	+ 7.8
Canada	87	50	94	80	+60.0
Italy	61	62	92	75	+21.0

SOURCE: Ref. #41

TABLE 6—Trends in Number of Cigarettes Manufactured, USSR and Selected Countries, 1974 and 1977

Country	Output (in million pieces) 1974	1977	Per Cent Change
US	635,000	665,871	+4.9
USSR	371,000	380,000	+2.4
Japan	292,157	297,000	+1.7
UK	158,809	154,625	−2.6
West Germany	139,842	137,000	−2.0

SOURCE: Ref. #41

TABLE 7—Cigarette Consumption, USSR, and Selected Countries, 1973

Country	Cigarette Consumption per Person over Age 15, per Year
US	3850
Canada	3450
Japan	3240
UK	3230
USSR	2600
Netherlands	2370
Finland	2040
Italy	1930
Sweden	1580

SOURCE: Ref. 41

smoked.[55] Of particular interest was the additional finding that smoking rates followed a clear social class gradient; smoking rates were 37.2 per cent for those with a higher education, 59.7 per cent with a secondary education, and 64.8 per cent with a primary education.[55] In Moscow, 3.5 per cent of boys in the age range 10–15 were reported to use cigarettes.[31] Smoking is said to remain relatively uncommon in the Moslem population of the Central Asian republics.[53]

Hypertension

Secular trends in blood pressure levels and hypertension prevalence rates are difficult to determine since absolute reference standards are not available. Reported blood pressure (BP) levels are of course highly dependent on the method of measurement, which also presents obstacles to international comparison. The LRC Collaborative Program, however, has also provided BP data collected with a standardized protocol which allow at least direct US-USSR comparison.[56,57] The prevalence rates of hypertension for men ages 40–59 in the USSR and the US are presented in Table 8. (Blood pressure measurement was based on the protocol of the Hypertension Detection and Follow-up Program.) The Soviet population surveys were drawn from random community samples in Moscow and Leningrad between 1975 and 1977. The finding of a two-fold greater prevalence in the Soviet sample is unexpected and, if confirmed, raises a number of interesting questions in relation to the etiology of this disease. The rate of hypertension control in the Soviet sample was 11 per cent (i.e., percentage of all hypertensives who were on therapy and whose BP was less than 95 mmHg). Further data on hypertension control are presented in Table 9. Although approximately half of the hypertensives were aware of their elevated blood pressure, control rates were very low, less than 13 per cent for all surveys.

Minor Risk Factors

The prevalence of obesity in recent surveys has been reported to be 20–25 per cent.[31] Among men in the late 1960s, obesity (defined as 15 per cent above standards derived from the Metropolitan Life Insurance Company data) was found in 27 per cent of the 50–54 year olds, and 34 per cent of those aged 55–59.[27] Excessive intake of alcohol may increase cardiovascular risk although moderate intake has a negative relationship to CHD.[58–60] In 1972, the per capita annual intake of absolute alcohol in the USSR was 8.9 liters[35]; intake in the US in 1975 was 10.5 liters per person, and in France in 1972, 22.4 (Table 10).[46] The absolute level of alcohol intake for the USSR is somewhat below the mean for European countries although the annual percentage increase is exceptional. There is most likely significant regional imbalance as well. Information on social stress and levels of physical activity are not available to our knowledge.

Discussion

The data presented in this report clearly demonstrate that over the last 20 years the Soviet population has suffered a significant increase in the prevalence of CHD risk factors. In relation to diet, over the last decade alone, calories from meat and dairy products have increased by a third, and egg consumption has almost doubled. Animal sources of food are significantly less plentiful in many of the Central Asian and Caucasian republics, lowering the national averages.[39] Regional studies, both of diet and the prevalence of atherosclerosis, support this observation.[39,61,62] Food processing and transport are relatively underdeveloped in the USSR as well and prevent wide distribution of some products.[39,63,64] Much of the recent dietary change has therefore been concentrated in the Baltic and Slavic regions. To the extent that population levels of serum cholesterol reflect dietary intake, the degree of hypercholesterolemia demonstrated in Moscow and Leningrad suggests that in these cities, at least, the fat composition of the food is similar to US and European patterns. Local studies based on direct nutritional interview are available from the LRC program and confirm this view.[65] A similar shift in dietary patterns has been observed in other European countries, associated with similar upward trends in CHD mortality.[40,66,67]

The rate of increase in Soviet cigarette consumption over the last decade is very comparable to other industrialized countries, with exceptions like the US and England which took up smoking at an earlier period.[41] Lung cancer rates in European Russia, which are rising rapidly and are

TABLE 8—Hypertension Prevalence Rates of Men, Ages 40–59, USSR and US, Lipid Research Clinics (Per cent)

Age Group (years)	Hypertension Rate*	
	USSR	US
40–44	24	10
45–49	34	15
50–54	37	17
55–59	43	20
40–59 (age-adjusted)	34	15

SOURCE: Ref. 56

*Hypertension defined as mean fifth phase diastolic pressure of two readings greater than or equal to 95 mmHg, or currently taking anti-hypertensive medication.

now virtually identical to those for men in the US, support the data on smoking.[53]

The epidemiology of hypertension in the Soviet Union has many unusual and interesting features. With the exception of CHD there has been a tendency worldwide for hypertension-related mortality to decline, a trend which existed before treatment for elevated BP was available.[2,68–70] In the USSR not only CHD but stroke and deaths coded specifically to hypertension have increased.[47] Trend data for hypertension are unavailable, and whether this phenomenon reflects more hypertension in the population (leading to more strokes) or is merely an artifact of death certificate coding (inappropriate or new assignment of deaths to these categories) cannot be determined. Unfortunately we have no information about salt intake or changes in other potential etiologic factors. The finding of twice the US prevalence of hypertension in the USSR is also very unusual and has not been reported elsewhere for a majority social group in an industrialized society. Only Blacks in the US, Carribean, and South Africa, and farmers in northern Japan have been found to have such a high prevalence.[70–73] By the same token, control rates for this disease are remarkably low, despite the reported 2 billion physician contacts per year.[56,57] This high rate of uncontrolled hypertension may in part explain why the rise in death rates from CHD was so steep when changes in diet and smoking took place.

Data regarding minor risk factors are sparse. Some observers, including Soviet authorities, have emphasized the potential role of alcohol as a cause of the rising death rates.[23,26,74] Although high levels of alcohol consumption (roughly five drinks per day or greater) are associated with an increase in total mortality and CHD deaths, moderate consumption has a negative relationship to CHD.[58–60,75] By international comparison, alcohol intake in the USSR is now relatively high, especially if one accepts Treml's estimate of illegal production, and the rate of rise over the last two decades has been exceptionally steep.[46] Alcohol probably has made a significant contribution to Soviet ill-health through cirrhosis and accidents, particularly among men in the age range 20–40, and that issue deserves further study. Unless unique features of the Soviet alcohol experience come to light, however, increased drinking by itself can account for only a small part of the CHD trends.

Given the role of CHD in determining mortality trends in other parts of the world, the Soviet experience is both highly consistent and expected. Only the steepness of the curve is unusual. A further question than the one posed by the relationship of population coronary risk to the CHD rates is the issue of how social policy is reflected in the public health. As noted by Field, the "system of priorities" within Soviet society is more explicit and directly political as a result of the centrally planned economy.[76] In an area as important as the public health, therefore, it should be possible to relate the developments described in this report to issues of policy.

There are a number of possible explanations for the development of the CHD epidemic in the Soviet Union as related to social and economic policy. Lack of an appreciation of the health consequences of a high fat diet, cigarette smoking, and uncontrolled hypertension must be addressed first. Although the importance of life-style in determining coronary risk may not be appreciated at the higher levels of the Soviet government, the relationship of risk factors to CHD has been known to the Soviet scientific community for decades. In fact, several key discoveries which led to an understanding of this disease were made in the USSR: the

TABLE 9—Hypertension Detection, Treatment, and Control among USSR Men, Ages 40—59‡

Sample	No. Examined	Per Cent Hypertensive	Per Cent Previously Aware	Per Cent Hypertensives Under Treatment	Per Cent Hypertensives Treated and Controlled
Moscow (polyclinic)	1480	27.9	75.7	27.5	12.8
Moscow* (factory)	3039	28.1	66.9	31.7	5.4
Kaunas (polyclinic)	1568	21.8	40.4	13.2	3.2
Minsk (polyclinic)	537	25.5	78.8	17.5	3.6
Cheboksary* (factory)	2763	18.5	55.5	10.0	6.5
Donetsk*	1599	22.8	43.1	7.5	0.8

‡Hypertension defined as in Table 8.

*Ages 40–54

SOURCE: Ref. 57

TABLE 10—Trends in Alcohol Consumption, USSR and Selected Countries, 1950s to Early 1970s*

Country	Year	Alcohol Intake	Year	Alcohol Intake	Per Cent Change	Per Cent Change per Year
France	1955	25.7	1972	22.4	−12.7	−0.75
West Germany	1959	8.3	1974	14.8	+79.6	+5.31
Italy	1958	10.6	1973	13.6	+28.3	+1.89
Canada	1958	7.1	1974	10.8	+51.0	+3.19
Netherlands	1958	6.9	1974	10.6	+52.7	+3.29
US	1960	7.8	1975	10.5	+33.7	+2.25
UK	1959	6.0	1974	10.2	+70.8	+4.72
USSR	1957	4.9	1972	8.9**	+82.5	+5.50
Finland	1957	3.0	1973	7.6	+157.2	+9.83
Sweden	1958	4.9	1973	7.0	+43.4	+2.89

*Units expressed as liters of absolute alcohol per capita, persons over the age of 15.
**Inclusion of estimate of illegal production would increase 1972 value to 11.3.
SOURCE: Ref. 46

initial experiments relating diet to hypercholesterolemia, and subsequent atherosclerosis, were performed in Russia by Ignatowski and Anitschkow in 1908[77]; the clinical entity of myocardial infarction was first described by Russians in 1910[78]; A. L. Myasnikov, for years the leading cardiologist in the USSR, reported the association of CHD and hypercholesterolemia in humans in 1924.[32] The implications of the diet-heart theory have been widely discussed by both Soviet and foreign authors in the Russian medical literature.[79–82] This work, supplemented by more recent findings on the role of smoking and hypertension, could serve as the basis for a preventive program.[2,32,49,55,80]

Analysis of policy issues in the Soviet Union is determined in large part by one's perspective on the development of Soviet history. During the early years of the Bolshevik regime, remarkable progress was made in improving the health of the population. By 1925, despite the fact that industrial production had not yet reached pre-war levels and the grain harvest was only 80 per cent as high as 1913, infant mortality had fallen 45 per cent.[29,83] Health conditions improved through 1964, despite the massive destruction of the Nazi invasion. However, in the mid-1960s mortality rates turned upward for adults, and shortly thereafter for infants as well.[23,84] The rising mortality for adults, as reported here, has been associated with an increased personal consumption of items known to be risk factors for CHD. Soviet policy in relation to the consumer economy, therefore, is one of the main arenas in which public health trends have been determined.

Whatever view one takes of the underlying process which has led to the current Soviet consumer policy, two conclusions are unavoidable. First, crucial aspects of that policy (i.e., in relation to cigarettes, diet, and alcohol) are in direct contradiction to the requirements of preventive public health. Despite recent efforts to address that problem, no decisive campaigns have been undertaken.[43,56,57,79,80] The authorities have in that sense abandoned their pursuit of "rational norms of consumption".[39,64] Second, in these key areas, the Soviet life-style is virtually identical to that found in the US and Europe.[64,85] Despite the fact that many differences persist in the way in which the economy is managed, the outcome as judged by its consequences for public health is strikingly similar.

The origins of current Soviet consumer policy are deeply rooted in historical developments. Briefly, political incentives for motivating the population and building loyalty to the regime, which were primary during the early years of constructing Soviet society and fighting World War II, have been replaced by a system of material rewards which is highly imitative of western societies.[64,85,86] Although wage differentials and other institutionalized forms of privilege have played an important role throughout Soviet history, particularly since 1928 and the move to rapid industrialization, only in the post-Stalin era have they become primary.[64] At any rate, the reported level of individual consumption was no higher in 1953 than it had been in 1913 so the impact of that policy in terms of health-related commodities could only have been appreciated in the last two to three decades.[64] For the first time in the directives of the Five-Year Plan, 1971–1975, it was stated that the "chief task" was to "increase the people's material and cultural standard of living."[85] While in itself a worthwhile goal, the actual content and purpose of that campaign is what matters. As formulated by Brezhnev at the 1971 party congress, this campaign was required primarily because its effect on worker morale and productivity made it "one of the prerequisites for the rapid growth of production."[85] One of the most visible aspects of this program has been perceived improvement in the diet, particularly in regard to the availability of meat.[87] Enormous sums, reflected in foreign purchases of grain for feeding livestock, have been invested in this venture and meat prices are heavily subsidized.[85] Ironically, at the same time, efforts are being made by public health officials in many other countries to move the composition of the diet in precisely the opposite direction.[1,2,4,8,9,11,12,40,48,49] In relation to cigarettes, as well as alcohol, one promoting force may be the high rate of profit obtained from their manufacture and sale. The value of tobacco production

increased by more than 100 per cent from 1960 to 1975, rising from 234 million rubles to 542, despite only a 50 per cent growth in physical units.[41,88] According to Treml, the tax revenue alone on alcohol represents "10 to 20 per cent of all direct state revenues and more than one-third of taxes paid by the population."[45]

Public health policy must ultimately be interpreted in relation to the economic and political structure of society.[89,90] The Soviet government appears to have endorsed a pattern of personal consumption which has been associated with high CHD rates in other parts of the world and is already recognized as having led to a sharp rise in death rates in their own country.[27,28] It is possible to argue that this policy is a "mistake", an example of "social mismanagement", or an inadequate response to changing historical conditions. The magnitude of the CHD problem, however, even in terms of the loss of manpower in a society with a chronic shortage of workers, leads us to conclude that this health liability is tolerated only because it is offset by important rewards in other spheres. One of the hallmarks of Soviet society has been its ability to concentrate resources on priority tasks[76,91]; clearly other concerns have displaced preventive cardiology from the priority list. As described by Millar, the current direction of the consumer-oriented economy forms a fundamental aspect of the Soviet strategy for economic growth.[64]

Soviet public health theory holds that mass disease is produced by the antagonistic relationships between classes in society.[89,90,92] It is therefore surprising that the socialist USSR faces public health problems of an identical nature to those found in western capitalist countries. Despite the early accomplishments of the Bolshevik regime in fighting epidemic infections, perhaps the disease burden of a mature socialist society will not look much different from that of society which has industrialized on the capitalist model.[89] As Field has observed, "modernization has been accompanied by a . . . (similar) . . . shift in the morbidity structure in the United States and the USSR." He further concludes, "Whether one wants to call this convergence, coincidence or resemblance, I would argue that the differences are decreasing and the similarities increasing."[93] In terms of mechanism, the convergence theory implies that the contemporary mass diseases are the natural consequence of industrialization and a rising material standard of living. On the other hand, no one has yet argued convincingly that there is anything inherent in modern technology and production that requires society to adopt the coronary life-style. Economic incentives, as in the cigarette market, play a key role in determining the specific use of industrial capacity. The ability of the cigarette industry within the US, and most of the world for that matter, to assert its interests ahead of public health priorities is well known.[41] An identical interplay between economics and public health appears to be taking place in the USSR.[94] An alternative to the general convergence theory suggests that, although significantly modified by the concentrated nature of power, similar economic laws operate in the USSR as in countries like the US.[95–105] We have explored the implications of that analysis for public health elsewhere.[22,71,106,107] This model for the Soviet Union—which we have termed state capitalism—provides both a consistent explanation for the life-style we observe and reconciles the Soviet health theory based on the class character of disease with their own experience. Whatever model one chooses to apply to the Soviet economy it must be acknowledged that the current strategy for economic growth extracts a significant sacrifice from the population in terms of health and well-being.

International comparisons in the pattern of mass disease have provided important insights.[1–7,9,17,18,40] At least in relation to atherosclerosis, the biological factors underlying the disease process appear to be relatively well understood.[49] Hopefully future analysis will help us elucidate the relationship between this disease and forces in the social structure which put the population at risk. Countries like the Soviet Union can be particularly useful models to study since they have experienced dramatic changes in the organization of society during the present century.

REFERENCES

1. Epstein F: Coronary heart disease epidemiology and nutrition. Athero Rev 1979; 5:149–182.
2. Stamler J: Lectures on Preventive Cardiology. New York: Grune and Stratton, 1967.
3. McGill HC Jr (ed): Geographic Pathology of Atherosclerosis. Baltimore: Williams and Wilkins, 1968.
4. Stamler J: Population studies. *In*: Levy RI, Rifkind BM, Dennis BH, Ernst N (eds): Nutrition, Lipids, and Coronary Heart Disease: A Global View. New York: Raven Press, 1979.
5. Jolliffe N, Archer M: Statistical association between international coronary heart disease death rates and certain environmental factors. J Chron Dis 1959; 9:636–652.
6. Keys A (ed): Coronary heart disease in seven countries. Circulation 1970; 41: Suppl I.
7. Kagan A, Harris BR, Winkelstein W, *et al*: Epidemiologic studies of coronary heart disease and stroke in Japanese men living in Japan, Hawaii and California: demographic, physical, dietary and biochemical characteristics. J Chron Dis 1974; 27:345–364.
8. Stern MP: The recent decline in ischemic heart disease mortality. Ann Intern Med 1979; 91:630–640.
9. Havlik RJ, Feinleib M (eds): Proceedings of the Conference on the Decline in Coronary Heart Disease Mortality, US Dept of Health, Education and Welfare, (DHEW Pub. No. (NIH) 79-1610) Bethesda, 1979.
10. Taylor HL, Romo M, Jacobs DR, Blackburn H: Secular changes in coronary heart disease risk factors. Circulation 1975; 52 (Suppl II)II-96, Abst.
11. Walker WJ: Changing United States life-style and declining vascular mortality: cause or coincidence? N Engl J Med 1977; 297:163–165.
12. Beaglehole R, LaRosa JC, Heis G, *et al*: Serum cholesterol, diet, and the decline in coronary heart disease mortality. Prev Med 1979; 8:538–547.
13. Rosenthal SR: Studies in atherosclerosis: chemical, experimental and morphologic. Arch Path 1934; 18:473–506, 660–698, and 827–842.
14. Katz LN, Stamler J: Experimental Atherosclerosis. Springfield, IL: Charles C Thomas, 1953.
15. Malmros HC: The relation of nutrition to health: a statistical study of the effect of the war-time on arteriosclerosis, cardiosclerosis, tuberculosis and diabetes. Acta Med Scan 1950; 246 (Suppl):137–153.
16. Strom A, Jensen RA: Mortality from circulatory disease in Norway, 1940–1945. Lancet 1951; 1:174–196.

17. Dwyer T, Hetzel BS: A comparison of trends of coronary heart disease mortality in Australia, USA and England and Wales with reference to three major risk factors–hypertension, cigarette smoking and diet. Inter J Epidemiol 1980; 9:65–71.
18. Kornitzer M, De Backer G, Dramaix M, Thilly C: Regional differences in risk factor distributions, food habits and coronary heart disease mortality and morbidity in Belgium. Inter J Epidemiol 1979; 8:23–31.
19. Soltero I, Cooper R: Improved hypertension control and decline in cardiovascular mortality. Comp Ther 1980; 6:60–65.
20. Cooper R, Stamler J, Dyer A, Garside D: The decline in mortality from coronary heart disease, USA, 1968–1975. J Chron Dis 1978; 31:709–720.
21. Cooper R: Cardiovascular mortality among Blacks, hypertension control and the Reagan budget. J Nat Med Assoc 1981; 73:1019–1020.
22. Cooper R: Rising death rates in the Soviet Union: the impact of coronary heart disease. N Engl J Med 1981; 304:1259–1265.
23. Dutton J Jr: Changes in Soviet mortality patterns, 1959–77. Population and Development Review 1979; 5:267–291.
24. Vallin J, Chesnai J-C: Evolution recente de la mortalite en Europe, dan les pays Anglo-Saxons et en Union Sovietique: 1960–1970. Population 1974; 29:861–898.
25. Dutton J Jr: Causes of adult Soviet mortality increase. Soviet Studies, in press.
26. Knaus WA; Inside Russian Medicine: An American Doctor's First-hand Report. New York: Everest House, 1981.
27. Chazov EI, Vikhert AM, Metelitsa VI: Epidemiology of ischemic heart disease. Cardiology 1972; 8:134–146 (Russian).
28. Bystrova VA, Ignatieva RK: Lethality from cardiovascular diseases in the USSR. Ther Arch 1974; 6:58–64 (Russian).
29. Naseleniye SSSR 1973, Moskva: Statistika. Population of the USSR, Statistical Collection, Moscow: Statistika, 1975, p. 146.
30. Glazunov IS, Arnov DM, Drombian YG, Krylova EA: Ischemic heart disease and occupation. Cor Vasa 1964; 4:274–280.
31. Mazur NA: Report from Union of Soviet Socialist Republics. Cardiovascular Epidemiology Newsletter, Council on Epidemiology, American Heart Association, Dallas, Tx 1979; 26:25–35.
32. Myasnikov AL: Atherosclerosis. US Govt Printing Office, Washington, DC, 1962 (Translated from Russian).
33. Kuraeff I, Haltaev NG (eds): Collaborative US-USSR study on the prevalence of dyslipoproteinemias and ischemic heart disease in American and Soviet populations. Amer J Cardiol 1977; 49:260–265.
34. Preimate E Ya: Incidence of ischaemic heart disease and certain factors of risk in the male population of Riga. Cardiology 1972; 12:48–53 (Russian).
35. Vikhert AM, Zhdanov VA: The Effects of Various Diseases on the Development of Atherosclerosis. Oxford, England: Pergamon Press, 1981.
36. Akhmeteli MA: The Union of the Soviet Socialist Republics. Cardiovascular Epidemiology Newsletter, Council on Epidemiology, American Heart Association, Dallas, Tx 1981; 30:121–143.
37. Lamm G: The cardiovascular disease programme of WHO/EURO: a critical review of its first 12 years. Euro Heart J 1981; 2:269–280.
38. Food Balance Sheets, Food and Agricultural Organization, Rome. 1966 and 1977.
39. Prospects for Soviet Agricultural Production in 1980 and 1985, Organization for Economic Co-operation and Development, Paris, 1979.
40. Byington, Dyer AR, Garside, *et al*: Recent trends of major coronary risk factors and CHD mortality in the United States and other industrialized countries. *In*: Havlik RJ, Feinleib M (eds): Proceedings of the Conference on the Decline in Coronary Heart Disease Mortality, US Dept of Health, Education and Welfare, (NIH Pub. No. 79-1610) Bethesda, 1979.
41. Tobacco—Hazards to Health and Human Reproduction. Population Reports, Series L, No. 1, March 1979, Population Information Program, Johns Hopkins University, Hampton House, 624 N. Broadway, Baltimore, MD.
42. Lee PN (ed): Tobacco consumption in various countries, 4th Edition, London: Tobacco Research Council, 1975 (Research Paper No. 6).
43. Anti-smoking campaign in the USSR. Lancet 1978; 2:328.
44. USSR Facts and Figures Annual; Vol 4, 1980. Gulf Breeze, FL: Academic International Press, 1980.
45. Treml VG: Production and consumption of alcoholic beverages in the USSR. Journal of Studies on Alcohol 1975; 36:285–320.
46. Keller M, Gurioli C: Statistics on Consumption of Alcohol and on Alcoholism. New Brunswick, NJ: Rutgers Center of Alcohol Studies, 1976.
47. Vestnik Statistiki, 1969, #2, pp 89–92; V.S., 1970, #6, pp 91–95; V.S., 1971, #2, pp 91–94,; V.S. 1971, #12, pp 81–85; V.S., 1973, #12, pp 80–83.
48. Stamler J: Primary prevention of coronary heart disease: the last 20 years. Am J Cardiol 1981; 47:722–735.
49. Arteriosclerosis, Vol. I, Report of the Working Group on Arteriosclerosis of the National, Heart, Lung and Blood Institute. Dept of Health and Human Services (NIH Pub. No. 81-2034) Bethesda, 1981.
50. Ovcarov VK, Bystorva VA: Present trends in mortality in the age group 35–64 in selected developed countries between 1950 and 1973. World Health Stat Quart 1978; 31:208–337.
51. Keys A, Anderson JT, Grande F: Serum cholesterol response to changes in the diet. 1–5. Metabolism 1965; 14:747–787.
52. Chazov EI (ed): Myocardial Infarction. Moscow: MIR Publishers, 1976.
53. Smulevich VB: Outline of lung cancer epidemiology in the USSR. *In*: Levin DL (ed): Cancer Epidemiology in the USA and USSR, US Dept of Health and Human Services, (NIH Pub. No. 80-2044), Bethesda, Md 1980.
54. Olenikov SP, Glazunov IS, Chaizova LV; Smoking among men and women of various age groups. Therp Arch 1981; 14:111–115 (Russian).
55. Chazov LV, Okeinikov SP, Shishova AM: Study of multifactor prevention of coronary heart disease in a free population. Cardiovascular Epidemiology Newsletter, Council on Epidemiology, American Heart Association, Dallas, Tx 1981; 30:140–141.
56. Tyroler HA, Glasunov IS, Deev AD, *et al*: A comparison of high blood pressure prevalence and treatment status in selected US and USSR populations. First Joint US-USSR Symposium on Hypertension, US DHEW, NIH, (DHEW Pub. No. 79-1272) Bethesda, 1979.
57. Glasunov IS, Chazov AA, Alexandrov R, *et al*: Further population studies on hypertension in the USSR. Hypertension in the USA and the USSR; Basic, Clinical and Population Research. Secon USA-USSR Joint Symposium, May 14–16, 1979. National Institutes of Health (NIH Pub. No. 80-2016) Bethesda, 1980.
58. Dyer A, Stamler J, Paul O, *et al*: Alcohol consumption, cardiovascular risk factors, and mortality in two Chicago epidemiologic studies. Circulation 1977; 56:1067–1074.
59. La Portes RE, Cresanta, JL, Kuller LH: The relationship of alcohol consumption to atherosclerotic heart disease. Prev Med 1980; 9:22–40.
60. Dyer A, Stamler J, Paul O, *et al*: Alcohol consumption and 17-year mortality in the Chicago Western Electric Company Study. Prev Med 1980; 9:78–80.
61. Vikhert AM, Sedov KR, Sokovolova RI: Comparative characteristics of aortic and coronary atherocalcinosis found in populations of Irkutsk, Kharkov, Baltic Repubics and Middle Asia, Cor Vasa 1970; 12:12–26.
62. Vikhert JA, Atherosclerosis in the Soviet Union. Athero Rev 1979; 5:183–241.
63. Soviet Almanac, New York: Harcourt, Brace and Jovanovich, 1980.
64. Millar J; The ABC's of Soviet Socialism. Champaign, IL: University of Illinois Press, 1981.

65. Proceedings of the First US-USSR Lipoprotein Symposium, Leningrad, May, 1981. Office of International Programs, National Heart, Lung and Blood Institute, Bethesda, MD (in press 1982).
66. Schettler G: Cardiovascular diseases during and after World War II: a comparison of Federal Republic of Germany with other European countries. Prev Med 1979; 8:581–590.
67. Armstrong BK, Mann JI, Adelstein AM, Eskin F: Commodity consumption and ischaemic heart disease mortality with special reference to dietary practices. J Chron Dis 1975; 28:455–469.
68. Kurtzke JF: Epidemiology of cerebrovascular disease. Cerebrovascular Survey Report for Joint Council Subcommittee on Cerebrovascular Disease, National Institute of Neurological and Communicative Disorders and Stroke, National Heart and Lung Institute, (Revised). Rochester, MN: Whiting Press, Jan 1976.
69. Soltero I, Liu K, Cooper R, *et al*: Trends in mortality from cerebrovascular diseases in the United States, 1960 to 1975. Stroke 1978; 9:550–558.
70. Moriyama I, Krueger DE, Stamler J: Cardiovascular Diseases in the United States. Cambrdige MA: Harvard University Press, 1971.
71. Cooper R, Steinhauer M, Miller, *et al*: Racism, society and disease; an exploration of the social and biological mechanisms of differential mortality. Inter J Health Services 1981; 11:389–414.
72. Seedat YK, Seedat MA, Njomo MN: The prevalence of hypertension in the urban Zulu. South African Med J 1978; 53:923–927.
73. Ueshima H, Tanigaki M, Ida M, *et al*. Hypertension, salt and potassium. Lancet 1981; I:504.
74. AI Smirnov, Deputy Chief, Statistics Bureau for Social Problems and Population, News Conference, Moscow, June 20, 1981, Population, Gosplan, USSR, quoted in New York Times, June 21, 1981.
75. Klatsky AL, Friedman GD, Siegelaub AB: Alcohol and mortality: a ten year Kaiser-Permanente experience. Ann Inter Med 1981; 95:139–145.
76. Field M: Soviet Socialized Medicine; An Introduction. New York: The Free Press 1967.
77. Anitschkow N: Experimental arteriosclerosis in animals. *In*: Cowdry EV (ed): Arteriosclerosis. New York: Macmillan, 1933.
78. Muller JE: Diagnosis of myocardial infarction: historical notes from the Soviet Union and the United States. Amer J Cardiol 1977; 40:269–271.
79. Mazur NA: Approaches to prophylaxis of the cardiovascular system diseases. Ther Arch 1979; 1:6–9 (Russian).
80. Khaltaev NG: Specific features of nutrition as a risk factor of ischemic heart disease. Ther Arch 1976; 6:142–148 (Russian).
81. Leren P: The Oslo programme of the prevention of coronary heart disease. Ther Arch 1974; 6:30–39 (Russian).
82. Keys A: Primary prevention of coronary heart disease. Ther Arch 1975; 5:95–107 (Russian).
83. Carr EH: Socialism in One Country. New York: Macmillan, 1962.
84. Davis C, Feshbach M: Rising Infant Mortality in the USSR in the 1970s. International Population Reports, Series P-95, No. 74, US Bureau of the Census, Washington, DC 1980.
85. Denton EM: Soviet consumer policy: trends and prospects. *In*: Soviet Economy in a Time of Change. Joint Economic Committee, US Congress of the United States, Govt Printing Office, Washington, DC, 1979.
86. Bushnell J: The "New Soviet Man" turns pessimist. *In*: Cohen SF, Rabinowitch A, Sharlet R (eds): The Soviet Union since Stalin. Bloomington, IN: Indiana University Press, 1980.
87. For example; "Per capita meat consumption has become the primary symbol of agricultural success in the USSR", James R. Millar; Post-Stalin agriculture and its future. *In*: Cohen ST, Rabinowitch A, Sharlet R (eds): The Soviet Union since Stalin. Bloomington, IN: Indiana University Press, 1980, pg 139; "A primary plank of the consumer program (in the USSR) has been the promise to improve diets, especially by way of expanding meat output." Denton EM: Soviet consumer policy: trends and prospects. *In*: Soviet Economy in a Time of Change. Joint Economic Committee, Congress of the United States, Washington, DC, 1979, pg 762.
88. Carey DW; Soviet agriculture: recent performance and future plans. *In*: Soviet Economy in a New Perspective. Joint Economic Committee of the Congress of the United States, Govt Printing Office, Washington, DC, 1976, pg. 599.
89. Sigerist H: Socialized Medicine in the USSR. New York: W. W. Norton and Company, Inc., 1937.
90. Navarro V: Social Security and Medicine in the USSR. Lexington, MA: D.C. Heath and Company 1977.
91. Gregory PR, Stuart RC: Soviet Economic Structure and Performance. New York: Harper and Row, Publishers, 1974.
92. Semashko NA: Selected Works. Moscow: Meditsina, 2nd Edition, 1967
93. Field MG: Health as a "public utility" or the "maintenance of capacity" in Soviet society. *In*: Field MG (ed): Social Consequences of Modernization in Communist Societies. Baltimore: The Johns Hopkins University Press, 1976, pp 234–262.
94. A similar case has been argued in relation to environmental pollution. "Environmental laws . . . are largely ignored. In general, development and production have first priority . . . Developers and manufacturers are under constant pressure to meet quotas and deadlines . . (and) . . . they usually find environmental measures too costly. . ." Ehrlich A (Book review): The Destruction of Nature in the Soviet Union, by Boris Komarov, Bulletin Atomic Scientists Nov, 1981; pp 42, 43.
95. Bettelheim C: Class Struggles in the USSR: First Period, 1917–1922. New York: Monthly Review Press, 1976.
96. Bettelheim C: Class Struggles in the USSR: Second Period, 1923–1929. New York: Monthly Review Press, 1978.
97. Dijlas M: The New Class. New York: Holt, Rinehart and Winston, 1974.
98. Nove A: Is there a ruling class in the USSR? Soviet Studies 1975; 27:615–638.
99. How the Soviet Revisionists Carry Out All Round Restoration of Capitalism in the USSR. Peking: Foreign Languages Publishing House, 1968.
100. Singer D: The Road to Gdansk: Poland and the USSR. New York: Monthly Review Press, 1981.
101. Bland W: The Restoration of Capitalism in the Soviet Union. Selected Editions. United Kingdom: Wembley, 1980.
102. Rakovski M: Towards an East European Marxism. London: Allison and Busby, 1978.
103. Soviet Capitalism. Progressive Labor Magazine, Spring 1981; 14:1.
104. Cliff T: State Capitalism in Russia. London: Pluto Press, 1974.
105. Nicolaus M: Restoration of Capitalism in the USSR. Chicago, IL: Liberator Press, 1975.
106. Cooper R, Schatzkin A: The pattern of mass disease in the USSR: a product of socialist or capitalist development? Int J Health Serv.
107. Cooper R: Rising death rates in the Soviet Union. (Correspondence) N Engl J Med 1981; 305:698,9.

ACKNOWLEDGMENTS

We would like to acknowledge the assistance of Dorothy Moss in the preparation of the food disappearance data. We are further indebted to other members of the International Committee Against Racism for critical discussion and assistance in research. This paper is based in part on material presented at the 109th annual meeting of the American Public Health Association, Los Angeles, CA, November, 1981.