

# MORTALITY FROM CARDIOVASCULAR DISEASES IN VARIOUS COUNTRIES, WITH SPECIAL REFERENCE TO ATHEROSCLEROTIC HEART DISEASE

## A Preliminary Analysis \*

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### SYNOPSIS

Data on cardiovascular mortality, by sex and age, in selected countries were analysed for the purpose of demonstrating geographical variations.

In accordance with the system adopted in the *International Statistical Classification of Diseases, Injuries, and Causes of Death*, causes were divided into four groups: (1) arteriosclerotic and degenerative heart disease; (2) vascular lesions affecting the central nervous system; (3) other diseases of the heart; and (4) certain other diseases of the circulatory system.

The discrepancies noted point to the need for a thorough investigation of the underlying causes of cardiovascular deaths in order to promote comparability of recording and classification.

Limited data on mortality from cardiovascular diseases, including atherosclerosis, in various countries of the world<sup>1</sup> are presented in this introductory study of geographical variations in such mortality. The groups of causes studied were restricted to those included in the Abbreviated List of 50 Causes for Tabulation of Mortality,<sup>2</sup> as follows :

<i>Cause group</i>	<i>Detailed List numbers</i>	<i>Group</i>
Vascular lesions affecting central nervous system	330-334	B22
Rheumatic fever	400-402	B24
Chronic rheumatic heart disease	410-416	B25
Arteriosclerotic and degenerative heart disease	420-422	B26
Other diseases of heart	430-434	B27
Hypertension with heart disease	440-443	B28
Hypertension without mention of heart	444-447	B29

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<sup>1</sup> Taken from: World Health Organization (1957) *Annual Epidemiological and Vital Statistics, 1954*, Geneva

<sup>2</sup> See: World Health Organization (1948) *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death. Sixth Revision* ... Geneva, p. 361.

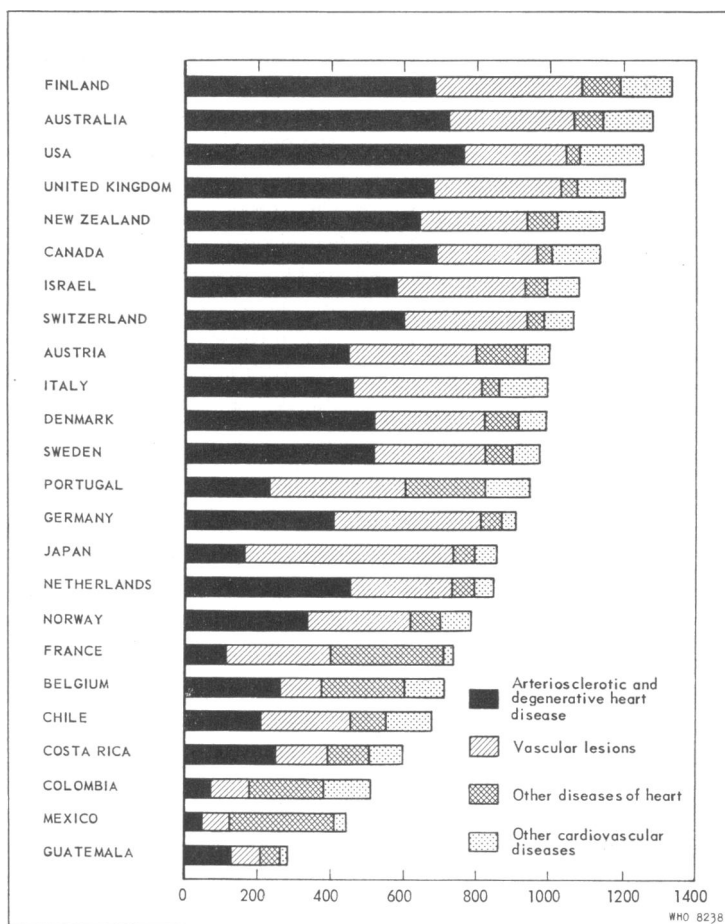
In addition to the diseases classified under Detailed List numbers 330-334 and 400-447, diseases of the circulatory system also include diseases of the arteries (450-456) and diseases of the veins and other diseases of the circulatory system (460-468) for which no provision has been made in the Abbreviated List tabulation. Such information could be obtained only from the published reports of the countries concerned or through a request to national offices. The number of deaths in these latter two groups (450-456 and

**TABLE 1. DEATHS FROM CARDIOVASCULAR DISEASES PER 100 000 POPULATION \* IN AGE-GROUP 40 YEARS AND OVER, IN 24 SELECTED COUNTRIES, 1954**

Country	Total cardio-vascular diseases	Arteriosclerotic and degenerative heart disease (B26)	Vascular lesions affecting central nervous system (B22)	Other diseases of heart (B27)	Other cardiovascular diseases (B24, B25, B28, B29)
Finland	1332.0	682.4	403.7	104.3	141.6
Australia	1280.4	716.9	351.0	75.8	136.8
USA	1254.8	762.3	284.9	33.9	173.7
United Kingdom	1206.1	678.0	353.4	41.7	133.0
New Zealand	1148.8	637.0	298.4	83.3	130.1
Canada	1134.9	683.9	281.1	36.4	133.5
Israel	1081.5	578.9	357.6	61.6	83.4
Switzerland	1067.9	596.8	339.4	48.8	82.9
Austria	996.1	444.2	353.8	129.4	68.6
Italy	994.7	459.3	361.4	40.6	133.3
Denmark	930.0	513.8	308.3	87.6	80.3
Sweden	974.8	515.5	312.6	72.5	74.2
Portugal	947.9	227.4	374.2	221.0	125.3
Germany	908.3	404.0	405.1	58.0	41.2
Japan	857.0	157.4	579.4	58.8	61.4
Netherlands	847.0	450.4	284.9	55.9	55.8
Norway	786.6	328.6	289.9	82.4	86.7
France	733.5	110.2	290.7	309.0	23.7
Belgium	707.1	255.0	123.0	224.9	104.1
Chile	676.9	200.7	251.2	99.9	125.0
Costa Rica	594.9	242.1	150.3	106.0	96.4
Colombia	510.5	65.6	110.6	205.5	128.8
Mexico	441.2	38.9	80.5	286.6	35.2
Guatemala	281.7	118.4	85.8	56.1	21.3

\* Rates adjusted by direct method to the age and sex distribution of the population of the USA in 1954.

**FIG. 1. DEATHS FROM CARDIOVASCULAR DISEASES, PER 100 000 POPULATION, IN AGE-GROUP 40 YEARS AND OVER, IN 24 SELECTED COUNTRIES, 1954**



Rates adjusted to the age and sex distribution of the population of the USA in 1954

460-468) is usually small; in 1954 in the USA, such deaths represented only about 5% of deaths from diseases of the cardiovascular system.

Great variation exists in death-rates for cardiovascular diseases<sup>1</sup> in the 24 countries of the world for which mortality and population figures by age-group are available. The death-rates for this group of causes in populations of 40 years and over are listed in Table 1 and presented diagrammatically in Fig. 1. These rates have been adjusted by the direct method to the age

<sup>1</sup> The term cardiovascular disease will be used for the remainder of this report to denote those diseases which are classified under Detailed List numbers 330-334 and 400-447. It is regretted that data were not available for diseases of the arteries and other diseases of the circulatory system (450-468), which should be included.

and sex distribution of the population of the USA in 1954. Causes have been divided into groups—namely, (1) arteriosclerotic and degenerative heart disease (420-422); (2) vascular lesions affecting the central nervous system (330-334); (3) other diseases of the heart (430-434) and (4) certain other diseases of the circulatory system (400-416, 440-447).

In the 12 countries with the highest cardiovascular death-rates, although such rates varied from 975 to 1332 per 100 000 population, in general the distribution of mortality in the four major groups was similar. In all except two instances, more than half of the deaths, after adjustment for age had been made, were found to be due to arteriosclerotic and degenerative heart disease. Within this group,<sup>1</sup> in the USA and Canada, over three-quarters of the deaths were caused by arteriosclerotic heart disease (420),<sup>2</sup> while in others the proportion was much lower, many of these deaths being attributed to other myocardial degeneration (422). In addition, between one-quarter and two-fifths of the cardiovascular mortality was due to vascular lesions affecting the central nervous system.

In the 12 countries where the total cardiovascular death-rates were lower, the marked variation in the distribution of such death-rates in the four major cause groups is noteworthy. In all these countries—with the exception of the Netherlands—less than half of the mortality was attributed to arteriosclerotic and degenerative heart disease, and in several—namely, Portugal, Japan, France, Colombia and Mexico—the proportion of the deaths attributed to this group of diseases, as well as the death-rates pertaining to it, was very low. In France, where only 15% of the cardiovascular mortality was reported to be due to arteriosclerotic and degenerative heart disease, 42% was due to group (3)—other diseases of the heart. In Belgium, the proportion of the deaths due to arteriosclerotic and degenerative heart disease (36%) was relatively higher than in France, but the proportion due to other diseases of the heart was likewise high. In Japan, over two-thirds of the cardiovascular disease mortality was due to vascular lesions. In the countries with the lowest death-rates for cardiovascular diseases, all of which are in Latin America, such rates are undoubtedly affected by the lack of medical facilities and incompleteness of registration. Especially in rural areas in Colombia, Mexico and Guatemala, facilities for the diagnosis of cardiovascular conditions are limited and many deaths are assigned to ill-defined causes. However, in these countries the extent and severity of arteriosclerosis may be less than in the USA according to recent evidence.<sup>3</sup>

The underlying causes of these differences should be ascertained; they may be due essentially to differences in the amount of cardiovascular disease and of arteriosclerosis in the population and in the deaths resulting from

<sup>1</sup> As shown in: World Health Organization (1956) *Epidem. vital Statist. Rep.*, 9, No. 10.

<sup>2</sup> The term arteriosclerotic heart disease (420) is used synonymously with coronary heart disease.

<sup>3</sup> Tejada, V. C. & Gore, I. (1957) *Amer. J. Path.*, 33, 887.

cardiovascular diseases, or to discrepancies between the terminology used in stating causes of death and the classification of such causes in the *International Classification of Diseases (op. cit.)*, or to a combination of these factors. For instance, in France the high proportion of deaths classified under Detailed List numbers 430-434 is related to the use of terms at present classified under Detailed List number 434 (other and unspecified diseases of the heart), such as congestive heart failure, left ventricular failure, cardiac compensation, etc. It is possible that this may also explain the situation in countries where clinical medicine is influenced by the French school, such as Portugal and certain Spanish-speaking countries—Colombia and Mexico, for example—where there is a high proportion of deaths likewise classified under Detailed List numbers 430-434. In a number of cases where this certification is used, it may well refer to arteriosclerotic heart disease. In such countries the importance of arteriosclerosis, as measured by the data on death-rates from cardiovascular disease, would be partly hidden by the terminology in use.

In the case of Japan, where the death-rate for arteriosclerotic heart disease is very low, that for group (3)—other diseases of heart—is also low, whereas mortality from vascular diseases is very high. The low death-rates may be due to a low incidence of arteriosclerosis. However, it is necessary to clarify whether the very high rate of deaths from vascular diseases corresponds to the actual situation, or whether the certification of these deaths is also possibly the result of a difference in the terminology used.

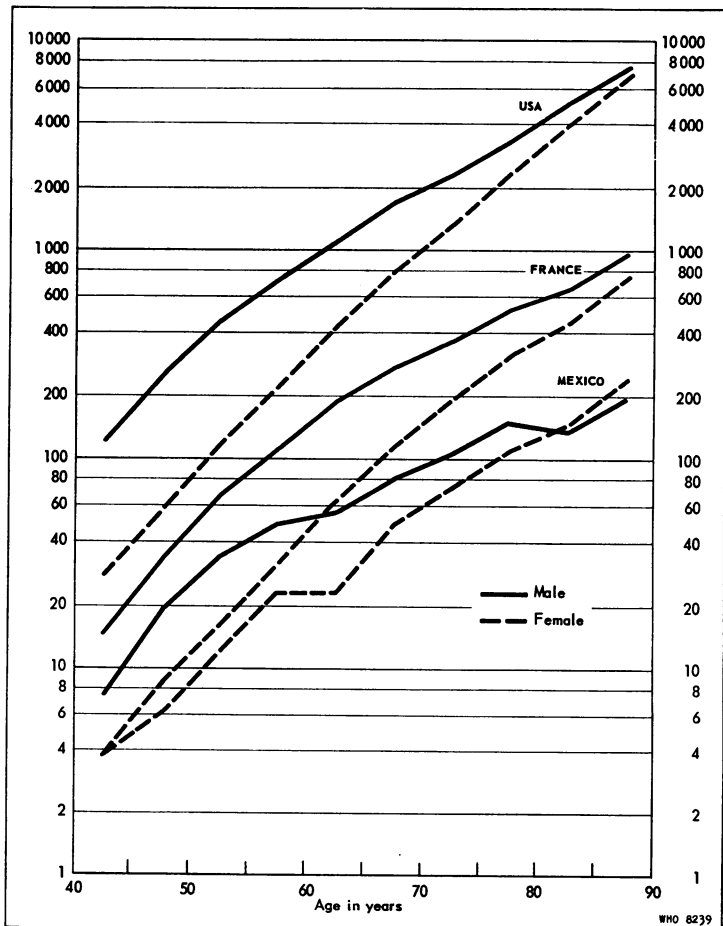
**TABLE 2. DEATHS FROM ARTERIOSCLEROTIC AND DEGENERATIVE HEART DISEASE (B26), PER 100 000 POPULATION, BY SEX AND AGE, IN THE USA, FRANCE AND MEXICO, 1954**

Age-group (years)	USA		France		Mexico	
	male	female	male	female	male	female
Total 40 and over	966.6	569.1	151.4	91.1	40.8	25.0
40-44	120.9	27.3	14.7	3.7	7.3	3.7
45-49	251.7	56.5	33.8	8.2	18.4	6.0
50-54	450.6	118.3	67.7	15.6	33.0	12.0
55-59	704.7	213.1	109.9	30.9	48.5	22.7
60-64	1095.7	420.4	184.1	62.2	54.5	23.2
65-69	1642.4	797.1	273.3	113.5	80.2	49.0
70-74	2242.6	1297.5	363.7	188.3	105.3	72.9
75-79	3332.7	2301.6	503.8	303.1	149.3	109.5
80-84	4938.5	3881.4	631.5	436.2	132.6	143.8
85 and over	6991.4	6535.0	988.9	719.9	196.2	234.2

Some of the causes listed under this group of vascular diseases—such as, for example, cerebral embolism and thrombosis—may be the result of arteriosclerosis. It would be important to study the method of certification of these deaths in order to find out to what extent arteriosclerosis is the underlying cause of deaths assigned to vascular disease in Japan, and why the death-rates for arteriosclerotic heart conditions are low.

The difficulties inherent in the interpretation of these differences all indicate the need for an investigation of the underlying causes as well as for the attainment of comparability in mortality statistics on cardiovascular disease. A careful analysis of the terms used and of the underlying causes

**FIG. 2. DEATHS FROM ARTERIOSCLEROTIC AND DEGENERATIVE HEART DISEASE (B26), PER 100 000 POPULATION, BY SEX AND AGE, IN THE USA, FRANCE AND MEXICO, 1954**

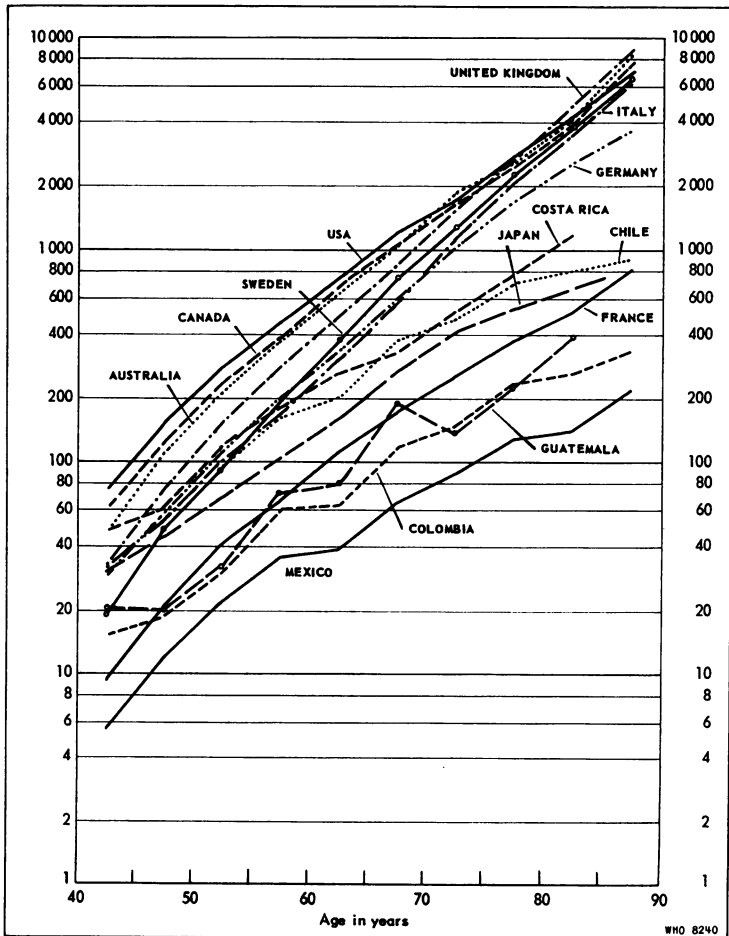


**TABLE 3. DEATHS FROM ARTERIOSCLEROTIC AND DEGENERATIVE HEART DISEASE (B26) PER 100 000 POPULATION, BY AGE, IN 14 SELECTED COUNTRIES, 1954**

Country	40 years and over *	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85 and over
USA	762.3	73.1	153.1	282.5	454.5	751.0	1206.9	1737.6	2771.2	4348.4	6715.4
Australia	716.9	45.7	105.1	211.1	369.1	626.7	1054.5	1763.0	2649.7	4320.6	8077.6
Canada	683.9	59.4	121.3	238.3	385.4	679.4	1056.3	1654.5	2481.9	3907.9	7242.0
United Kingdom	678.0	33.0	73.0	154.1	273.0	494.3	873.5	1541.3	2727.3	4851.2	8728.1
Sweden	515.5	19.0	47.7	94.5	196.3	380.0	712.6	1276.9	2258.8	3902.3	6316.5
Italy	459.3	24.1	50.6	97.3	163.8	308.7	581.8	1115.4	2046.3	3426.2	5999.3
Germany	404.0	29.6	57.5	115.5	205.6	339.9	589.3	1027.1	1693.1	2525.2	3532.1
Costa Rica	242.1	45.7	59.1	115.8	178.1	258.0	325.5	493.5	699.0	1145.5	891.8
Chile	200.7	31.6	50.8	97.1	162.5	200.7	372.2	477.1	534.0	787.1	725.9
Japan	157.4	30.2	44.5	67.5	102.5	161.1	264.3	403.9	377.9	377.9	801.9
Guatemala	118.4	20.0	20.0	30.8	68.5	77.2	185.8	132.9	380.5	506.7	801.9
France	110.2	9.1	20.9	41.2	66.8	112.1	178.1	256.3	230.4	256.2	327.8
Colombia	65.6	15.1	18.4	30.1	58.8	61.9	114.1	146.0	128.9	138.8	217.5
Mexico	38.9	5.5	12.1	22.3	35.5	38.2	64.3	88.2			

\* Rates adjusted by direct method to the age and sex distribution of the population of the USA in 1954.

**FIG. 3. DEATHS FROM ARTERIOSCLEROTIC AND DEGENERATIVE HEART DISEASE (B26), PER 100 000 POPULATION, BY AGE, IN SELECTED COUNTRIES, 1954**



is required in several countries, in order to promote comparable recording and classification of causes of death.

The mortality from arteriosclerotic and degenerative heart disease has been further analysed by age and sex (Table 2). The death-rates by 5-year age-groups for 40 years and over are plotted in Fig. 2 on a semi-logarithmic grid, for relative differences and changes with age are best shown in this way. These differences by age and sex are illustrated for a country with very high rates (USA), for a country in the middle group (France) and for a country with low rates (Mexico). In the USA and France the death-rate for males in the age-group 40-49 years was about four times as high as that for females



in the same age-group. However, the difference decreased until, in the age-group 85 years and over, the male death-rates were only slightly higher than the female rates. In addition to the sex variation already noted, there appeared to be a continuous marked increase with age in the rates in the country with the highest rate (USA), while a lesser increase with age was noticeable in the country with very low rates (Mexico).

The total death-rates for the arteriosclerotic and degenerative heart diseases are also shown by 5-year age-groups for 40 years and over in 14 selected countries (see Table 3 and Fig. 3). The wide range in these rates throughout this age-span are clearly evidenced. For the first 5-year age-group (40-44 years), the rates varied from 6 to 73 per 100 000 population. However, for the oldest age-group, the range was even greater—namely, from 218 to 8728. Although factors such as terminology, classification and completeness of registration must be considered, in general the increase with age was greater in those countries with higher rates than in those with lower rates.

In summary, this limited study of mortality has been made principally to demonstrate existing variations in several countries of the world. It serves to stress the need for improvement in the quality of the basic data, for investigation of the underlying causes of death, and for obtaining comparability in classification.

## RÉSUMÉ

Les données statistiques relatives à la mortalité par maladies cardiovasculaires, par âge et sexe, ont été analysées, en vue de mettre en évidence d'éventuelles variations géographiques.

Conformément au *Manuel de Classement international des maladies, traumatismes et causes de décès*, les causes ont été réparties en 4 groupes: 1) artériosclérose des coronaires et myocardite dégénérative; 2) lésions vasculaires affectant le système nerveux central; 3) autres maladies du cœur; 4) certaines autres maladies du système circulatoire (cardiopathie rhumatismale chronique, hypertension).

Dans 12 pays ayant le taux le plus élevé de mortalité par ces causes (taux variant entre 975 et 1332 par 100 000 habitants), la répartition entre les 4 groupes était à peu près la même d'un pays à l'autre. Dans tous sauf deux, les causes du groupe 1 étaient responsables de plus de la moitié des décès. Aux Etats-Unis et au Canada, plus de 3/4 des décès étaient dus à l'artériosclérose des coronaires, alors que dans d'autres pays, cette proportion était beaucoup plus faible. En outre, 1/4-2/5 de la mortalité par lésions cardiovasculaires était représentés par des lésions affectant le système nerveux central. Dans les 12 pays où la mortalité par maladies cardiovasculaires est la plus basse, la répartition entre les 4 groupes varie beaucoup. Dans ces pays — sauf les Pays-Bas — moins de la moitié de la mortalité était attribuée aux causes du groupe 1. En France, 15% seulement de la mortalité cardiovasculaire est attribuée au groupe 1, 42% au groupe 3. Au Japon, plus de 2/3 de la mortalité est considérée comme provenant de lésions vasculaires. Dans les pays de l'Amérique latine en particulier, le taux de mortalité par toutes ces causes, qui est plus bas que celui des autres pays considérés, peut s'expliquer en partie par l'in-

suffisance du diagnostic et les déclarations incomplètes. Il semble toutefois que ces maladies y soient nettement moins fréquentes qu'aux Etats-Unis et au Canada.

Il se peut que ces différences expriment un état de fait. Il est possible aussi qu'elles résultent d'un manque d'uniformité dans la terminologie. Il est probable, par exemple, que, dans divers pays suivant l'école française, on a classé dans le groupe 3 ou sous « maladies du cœur autres ou sans précision » des décès dus en réalité à des causes du groupe 1. Au Japon, se pose un problème du même ordre.

L'interprétation difficile de ces données fait ressortir la nécessité de préciser avec plus de soin la cause initiale de décès, afin que l'on obtienne des statistiques comparables.