

Chapter 10

Risk of Cardiovascular Disease

Cardiovascular diseases (CVDs) refer to a broad spectrum of diseases that affects the heart and blood vessels. CVDs include coronary heart disease (CHD), such as angina and myocardial infarction (commonly known as heart attack), stroke, heart failure, hypertensive heart disease, rheumatic heart disease, cardiomyopathy, heart arrhythmia, congenital heart disease, valvular heart disease, carditis, aortic aneurysms, peripheral artery disease and venous thrombosis. Heart diseases and cerebrovascular disease are the third and fourth leading causes of death in Hong Kong respectively. Smoking, hypertension, diabetes mellitus and raised blood cholesterol are well-known risk factors for CVD.

Risk prediction models were developed to quantify the risks of CVD over the next 10 years. CVD risk prediction is important for prevention of CVD events because it enables the health professionals in primary health care to identify individuals in the community who are at high-risk of CVD to treat their risk factors early, such as high blood pressure and high blood lipids, increase their health awareness and, if necessary, refer them for appropriate treatment. This approach will improve the efficiency of primary prevention strategies. Up to date, there is no CVD risk prediction model developed specifically for the general population in Hong Kong. In this survey, we adopted the widely used Framingham risk model for general CVD risks¹ to predict the risk of CVD over the next 10 years in the general adult population aged 30-74. However, as with other models, the Framingham risk model has its strengths and limitations and results of predicted risks from this model need to be interpreted with caution.

Snapshot of Population's Risk of Cardiovascular Disease (CVD) (for persons aged 30 to 74)

Indicator	Female	Male	Overall
CVD risk † \geq 20% over the next 10 years predicted by the Framingham risk model *	5.1%	29.1%	16.4%

Notes: † CVD events include coronary heart diseases (CHD), such as angina and myocardial infarction, stroke, peripheral artery disease and heart failure.

* All respondents aged 30 - 74 who had participated in the health examination.

10.1 Risk of Cardiovascular Disease over 10 Years Predicted by Framingham Risk Model

The Framingham Heart Study developed several risk models to predict the risk of cardiovascular events. The most updated model developed from the Framingham Heart Study Cohort was the Framingham model published in 2008 to predict the CVD risks in general population over the next 10 years for use in primary care¹. The cardiovascular outcomes included coronary heart disease (CHD), stroke, peripheral artery disease or heart failure and the updated risk model adjusted for patients already on antihypertensive therapy. Sex-specific multivariable risk functions were derived that incorporated age, habit of smoking, total and high-density lipoprotein cholesterol, systolic blood pressure, treatment for hypertension and diabetes status.

The Framingham risk model was developed in a cohort of general population in the United States and Caucasians were dominant in this cohort. Previous risk prediction models developed from the Framingham cohort had been reported to overestimate the CHD risk in Chinese population²⁻⁵. A recent study using a Hong Kong Chinese cohort concluded that the Framingham CVD risk model can be applied to the Chinese population but requires recalibration in men⁶.

Among persons aged 30-74, the mean CVD risk over the next 10 years predicted by the Framingham risk model was 10.6%. That is, on average, there would be 106 persons who would have CVD covered by the Framingham risk model among every 1 000 persons aged 30 to 74 over the next 10 years. The corresponding mean CVD risks for females and males were 6.2% and 15.5% respectively. The mean CVD risks increased with age from 1.5% among females aged 30-44 to 15.7% among females aged 65-74, and from 4.1% among males aged 30-44 to 33.2% among males aged 65-74 (Table 10.1a).

Table 10.1a: Mean Framingham 10-year cardiovascular disease risk among persons aged 30 to 74 by age group and gender

Age group	Female	Male	Total
30 - 44	1.5%	4.1%	2.7%
45 - 54	4.7%	11.7%	8.0%
55 - 64	8.9%	23.0%	15.9%
65 - 74	15.7%	33.2%	24.0%
30 - 74	6.2%	15.5%	10.6%

Base: All respondents aged 30 - 74 who had participated in the health examination.

The risk of cardiovascular events over the next 10 years are classified into low-risk (CVD risk < 10%), medium-risk (CVD risk \geq 10% and < 20%) and high-risk (CVD risk \geq 20%) groups. Among the persons aged 30-74, 16.4% were classified as high-risk, 18.3% medium-risk and 65.4% low-risk according to the Framingham risk model. Analysed by sex, 5.1% of females and 29.1% of males were classified as high-risk. Analysed by age group, the proportion of persons classified as high-risk increased with age in each sex from 0% among females aged 30-44 to 24.0% among females aged 65-74 and from 0.7% among males aged 30-44 to 84.9% among males aged 65-74 (Table 10.1b).

Table 10.1b: Framingham 10-year cardiovascular disease risk level among persons aged 30 to 74 by age group and gender

Age group / Risk level	Female		Male		Total	
	No. of persons ('000)	%	No. of persons ('000)	%	No. of persons ('000)	%
30 - 44						
Low risk	821.0	100.0%	652.7	96.0%	1 473.6	98.2%
Medium risk	-	-	23.0	3.4%	23.0	1.5%
High risk	-	-	4.5	0.7%	4.5	0.3%
Sub-total	821.0	100.0%	680.2	100.0%	1 501.1	100.0%
45 - 54						
Low risk	584.3	92.1%	264.1	48.2%	848.4	71.7%
Medium risk	41.9	6.6%	230.1	42.0%	272.0	23.0%
High risk	8.5	1.3%	54.2	9.9%	62.6	5.3%
Sub-total	634.6	100.0%	548.4	100.0%	1 183.0	100.0%
55 - 64						
Low risk	380.4	70.8%	95.9	18.2%	476.3	44.7%
Medium risk	132.1	24.6%	165.2	31.3%	297.3	27.9%
High risk	25.0	4.7%	267.0	50.6%	292.0	27.4%
Sub-total	537.5	100.0%	528.0	100.0%	1 065.5	100.0%
65 - 74						
Low risk	99.5	27.3%	7.6	2.3%	107.2	15.4%
Medium risk	177.0	48.6%	42.6	12.8%	219.5	31.5%
High risk	87.4	24.0%	282.1	84.9%	369.6	53.1%
Sub-total	363.9	100.0%	332.3	100.0%	696.2	100.0%
30 - 74						
Low risk	1 885.1	80.0%	1 020.3	48.8%	2 905.4	65.4%
Medium risk	351.0	14.9%	460.8	22.1%	811.8	18.3%
High risk	120.9	5.1%	607.8	29.1%	728.7	16.4%
Total	2 357.0	100.0%	2 088.9	100.0%	4 445.9	100.0%

Base: All respondents aged 30 - 74 who had participated in the health examination.

Notes: Definition of cardiovascular disease risk levels over the next 10 years based on the Framingham risk model for CVD risks-

Low risk: CVD risk < 10% over the next 10 years;

Medium risk: CVD risk ≥ 10% and < 20% over the next 10 years; and

High risk: CVD risk ≥ 20% over the next 10 years.

Figures may not add up to the total due to rounding.

Analysed by household income, 36.4% of those with a monthly household income of less than \$5,000 were classified as high-risk, as compared to the corresponding proportion of 10.0% among those with a monthly household income of \$50,000 or above (Table 10.1c).

Table 10.1c: Framingham 10-year cardiovascular disease risk level among persons aged 30 to 74 by monthly household income

	Less than \$5,000		\$5,000 – \$9,999		\$10,000 – \$19,999		\$20,000 – \$29,999		\$30,000 – \$39,999		\$40,000 – \$49,999		\$50,000 or above		Total	
	No. of persons ('000)	%														
Risk level																
Low risk	88.4	38.2%	94.1	40.0%	483.2	66.7%	539.2	65.1%	503.8	63.5%	383.5	69.5%	811.0	75.2%	2 903.3	65.3%
Medium risk	58.8	25.4%	40.8	17.4%	124.1	17.1%	162.6	19.6%	160.0	20.2%	105.7	19.2%	159.8	14.8%	811.8	18.3%
High risk	84.4	36.4%	100.2	42.6%	117.3	16.2%	126.5	15.3%	129.7	16.3%	62.7	11.4%	107.9	10.0%	728.7	16.4%
Total	231.6	100.0%	235.2	100.0%	724.6	100.0%	828.3	100.0%	793.5	100.0%	551.9	100.0%	1 078.7	100.0%	4 443.7	100.0%
Mean risk	18.1%		18.9%		10.6%		10.1%		10.6%		9.9%		8.0%		10.6%	

Base: All respondents aged 30 - 74 who had participated in the health examination and provided the information of monthly household income.

Notes: Definition of cardiovascular disease risk levels over the next 10 years based on the Framingham risk model for CVD risks-

Low risk: CVD risk < 10% over the next 10 years;

Medium risk: CVD risk ≥ 10% and < 20% over the next 10 years; and

High risk: CVD risk ≥ 20% over the next 10 years.

Figures may not add up to the total due to rounding.

References

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