WHO/ISH Cardiovascular Risk Prediction Charts
Strengths and Limitations

Who is the target audience for these charts?
Among the 193 Member States of WHO, all high-income countries have developed cardiovascular risk prediction charts using cohort data from their own populations. They have been refined over the years.

Charts to predict the risk of heart attack or stroke do not exist for 160 WHO Member States. The WHO/ISH risk prediction charts have been developed from best available mortality and risk factor data of these low- and middle-income country (LMIC) populations. They are meant to be used in LMIC, where refined risk prediction charts do not exist.

What is the added value of these charts?
Almost 80% of the global epidemic of cardiovascular disease is already in LMIC. Individual and societal costs of premature deaths and disability and escalating costs of medical care call for urgent measures to prevent and control this epidemic in LMIC.

Pragmatic and feasible approaches are needed to prevent people from getting heart attacks and strokes. Treating risk factors such as blood pressure and blood lipids is one such approach. However, this approach is cost-effective and affordable to most countries, only when targeted at high-risk individuals.

Further, currently individuals are often given drug treatment based on the presence or absence of a single cardiovascular risk facto, such as high blood pressure or high blood lipids. Although this approach appears simple, it can result in committing a patient with only a small cardiovascular risk to many years of drug therapy or, conversely, neglecting to treat those with an overall higher cardiovascular risk.

Why not make the charts more accurate by using more variables?
The charts can have an impact on prevention of heart attacks and stroke, particularly if they can be used by health-workers in primary health care. Health systems in LMIC do not have the basic infrastructure facilities to support resource intensive risk prediction tools, particularly in primary health care. As charts use simple variables, they can be applied even in low resource-settings.
Using the chart, a health worker in PHC can select people at high-risk and, if necessary, refer them for appropriate treatment to the next level of care. Thus, the WHO/ISH risk prediction charts and the accompanying guidelines will improve the effectiveness of cardiovascular risk management, even in settings which do not have sophisticated technology.

**What is their added value?**

Specialist physicians may not need risk prediction charts to broadly categorize the level of risk of a person. In many LMIC settings, non-physician health-workers are the first contact for medical care. A simple tool of this nature will help them to assess the cardiovascular risk of people rapidly, and take appropriate action.

**How have they been developed?**

The charts have been developed using a modelling approach. In brief, a set of individual-level CVD risk factor profiles (age, sex, systolic blood pressure, total cholesterol, and the presence or absence of type -2 diabetes) have been generated using information on the population distribution of these risk factors from the WHO Comparative Risk Assessment study. These risk factor profiles have then been combined with information on the relative risk of each risk factor, along with the population-level estimate of absolute risk. The risks of non-fatal and fatal myocardial infarction and non-fatal and fatal stroke have been modelled and combined to predict the individual risk of coronary heart disease and cerebrovascular disease.

**What are their limitations?**

Due to the paucity of data, charts have been compiled not for individual countries but for 14 WHO epidemiological sub-regions. There are 28 different charts for 14 epidemiological sub-regions of WHO. One set with cholesterol and one set without cholesterol. It is likely that results will be most applicable to the largest country within the region. The accuracy and predictive value of current risk prediction charts need to be improved as more epidemiological data becomes available from individual countries.
*If the charts are not perfect, is it safe to use them?*

Charts are not perfect because of paucity and quality of available data but they are safe for use for the intended purpose of broad risk stratification.

Only five categories of risk are depicted with five colours, four blood pressure categories and five cholesterol categories are shown (as they should not be too complicated for use in the field). Therefore, the charts will not depict minor gradations in risk with precision.

The best available data (not as good as for high-income countries) have been used for developing the charts. This is the best that can be done for LMIC populations for the moment. It is a start. We will be able to refine the charts in the future, once cohort data (hopefully) are available for individual populations.

At present, these charts are necessarily crude but are safe and useful tools for guiding the management and treatment decisions for individuals.

*When can treatment decisions be made without the charts?*

As explained in the WHO guideline, the charts can underestimate the risk in certain categories of people

- Persistent raised blood pressure $\geq 160/100$ mm Hg or
- Blood cholesterol $\geq 8$ mmol/l or
- Established ischemic heart disease, or
- Diabetes with renal disease.

All of them need intensive lifestyle interventions and appropriate drug therapy. They do not need risk stratification using charts for treatment decisions.
**When are the charts useful for stratifying risk?**

Charts are useful for stratifying risk for people with blood pressure <160/100 mm Hg or blood cholesterol < 8 mmol/l or uncomplicated diabetes.

For example, by using the charts, person X and Y who have similar blood pressures and blood cholesterol levels can be correctly assessed for their risk of developing a heart attack or a stroke as follows:

<table>
<thead>
<tr>
<th></th>
<th>Risk factor profile</th>
<th>10 year risk of heart attack or stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male X</td>
<td>SBP 140 mm Hg, TC 7 mmol/l, nonsmoker, no diabetes</td>
<td>10% to &lt;20%</td>
</tr>
<tr>
<td>50 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Y</td>
<td>SBP 140 mm Hg, TC 7 mmol/l smoker, diabetes</td>
<td>≥ 40%</td>
</tr>
<tr>
<td>50 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Person Y needs intensive lifestyle interventions and drug treatment to prevent a heart attack or stroke.

Person X needs lifestyle interventions and may need drug treatment if risk persists at follow up.