# Developing cardiovascular risk prediction models for Australia

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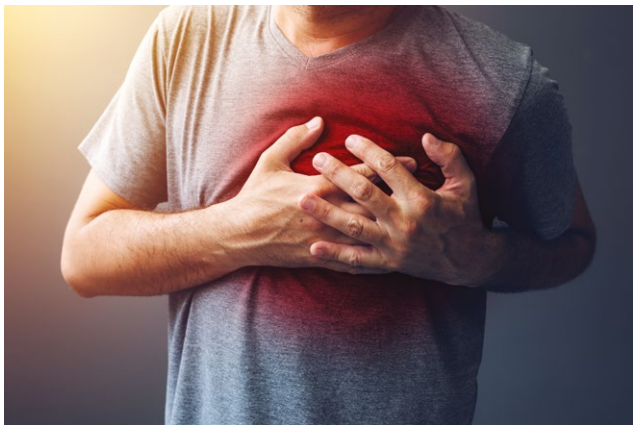
Risk stratification is the best strategy for deciding who needs medication for primary prevention of cardiovascular events

An absolute risk approach to managing cardiovascular disease (CVD) risk factors is superior to managing individual risk factors, and has been endorsed by peak professional bodies and in CVD management guidelines.[1] However, clinicians need to be confident about the robustness of the risk estimates if they are to act upon them. Ideally, a CVD risk score model for patients in Australia should be based upon a large Australian cohort study including information on all relevant risk factors and a sufficient number of CVD outcomes.[2] As this is not available, one applies an algorithm based on other data, such as those of the American Framingham Heart Study; the Australian Risk Calculator (https://www.cvdcheck.org.au), a recalibration of a Framingham algorithm, is currently the recommended tool. In the study published in this issue of the *MJA*, Albarqouni and colleagues[3] compared four algorithms derived wholly or partially from Framingham data, including the 2013 Pooled Cohort Risk Equation (PCE-ASCVD), an algorithm based on data for four American cohorts, including the Framingham study. The authors did not include the 1976 Framingham-based algorithm in their assessment.[4] The New Zealand prediction equations[5] could also have been assessed as a contemporary algorithm.

Albarqouni and his co-authors compared the utility of these algorithms by analysing data from the Australian Diabetes, Obesity and Lifestyle study (AusDiab), an observational study of 5453 people aged 40–74 years and without a history of CVD, drawn from a general population sample.[6] Over a median follow-up time of 11.1 years, there were 310 CVD events, less than 30% of the number upon which the 2008 Framingham equation was based.[7] It was unfortunate that 15% of the participants were taking blood pressure-lowering medication, as the purpose of calculating the absolute risk score for an individual is to determine whether blood pressure- and cholesterol-lowering therapy should be initiated. Further, the PCE-ASCVD definition of a CVD event (acute myocardial infarction, death caused by coronary heart disease, or fatal or non-fatal ischaemic stroke) would not capture new onset acute coronary syndromes with revascularisation avoiding myocardial infarction, which are



captured by the Framingham models as "non-fatal coronary heart disease".

In practical terms, risk algorithms rank individuals for priority of therapy, with a cut-point for action, as for individual risk factors. The threshold for therapy recommended in guidelines — a 5-year predicted risk of 15%[1,8] — is as arbitrary as a blood pressure value of 140 mmHg, but is more cost-effective because the patients most likely to benefit in the intermediate term receive treatment, but medicalising individuals at low risk is avoided. This, to some degree, moderates the overestimation of risk, a perennial problem because of the gradual reduction in age-standardised CVD event rates, as the correct ranking of patients determines the efficiency of treatment.

Why did the authors choose a 10-year risk estimate? The current Australian[1] and New Zealand[5] guidelines both choose 5 years because it is consistent with the duration of the clinical trials that have examined the benefits of therapy, and also because it is aligned with patient preferences. Discounting — granting more credence to something predicted for the immediate future rather than the long term — is a recognised motivator for patients accepting therapy for an asymptomatic condition.

Albarqouni and colleagues conclude that the PCE-ASCVD and one of the Framingham algorithms are "appropriate for estimating cardiovascular disease risk in Australia". However, AusDiab is not representative of the Australian population; the CVD mortality rate in this cohort is much lower than that of the national population, even after accounting for risk factor levels. Further, the authors concede that not knowing the event status for 1 of 7 subjects may have "influenced [their] estimates". Finally, the calibration of all the external algorithms was poor, so that the authors appropriately conclude that none is ideal. The four algorithms, however, are good at ranking the chances of an individual developing CVD, as indicated by respectable *C*-statistic values (although the authors did not take censoring into account, unlike the four algorithms).

The discrimination by existing CVD risk score models in other populations is good, as confirmed by Albarqouni and colleagues,

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but these models are poorly calibrated, often even in their home populations. Rather than adopting another American algorithm, a favourable solution would be to develop a model based on pooled cohorts and calibrated to local conditions on the basis of national statistics, such as those of the Australian Bureau of Statistics.[2,9] New CVD risk charts are being developed by the World Health Organization with this approach.

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