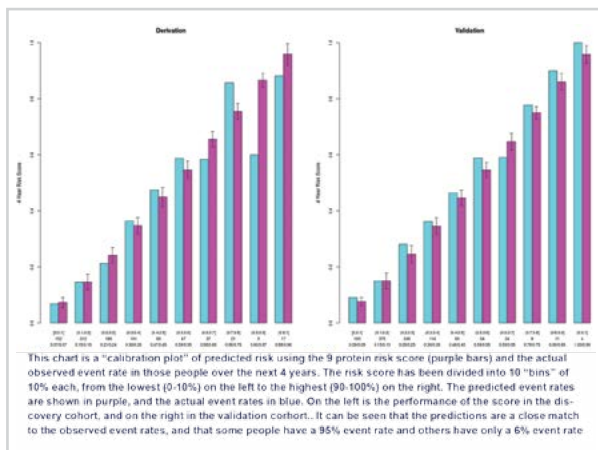


## Precision Risk Profiling in Heart Disease and Stroke for Tailored Care and Health Behaviour Advice

Cardiovascular disease is the UK's biggest killer but existing risk scores are imprecise and inaccurate; perhaps because of this, most people don't reliably take their medicines or change their lifestyles effectively. This project is to develop and implement within the NHS a protein-based risk profile that enables care teams to individualise interventions and motivates patients to improve lifestyles.

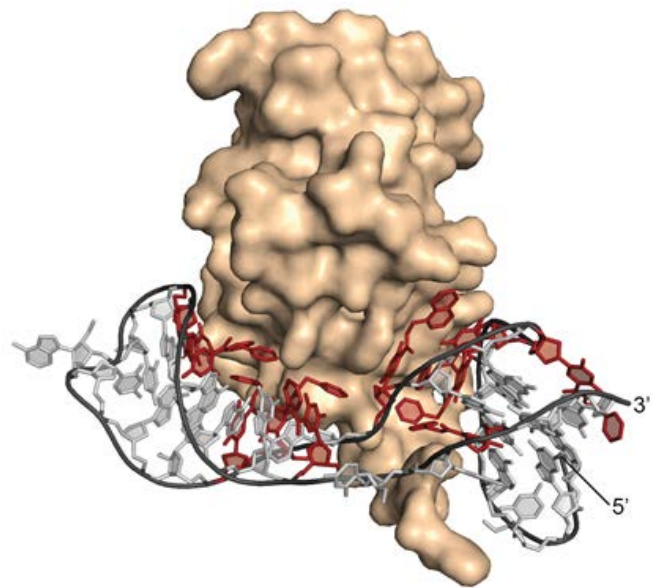
People with known coronary heart disease are all told they are at high risk but not everyone is the same. We describe how measuring thousands of proteins using modified DNA-based reagents has led to the ability to discover signatures for risk which can discriminate between people who otherwise look similar, but some have a 9 in 10 chance of death or hospitalisation within 4 years, and others with only a 1 in 20 chance.



We made 2.7 million individual measurements in plasma from ~1800 people with apparently stable heart disease to discover the optimal combination of proteins to predict poor outcomes such as death, heart attack, heart failure and stroke over the 1-5 years after their blood sample. We used mathematical machine learning techniques to finalise an algorithm that used 9 proteins, and then applied it to an independent validation set. When the population is ranked for risk using this score, the actual observed event rate in the top 20% is >10 fold higher than that in the bottom 20%. This is better than any combination of traditional markers, demographics or known risk factors.

Now the project has evolved into planning, with the Oxford AHSN, the early implementation of this product within the NHS in this region. The development of an individualised and accurate prediction is only the first step towards improved outcomes and reduced costs. Can the score be used to direct more medical resources towards the most needy?

Can and will patients improve their lifestyles and nutrition with a less deniable and frighteningly accurate prediction? Will the monitoring of within-person changes in risk help? Can the medical care teams tailor interventions based on individualised risk? Those are the key questions that the prospective early implementation program will seek to address.



The picture above is a DNA-based reagent (a SOMAmer or Show, Off-rate Modified Aptamer) binding to a protein commonly found in the blood. Thousands of these reagents are used together to measure thousands of proteins in the blood simultaneously.



**Dr Stephen A Williams MD**  
Chief Medical Officer, SomaLogic Inc  
swilliams@somallogic.com

