Understanding Racial Bias in Medical Statistics

Will future medicine be equal for all ?

As technology advances at a blistering pace, it becomes more and more involved in our daily lives. Technologies such as AI are expected to transform the medical field by ensuring faster diagnoses and aiding medical professionals to personalize care for each patient. This is needed more than ever before as we're expected to face more pandemics and an ageing population in the future. Already, technologies such as Google's Deep mind AI, are aiding Moor-field's Eye Hospital in diagnosing retinal diseases with the the government expecting to invest £250 million in this sector in the coming few years.[1][2]

However, since health is a **matter of life and death, are these technologies equal for all?** Using statistical analysis on these technologies, both established and experimental, reveals that these advances are biased especially against patients from a minority ethnic background. Investigating why these biases occur provides a stunning insight on how **biased, neglectful and prevalent systemic racism is within the current medical establishment.**

Can automated healthcare be equal?

Though not widespread in the UK, the **US healthcare systems routinely uses algorithms to allocate care to some 250 million patients**.These algorithms rank a person, given their health data, on a scale from 0-100 with 100 noting that a patient needs serious medical care. Ideally, these algorithms should be equitable in their outcomes but a paper by researchers Obermayer & Co. in the journal Science indicate a far deadlier truth.

In this paper, the researchers tested this type of algorithm against a dataset of 50,000 patients to test for racial bias. What it revealed was a continual and systemic bias against black patients compared to their white counter parts. In Fig 1.), **black patients have a lower risk score than white patients with the same number of active chronic conditions**. The same is seen in Fig 2.) where black patients with a higher blood glucose level were given a lower risk of diabetes compared to their white counterparts.

The cause of this bias is due to the algorithm using healthcare spending as part of its inputs. Since black patients, due to other systemic factors, spend less on healthcare than white patients, the algorithm is convinced that black patients are 'healthier' than white patients. This is a **deadly bias as it could make black patients not get the adequate health care they need.**[3]

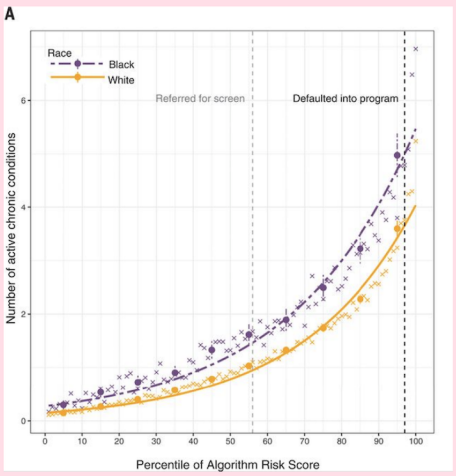

Fig 1: A graph of the number of active chronic conditions a patients has against their predicted health score.[3]

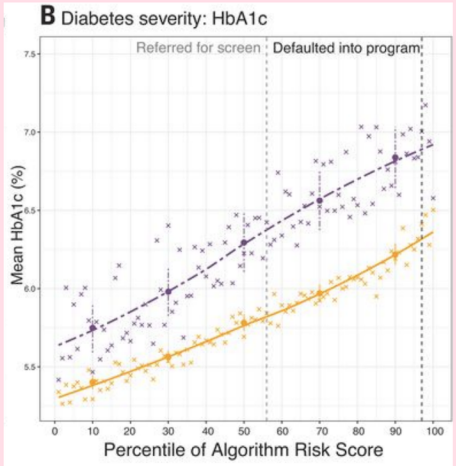

Fig 2: A graph of the concentration of Hb1aC (blood sugar level) a patient has against their predicted health score.[3]

Is existing medicine fair to all?

Pulse oximeters are the little devices attached to the end of patient's fingers to measure blood oxygen levels. They have been around for more than 50 years but only during the Coronavirus Pandemic, where they were extensively used, did researchers thoroughly investigate them.

In the paper, the researchers measured blood oxygen level taken from blood samples against the levels measured by pulse oximeters. As seen from Fig 3.) at the bottom, black patients were reported with a higher blood oxygen by pulse oximeter compared to a blood sample, on average, than their white peers. If blood oxygen levels drop below 88% (as seen by the dashed line), a patient has occult hypoxemia-a deadly lack of oxygen in the blood. These researchers revealed **that black patients had a 3x more risk of having occult hypoxemia not detected by pulse oximeters**.

This bias exists because pulse oximeters are calibrated on subjects with fair-typically white-skin. As they are not calibrated on darker skin, they become more inaccurate for patients from minority backgrounds. However, the widespread and up until now use of biased pulse oximeters in medicine raises the question of how many excess deaths, especially of those from minority backgrounds, were caused by inaccurate readings. More importantly, **are there other widespread medical tools that have a hidden bias against the most vulnerable in society?** [4]

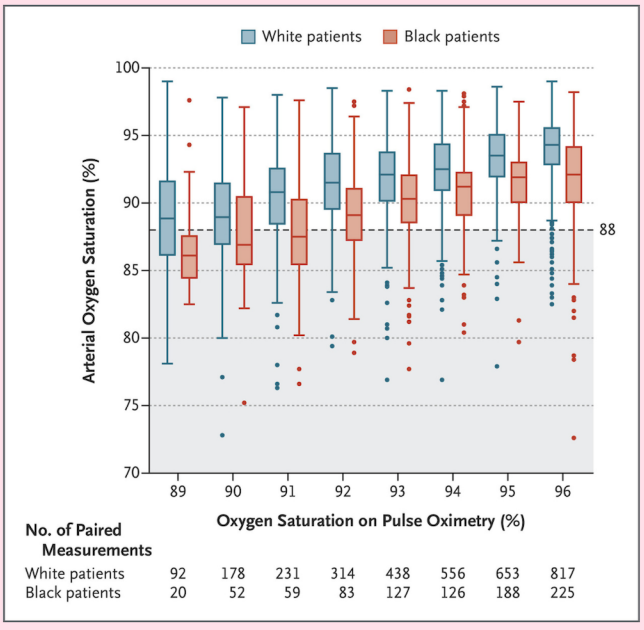

Fig 3: A boxplot of Arterial Oxygen Saturation (Oxygen level measured directly from the blood) against Oximetry Oxygen Saturation between black and white patients. The table below is the comparison of the sample size each boxplot is based upon. The dashed line represents the level at which occult hypoxemia (a lack of blood oxygen) occurs.[4]

Building an equal future

Both cases highlight how both future and existing healthcare systems can target against marginalised groups. These biases are caused by samples not being diverse and taking into consideration all patients that are affected. In Fig 4.) the researchers modified the algorithm from above to remove racial bias so that a greater proportion of black patients received necessary care.

Even more important, as pulse oximeters have shown, we should test existing medical technologies for bias including racial bias. However, **for these technologies to be questioned, there must be researchers from these backgrounds to raise them**. Consequently, it is also vital that we should foster more researchers, doctors and statisticians from a set of **diverse backgrounds** as they're the ones most affected and most qualified to make medicine of the future fair for all.[1][2]

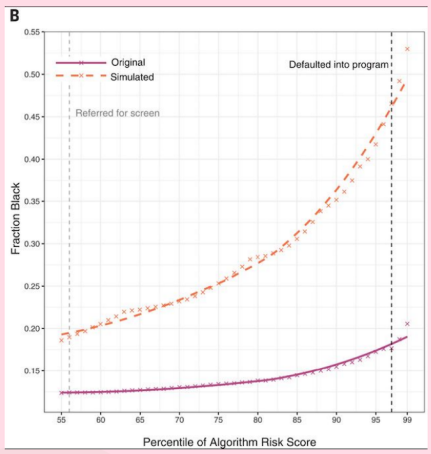

Fig 4: A graph showing the difference in black patient acceptance between the modified and original algorithm from above. [3]

Sources

1.) Knight H., Deeny S., et al., 2021, *Challenging racism in the use of health data*, Volume 3 Issue 3, Lancet Digital Health.

2.) Noor P., *2020, Can we trust AI not to further embed racial bias and prejudice?*, Racism in Medicine, BMJ.

3.)Ziad Obermeyer et al., 2019, *Dissecting racial bias in an algorithm used to manage the health of populations*, Science, pp.366:447-453.

4.) Sjoding M.W et al, 2020, *Racial Bias in Pulse Oximetry Measurement*, Correspondence, The New England Journal of Medicine, 383:2477-2478

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