**Question 1: What do you think of the proposed definition of AI for the purposes of the strategy?**

Royal Blind welcomes the proposed definition of AI for the purposes of the strategy. As Scotland’s largest visual impairment organisation we have worked with our sister charity Scottish War Blinded to support research into AI technologies which are already enabling eye conditions to be diagnosed and treated more speedily and accurately, with the potential for AI to secure further benefits for patients, health services and our economy.

Eye health is an area where AI has particular potential to deliver ground-breaking progress, and the benefits are already being realised. It has enabled the development of assistive technology which can be used to carry out eye scans for hundreds of people every day in public health centres in countries across the world. The device operator needs only minimal training to complete the scans, which are sent through the cloud to be reviewed by an ophthalmologist. This is taking place in communities where previously lack of specialist staff and facilities meant people needlessly lost their sight.

We welcome the focus in the consultation document on data-driven technologies. Due to technological advances in producing images of the eye and retina in the course of eye health checks and eye examinations, for the first time ophthalmic big data from the general population can be used to research markers of early disease. These markers can help earlier detection both of eye conditions and many others, including Alzheimer’s and cardiovascular diseases. Early disease markers open the route for early intervention and even development of completely new treatments.

The provision of free eye health checks in Scotland creates a unique opportunity for our country to lead research into eye health conditions, develop speedier diagnosis, new treatments, support clinical trials and new life sciences activity. Along with wider data initiatives in NHS Scotland, the General Ophthalmic Services (GOS) contract, which has created effective links between optometrists and ophthalmologists, also means that Scotland is particularly well placed to take forward new research. Royal Blind and Scottish War Blinded are pleased to be one of the partners investing in the establishment of SCONe, the Scottish Clinical Optometry Network e-health, which is taking forward vital work to establish links between opticians and optometrists with academic researchers to enable data collected by high street opticians to be applied to research.

Given the specific needs of people with visual impairment, we welcome the definition highlighting tasks in relation to areas such as visual perception and speech recognition. Technology such as Amazon’s “Alexa” has been transformative for many people with visual impairment. We are currently working in partnership on a project with Heriot Watt University to deliver the next generation of natural language devices and robotics to assist people with sight loss in their everyday environments.

The definition refers to “decision-making.” We recognise this may be a more contentious aspect of the definition, and in application of the new technology we have referred to above, like other AI technologies applied to diagnosis and treatment of eye conditions, final clinical decision still rest with eye health specialists.

**Question 2: Do you agree that the strategy should be people-centred and aligned with Scotland’s National Performance Framework?**

We agree the strategy should be people-centred and aligned with Scotland’s National Performance Framework. We believe support for AI-driven improvements in treatment of eye conditions aligns closely with key elements of the National Performance Framework - enabling people to be healthy and active; have access to fair work; be educated and skilled; empowered and included; and ensuring Scotland can contribute to learning internationally and benefit from the economic potential of AI. We understand this will be the case for other areas of AI innovation as well.

If people have eye conditions diagnosed and treated more quickly they are less likely to suffer the emotional, broader health and economic impacts sight loss can bring, as can tackling avoidable sight loss and developing new treatments for eye conditions. In leading this area of innovation, which Scotland has the potential to do, we can contribute to global progress on this key health issue and our economy can benefit.

It is already clear how AI innovation in eye health can produce significant benefits which are both people-centred and aligned with Scotland’s National Performance Framework. New research in the data sciences sector has already resulted in AI technology which can automatically detect eye conditions in seconds and assist practitioners to prioritise those patients in urgent need of care. This has the potential to benefit thousands of patients in Scotland who have eye conditions for which early detection and treatment is essential to achieve the best outcome. It also means more effective use of resources in hard-pressed NHS services. Research carried out at Moorfields Eye Hospital showed that out of approximately 7000 referrals as ‘urgent wet AMD’ per year, only 800 were actually confirmed as such, thus creating additional pressure on the healthcare costs, services and timeline before intervention, if needed. Using AI to develop more accurate approaches to diagnosis has the potential to enable patients to be prioritised for treatment more effectively, securing better outcomes for them and reducing pressures on ophthalmic services.

Scotland can be at the forefront of this rapidly developing area of research due to the development on the Community Health Index (CHI) population register and also through reforms being and innovations which have already been introduced through the GOS contract, the National Eyecare Workstream and the National Ophthalmology Workstream. These are enabling more efficient systems for the collection, sharing and storage of data on eye health in Scotland. This work is building on the investment of £6.6 million announced by the Scottish Government in 2012 to to roll out electronic digital communications between optometrists and hospital eye services throughout Scotland. Optometrists were connected to a virtual private network, known as the Scottish Clinical information Gateway, which could send patient referrals to hospital eye services. In addition to clinical information transmitted, support information, such as ophthalmic images, computerized visual field testing, and OCT images, could also be attached to the referral. (1)

The National Eyecare Workstream is taking forward further reforms including accrediting some community optometrists to take on the care of more stable hospital patients and ensuring records can be shared electronically across the country. Work is under way to develop an electronic patient record which will support robust outcome data within hospital eye services, and help ensure that patients with life-long ophthalmic conditions receive a high level of care.

The first high level message set out in the National Ophthalmology Workstream report is on Health Intelligence, to ensure collection of robust and adequate data to develop and support services. The action outlined in the report document is to “Improve data capture and use of health intelligence as a basis for ongoing and informed decision making about how best to deliver our services. To capture data on diagnosis, outcomes and waiting times for new and return patients for transparency, local use and submission to a central data warehouse to highlight and evidence opportunities for further change.” It goes on to make a recommendation for the development of “ an electronic patient record system that meets the needs of ophthalmology should be introduced in order to permit electronic capture of clinical data, audit and follow up data. Where appropriate this will promote care across primary and secondary care through data sharing.” Work is also being undertaken to ensure Electronic Records, including through bridging gaps in existing patient record systems, will enable 3-D images to be viewed. (2)

This activity which is already underway in our eyecare services underline why Scotland has such potential to lead the way through big data AI projects in eye health and how this sector is particularly well placed to benefit from an effective AI strategy.

**Question 3: How do you think AI could benefit Scotland’s people, and how do we ensure that the benefits are shared and no-one is left behind?**

We believe that Scotland can be a world leader in developing AI technologies which improve treatment for eye conditions, helping grow further a Scottish life sciences sector which achieved turnover of £6.5 billion in 2017, and also enabling health services to be delivered more efficiently. (3)

Scottish War Blinded is one of four founding members of Action Against Age Related Macular Degeneration (AAAMD). AAAMD is structured as a medical research charity focused on facilitating research around early-stage AMD, raising awareness and funding from strategic organisations around the world. The charity’s mission is to find and enable convenient, affordable and accessible solutions to stop AMD in its early stages, before it causes sight loss.

Age Related Macular Degeneration is the biggest cause of sight loss in Scotland, affecting around 291,000 people. With sight loss projected to double in the next few decades due to the ageing population, this urgent problem will quickly become a major public health crisis. Capitalising on AI innovation to provide better treatment for AMD and other eye conditions - as well the range of other conditions for which eye health is a maker - will be transformational for thousands of Scots.

AAAMD is developing a model for ensuring the maximum benefit through research into AI technologies for eye conditions through establishing the Foresight Consortium. Positive engagement has already taken place with the Scottish Government to facilitate an approach which can securely harness the wealth of data from eye scans carried out by opticians and optometrists, establish partnership working between the Scottish Government, NHS Scotland, industry, academia and the third sector, and secure investment in research to give Scotland a competitive advantage in this rapidly expanding field. Furthermore, people-centred strategy should encompass both people as receiving the benefits of AI outputs/ products, as well as assisting/ enhancing the capabilities of existing professionals, creating ‘Augmented Professionals’ of the future: in other words, it wil not rob jobs, but rather free-up experts to perform their task even more efficiently.

Through the work of SCONe and Foresight, a hospital-based electronic medical record (EMR) in ophthalmology will be developed, as it has been in other health services. As a result, through these projects moving forward, they offer the potential for both improving support for patients and building cross-linked data research across sectors.

**Question 4: What do you think of the proposed overarching vision of the strategy, and the two strategic goals that are proposed to underpin this?**

We agree the goals of the strategy should align with the National Performance Framework, and so welcome the proposed overarching vision and also its focus on National Outcomes and the potential for AI to be transformational for the people of Scotland.

Given success in developing AI could be so beneficial to such a wide range of services and activities, we believe every department in the Scottish Government should assess how the AI strategy could support innovation in their area of responsibility and consider what they can do to help drive the strategy forward. For our charity, established in 1793 to support blind and partially sighted people, the potential of AI to improve and innovate in health and social care services is particularly evident, but we are aware of the potential of AI in so many different fields.

We also support the two strategic goals, and believe that success in developing AI technologies in healthcare - where AI in eye conditions is already making medical advances - is clearly an area where Scotland has the potential to realise significant achievements in relation to both goals. Scotland’s people will flourish thanks to improved health and treatment. Scotland’s health services, businesses, and academic institutions will thrive and prosper thanks to a research environment which has the potential to speed up clinical trials as well as develop new treatments and medicines.

**Question 5: Do you agree with the representation of Scotland’s AI ecosystem outlined in the scoping document? Is it missing anything?**

We support the representation of Scotland’s AI ecosystem as it has been outlined in the scoping document and welcome the emphasis on collaboration in the concept for the ecosystem, involving a wide range of partners including the third sector. We believe the vision for the ecosystem is a comprehensive one, but in the reference to “Data” as it flows to “Resources” believe that a reference could also be made to data security.

It is vital for public trust and confidence in AI systems, and clearly also for legal compliance, that appropriate permissions are received in relation to data on people’s health conditions, that this data can be stored securely and that both governance and regulations around ethics are robust. We believe it will be important to have broad engagement in drafting guidance on ethical use of data and consultation on any new regulations which may need to be introduced. These could include significant penalties for any misuse of data in the course of AI research and development.

The consultation document is right to highlight the need for discussion and consideration on “trust, transparency and recourse” and power, privacy and consent” in regard to ethical considerations. A key advantage Scotland has in developing new AI through big data projects in healthcare is the ability to track pathology through CHI numbers. Here the “trade-offs” between personal and civic benefit become relevant. If we can win the acceptance of patients that their data can be securely and confidentially accessed for the purposes of big data research, then they and the wider community can benefit.

**Question 6: Do you have any comments on the strategic themes that will be explored in detail?**

We believe the strategic themes which have been identified to be explored in detail will form a helpful framework for discussions. Creating the right ecosystem is key. As highlighted earlier in this submission, particularly for projects with direct public sector interests, we believe governance arrangements which are a partnership between government, academia, private sector and potentially third sector organisations can create a culture of collaboration which will maximise participation in and benefits secured from AI innovation.

There are many elements required to create an ecosystem for AI which will drive forward its contribution to Scotland’s people and economy, and developing resources in terms of skills, data and investment are all key. Scotland has traditionally been a leader in academic research and development, and it is still the case we need to do more to ensure we can commercialise this research effectively. The life sciences sector in Scotland is leading the way in ensuring we capitalise on our academic expertise. Building on this market leading position by ensuring the right priority is given to AI in healthcare can help achieve early successes for this strategy.

It is also important to ensure research funding investment incentivises AI projects and the wider social and economic benefits they can bring. It is clear that certain areas of AI innovation have particular potential to bring social and economic benefit, with eye health being among them. Sight loss has traditionally lagged behind other health conditions for public sector investment in research, but we are pleased the Scottish Government has already indicated support for projects such as SCONe. We believe further research funding for this area of AI innovation will yield huge benefits in the future for patients, for efficiencies in health spending and successful commercialisation of research.

**Question 7: How can confidence in AI as a trusted, responsible and ethical tool be built?**

As we have highlighted previously in the submission, given the importance of big data projects to AI innovation, secure handling and storage of data is essential to instill confidence in AI technology.

It is vital data is safeguarded, studies are underpinned by a robust ethical framework, and the public has confidence in taking forward this important area of research.

Action Against AMD is pleased to be a member of INSIGHT - The Health Data Research Hub for Eye Health. INSIGHT is focused on eye disease and its application to wider health, including diabetes and dementia. It will use anonymised large-scale data and advanced analytics, including artificial intelligence, to develop new insights in disease detection, diagnosis, treatments and personalised healthcare.

INSIGHT is one of seven Health Data Research UK (HDR UK) Hubs established to create a system for the safe and responsible use of health-related data on a large scale, by combining best practices and tested frameworks to ensure patient and individual privacy whilst promoting innovation through use. Led by Prof Andrew Morris - previously Chief Scientist for the Scottish Government - HDR UK will ensure patients and the public will be involved in decisions about how their data is used and accessed, making it one of the best examples of a safe and trustworthy population-scale health research database. Additionally, NHS Scotland is already a signatory of the HDR Alliance, which aggregates multiple data controllers under its common set of strict data protection. (4)

**Question 8: Please comment on any other aspect of AI that you feel it is important for Scotland’s AI Strategy to address.**

The development of AI is a highly competitive field internationally. This is also true for healthcare AI, with health data consortiums being established globally including through the Microsoft Intelligent Network for Eyecare (MINE). This strategy can be an important step forward in ensuring Scotland can be a world leader in the development of AI, and if it is to achieve that goal then it must recognise, support and nurture the competitive advantage we currently have in important areas of healthcare AI. Eye health AI innovation is one of those areas where we have the ability and potential to be a world leader, but in the context of global competition it is vital we act now to capitalise on this advantage as well as through the strategy as it is implemented.

**References**

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**4.** [**Information on Health Data Research UK hubs**](https://www.hdruk.ac.uk/infrastructure/the-hubs/)