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| **Title:** | | TG-Ophtalmo: DR-NET (Diabetic Retinopathy Network) | | |
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| **Abstract:** | The DR-NET is a network of Diabetic Retinopathy screening programmes in low and middle income countries: 18 Africa; 4 Caribbean; 5 Pacific ; 1 India; 1 China  The aim of the DR-NET is to build capacity for the development of DR systems and services in LMICs. Each member programme is part of the VISION 2020 LINKS Programme, which links UK eye departments with the LMIC eye department.  Since 2014, the DR-NET has worked on the development of integrated DR screening and treatment services in the 29 countries.  If LMICs are to benefit from the opportunity that AI presents, benchmarking for DR should include data from real life programmes, a variety of cameras and different ethnicities, so that we know that the technology will work accurately in those settings. |

# Overview

The public health challenge of diabetes is already enormous. Worldwide, approximately 1 in 11 adults (425 million people) currently have diabetes. Only half of these people are aware of their diagnosis and around three quarters live in low- and middle-income countries (LMICs). The current global projections forward to 2045 indicate a 48% increase in the absolute numbers with diabetes, to 629 million people. This dramatic rise is driven by major socio-demographic and lifestyle changes, particularly in low-income populations.

The rising prevalence of diabetes is affecting huge numbers of people in LMICs, which currently have some of the highest prevalence levels and will experience some of the greatest increases in coming years. For example, many of the Pacific Island nations have some of the highest diabetes age-adjusted rates in the world, with many populations having more than 20% in people 20 years and above. The sub-Saharan Africa region is projected to experience a 156% increase by 2045 in the number of people with diabetes, the highest for any world region. Africa also has the highest proportion of undiagnosed diabetes, with over two-thirds of adults currently living with diabetes unaware of their condition.

African health care systems are not ready to deal with the increasing burden of diabetes and its complications, such as diabetic retinopathy (DR). Lack of awareness in the population, and lack of facilities for detection, managing and monitoring diabetes and its complications, contribute to high morbidity and mortality from diabetes. Limitations in the numbers of sufficiently trained health care staff, delay in seeking medical attention, and lack of access to affordable treatment all contribute to the high rate of diabetes-related sight loss.

# Relevance

Diabetic retinopathy (DR) is a leading cause of preventable blindness among adults of working age. DR occurs in almost 75% of patients with adult onset diabetes within the first fifteen years of diagnosis. Approximately 2% of these people will go completely blind and 10% will develop severe visual impairment during this time.

Prevention of sight loss from DR is achievable through good diabetic (sugar) control, regular screening of the eyes for signs of DR and the timely treatment of disease. Periodic retinal examination of diabetes patients is necessary because DR is asymptomatic in its early stages, and because early treatment reduces both the risk of blindness and the cost of treatment. Early treatment slows or stops the progression of the disease. Patients who have established sight-threatening retinopathy usually require laser treatment. In high-income countries the health systems usually operate screening and treatment programmes that are integrated within the general health system. Until recently in most LMICs there have been no, or only very limited, DR screening and treatment services.

# Impact

At the moment the DR-NET programmes rely on health workers trained in screening and grading. In countries where there are very scarce resources for health, and limited financial resources, AI presents a great opportunity to screen large numbers of people with diabetes regularly, accurately and at a lower cost for the health services and less indirect costs for the patients. Introducing AI in DR screening within the DR-NET could help scale up the country programmes in a sustainable manner. In the last five years the DR-NET programmes have screened and graded 90,000 patients and delivered laser treatment for DR to 12,800 patients.

# Existing work

The DR-NET was built on the long-term health partnerships established by the VISION 2020 LINKS Programme, which bring together a LMIC eye department with a partner eye department in the UK with the aim of improving the quality and quantity of eye care services in the poorest countries in the world. The main objective was to train and nurture multi-disciplinary teams who would work together to deliver integrated DR screening and treatment programmes. Between 2014 and 2018 the network has scaled up and the number of partnerships implementing DR screening and treatment programmes is now 29: 18 in Africa; 4 Caribbean; 5 Pacific; 1 India; 1 China.

# Feasibility

The DR-NET has engaged with the MoH from each country in order to ensure the sustainability of the DR programmes, and has facilitated the development of national frameworks for DR services and specific clinical guidelines for use in their countries.

# Data availability

The DR-NET is run and coordinated by the VISION 2020 LINKS team at the London School of Hygiene & Tropical Medicine in the UK. Each DR-NET country programme holds the image data and there is centralized data sharing with the management team for quantitative programme indicators. Sharing the anonymized data sets is subject to permissions which vary from programme to programme. DR-NET data would be available only for benchmarking. Data won’t be made available for development purposes.

None of the data has been disclosed so far.

The images are not labelled/annotated. Only the raw data is available.

# Data quality

The images come from a variety of programmes, cameras and are real programme data, not selected for specific quality.

# Annotation/label quality

The DR-NET countries have raw image data, with no annotations.

# Data provenance

The data from each of the DR programmes is collected in a clinical setting as part of the DR screening process. Most of the network partners are part of the public health system in the country and subject to the data permissions of the health system.

# Benchmarking

The DR-NET data is real programme data, using a variety of different cameras, used in real conditions. Most of the data is from black ethnicity populations.

# Organizer

The DR-NET aims to meet the enormous challenge of the increasing burden of blindness due to DR in LMICs. One of the key issues, particularly in Africa, is the lack of human resources for health. AI presents an opportunity to increase access to DR screening to these populations. If LMICs are to benefit from this technology, it is important that any benchmarking for AI platforms for DR include images and data from real life programmes in these countries, using different cameras, and representing different ethnicities.

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