Alon Harris, MS, PhD, FARVO, has committed 30 years of research to chipping away at the notion that intraocular pressure (IOP) is the predominant risk factor for open-angle glaucoma (OAG), particularly in people of African descent. Through his internationally acclaimed work, the Professor of Ophthalmology and Vice Chair of International Research at the Icahn School of Medicine at Mount Sinai has demonstrated that vascular abnormalities can result in reduced blood flow through the retrobulbar vessels and within the retina, which, in turn, are predictive of worse glaucoma progression in people of African descent.

With the help of funding from the National Institutes of Health (NIH) and the National Science Foundation, Dr. Harris and his team are taking that research to the next level by integrating artificial intelligence (AI) and mathematical modeling with clinical and research data to better understand the role that race—as well as other risk factors, such as structural properties of the eye, ocular blood flow, and systemic conditions—plays as a risk modifier and contributor to OAG pathophysiology. For this purpose, Dr. Harris has assembled a multidisciplinary research team comprising glaucoma specialists, physiologists, mathematicians, and bioengineers.

“Dr. Harris sees mathematical modeling and AI as essential strategies to build on these earlier results. “To understand the pathophysiology of glaucoma and identify modifiable risk factors beyond IOP, we need to develop a new generation of models that are able to describe the coupling of systems like the biomechanics of ocular tissues, the hemodynamics of ocular blood flow, and the functionality of retinal ganglion cells,” he explains. Modeling and AI in conjunction with clinical and research data can serve as a “virtual lab,” he adds, where risk factors can be isolated and assessed independently of each other, leading to the design of further clinical studies towards individualized medicine.

To that end, Dr. Harris cites the considerable resources he has been able to tap into since moving his lab to the Department of Ophthalmology at New York Eye and Ear Infirmary of Mount Sinai two years ago from Indiana University School of Medicine. As he puts it, “The access to advanced imaging like OCTA coupled with incredibly skilled glaucoma specialists and a wide variety of patients and ethnicities have provided a unique platform to unravel the many questions around glaucoma that remain unanswered.”

With Dr. Harris’s findings published in more than 380 peer-reviewed manuscripts and 22 books, it has been gratifying to see recognition for his work not only from his peers but also from the NIH. To date, his study of glaucoma disparity among people of African descent, stemming from retinal and retrobulbar vascular impairments, has received $3,242,699 in federal support, with a new NIH RO1 grant of $1.2 million awarded in 2022.