nature

have made treatments for sickle-cell disease a priority. Newborn-screening programmes have been expanding, and efforts are being made to deploy an old chemotherapy drug called hydroxyurea in Africa to help ease symptoms.

Last week, the US Food and Drug Administration (FDA) approved the first drug, voxelotor, to target the cause of the disease. Made by Global Blood Therapeutics in South San Francisco, California, it reduces the interactions between mutated haemoglobin proteins that lead to the sickled blood cells characteristic of the condition. That came hot on the heels of the FDA approving a drug called crizanlizumab, made by Novartis in Basel, Switzerland, which helps to stop the sickled cells from sticking together.

In October, the US National Institutes of Health (NIH) and the Bill & Melinda Gates Foundation in Seattle, Washington, announced a landmark programme to develop gene-based technologies to treat sickle-cell disease and HIV in Africa. Both will contribute US$100 million over the next 4 years, and the ambition is to fund treatments into clinical trials within 10 years.

These developments are promising, but they don't address one stark reality. Most people with the disease struggle to access even basic health care, and the new treatments have a hefty price tag.

In 2017, the FDA approved a treatment called Endari, made by Emmaus Medical in Torrance, California. Endari is a formulation of the amino acid glutamine, and costs $13,000 a year. Unsurprisingly, US physicians are struggling to get insurance companies to foot the bill – meaning that many people are unable to access the treatment.

The first gene therapies for the disease, which involve an elaborate procedure much like a stem-cell transplant (see page 18), are likely to cost upwards of $1 million per patient. And transplant procedures and hospital stays will push costs higher. The excitement even of voxelotor's landmark approval needs to be tempered by the fact that the treatment costs $125,000 per year per patient.

This means that advocates such as Akinyanju cannot yet slow down. They have made impressive gains. But alongside the growing sums being invested in research and development, foundations, advocates and patients will continue to need support – especially for the costs of treatments.

Researchers can help – not only through their work, but also by continuing to pressure the government officials, donors and health-care providers with whom they interact to consider the issue of who will foot the bill.

The payment question isn't confined to sickle-cell disease. It bedevils many of the bespoke drugs emerging from biomedical research. What is clear is that the current health-care models won't work: insurance companies baulk at the costs, and public systems often can't afford them. An answer will require the combined efforts of biomedical scientists, health-care economists, public-health experts and others.

The NIH and the Gates foundation want a future in which the disease can be treated with a one-time therapy in an outpatient setting – and that is potentially achievable. But companies, funders and governments must find ways to ensure that the costs are not shouldered by communities that have already suffered for too long.

"Foundations, advocates and patients will continue to need support – especially for the costs of treatments."

Laying the ghost of Icarus

Humanity is finally getting up close and personal with Earth's nearest star.

In some ways, NASA's Parker Solar Probe can trace its ancestry to the tale of Icarus, the character from ancient Greek mythology who took flight by donning wings made from feathers and wax. Ignoring advice from his wise father, Daedalus, Icarus flew too close to the Sun, causing the wax to melt, and plunged to his death.

In the spirit of the Icarus legend, the Parker Solar Probe is one of the most daring space missions ever launched, but there's no metaphorical melting wax. The probe's cutting-edge scientific instruments live behind a carbon-composite heat shield 11 centimetres thick that can withstand temperatures of almost 1,400 °C.

The mission's achievements are thanks in no small measure to the work of teams at the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland, who built the $1.5-billion probe and designed its trajectory.

The probe was originally supposed to start its journey by flying past Jupiter – the idea being that Jupiter's gravitational influence would hurl it out of the plane of the planets and over the Sun's poles, from where it would record its measurements. But Yanping Guo, a celestial navigator at the Maryland lab, found a way to send it past Venus instead. This, she reasoned, would keep the probe on a path in the planetary plane and would mean the spacecraft could visit the Sun more often and spend more time close to the star. Since its 2018 launch, the probe has passed close to the Sun 3 times – and it will do so another 21 times in the next 6 years, sending back exclusive data from the Solar System's hottest and most dangerous object.

This week, a News & Views article (D. Verscharen *Nature* https://doi.org/10.1038/d41586-019-03665-3; 2019) discusses four papers, published in *Nature*, that report the first of the probe's discoveries, resolving mysteries such as the birthplace of the energetic particles that make up the solar wind, which floods interplanetary space.

Astrophysicist Eugene Parker at the University of Chicago in Illinois proposed the existence of the solar wind more than 60 years ago (E. N. Parker *Phys. Fluids* **1**, 171–187; 1958). At that time, few of his peers accepted that he was on to something. Now, at the age of 92, Parker can justifiably revel in the data from the spacecraft named after him.

The Parker Solar Probe has many more solar flybys ahead of it, taking it progressively closer to the star. The spacecraft has yet to cross a long-anticipated boundary into the Sun's corona, or outer atmosphere; beyond that lies a 'here be dragons' realm that no one has ever seen.

The ghost of Icarus has finally been laid to rest. Much more science is sure to come.