



Reportage

Addressing the childhood cancer crisis in sub-Saharan Africa

Introduction

Sub-Saharan Africa is facing a childhood cancer crisis. Annually, nearly 90% of the more than 100 000 children who develop cancer in sub-Saharan Africa die. By contrast, 85% of paediatric patients with cancer survive in high-income countries, where advanced paediatric cancer care is available. Additionally, the burden of paediatric cancer in sub-Saharan Africa is compounded by substantial population growth, which is rapidly increasing the number of patients. The causes of this staggering inequity are multifactorial and include a paucity of paediatric cancer care expertise, inadequate paediatric medical facilities, and a general absence of childhood cancer awareness. Most children with cancer in sub-Saharan Africa are not diagnosed, and for those who are, their diagnosis is frequently too late. In addition to delayed diagnosis, treatment failures result from treatment abandonment, toxicities, and comorbidities such as malnutrition. The Texas Children's Hospital Global Hematology Oncology Pediatric Excellence (Global HOPE) initiative is a comprehensive paediatric haematology and oncology programme designed to build capacity to rapidly improve the survival of children with cancer in sub-Saharan Africa. The Global HOPE initiative partners with many stakeholders who are crucial for sustained and scalable transformation of paediatric cancer care in sub-Saharan Africa, including national ministries of health, medical academic centres, international philanthropic agencies, and community-based organisations. To date, Global HOPE has established partnerships in Botswana, Kenya, Malawi, Rwanda, South Africa, Tanzania, and Uganda.

The main objective of these programmes is to build the capacity of African health systems to provide evidence-based curative childhood cancer care. To achieve this, Global HOPE and its partners provide specialist paediatric haematology–oncology education at established academic paediatric training and treatment centres as well as cancer education for non-specialist health-care professionals who refer and participate in the continuing care of children with cancer in their communities. Since 2017, 6355 health-care professionals in sub-Saharan Africa have completed various paediatric cancer courses and attended numerous seminars, workshops, and conferences on childhood cancer care. To improve the specialist training and patient care at selected academic training centres, Global HOPE enhances local diagnostic resources and increases capacity to provide higher quality care. They do this by providing much needed cancer and supportive care medicines and building the physical infrastructure in the centres for safe drug storage and preparation. Global HOPE also facilitates paediatric

cancer research in sub-Saharan Africa, with a primary focus on research that has potential benefits for patients, particularly in research that could enhance evidence-based practice and ultimately build capacity for clinical trials. In this Reportage, we highlight the capacity building activities and impact of Global HOPE's specialist paediatric cancer education and paediatric cancer diagnostic initiatives.

Training a specialist paediatric cancer workforce *Paediatric haematology–oncology specialists*

Before Global HOPE developed its initial paediatric haematology–oncology training programme in Uganda in 2016, most countries in sub-Saharan Africa had no paediatric oncology specialists. As of May 1, 2023, Makerere University (Kampala, Uganda) has trained 24 paediatric oncologists in a paediatric haematology–oncology fellowship programme developed and conducted with support from Global HOPE. The 2-year clinical paediatric haematology–oncology curriculum is modelled on paediatric haematology–oncology fellowships certified by the Accreditation Council for Graduate Medical Education in the USA. Graduates of this paediatric haematology–oncology fellowship now lead paediatric oncology care in ten centres in Botswana, Kenya, Malawi, Tanzania, and Uganda, where they oversee the care of over 2800 children with cancer annually. Global HOPE expanded on this successful approach in 2020, establishing a second joint paediatric haematology–oncology fellowship in Tanzania with the leading academic medical centre at Muhimbili University of Health and Allied Sciences (MUHAS) in Dar es Salaam. Global HOPE also supports paediatric oncology

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For more on **global childhood cancer survival estimates** see **Articles** *Lancet Oncol* 2019; **20**: 972–83





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approaches. In addition to bedside nurse training, these educational approaches include use of online learner-directed resources such as the Modular Object-Oriented Dynamic Learning Environment (MOODLE) education platform that hosts over a dozen open courses and virtual workshops, including Project ECHO seminars. As of May 1, 2023, 108 nurses have completed core specialised training in paediatric cancer care. The Global HOPE nursing curriculum teaches basic principles of nursing care for a child with cancer and their family. Nurses learn how to identify and manage the side-effects of cancer and treatment. Specialised training in the essentials of chemotherapy supports the development of nursing competencies in the safe handling of drugs, procedures for drug administration, and managing common side-effects. Important aspects of supportive care are included in the foundation courses within the curriculum.

Excellence in nursing education is core to maximising the number of children who are cured of cancer in low-income and middle-income countries. Recognition of the importance of specialised clinical nursing is crucial to increasing the number of children with cancer who are cured. Global HOPE is creating an environment that promotes future nursing specialisation across sub-Saharan Africa. Currently, Global HOPE is developing formal partnerships with schools and departments of nursing in hospitals and universities in sub-Saharan Africa to integrate appropriate paediatric oncology modules in both undergraduate and graduate nursing curricula.

Other paediatric subspecialties

Optimal paediatric cancer care requires a broad variety of specialised paediatric clinical disciplines, including general paediatrics, paediatric surgery, neurosurgery, pathology, intensive care, and radio-oncology, among others. As with paediatric oncology, there is a dire shortage of skilled workers in these disciplines in sub-Saharan Africa. Global HOPE advocates and develops partnerships with other entities to lead education efforts in these disciplines. For example, the Texas Children's Hospital Department of Surgery participates in the College of Surgeons of East, Central and Southern Africa's paediatric surgery training programmes, with specific emphasis on paediatric cancer surgery skills training. As well as formal training, clinical teams engage in weekly multidisciplinary tumour boards that generate collegiality and share knowledge of best practices among professionals from the various disciplines. Additionally, doctors trained in pathology and laboratory medicine are under-represented in sub-Saharan Africa, with some countries lacking a single haematopathologist. Pathologists do not typically acquire specialised training, leaving a dearth of knowledge in paediatric pathology, molecular pathology, neuropathology, and haematopathology. Global HOPE provides training for

For more on the **Global HOPE initiative** see <https://www.texaschildrensglobalhealth.org/global-hope>

For more on **Project ECHO seminars** see <https://www.projectecho.org/>

fellowship training at the University of Cape Town's Red Cross War Memorial Children's Hospital (Cape Town, South Africa). The three fellowship programmes have the capacity to train up to 12 fellows per year. They all are integrated into comprehensive paediatric departments to ensure that children and fellows have access to holistic paediatric expertise and facilities.

In addition to clinical training, these fellowship programmes provide systematic leadership training. Each graduate is a pioneer in the paediatric haematology-oncology field in their respective institutions and countries. They are trained to be dynamic leaders of multidisciplinary paediatric haematology and oncology teams that care for large numbers of patients and to be powerful advocates for children with cancer and their families, both within their medical institutions and governments. Where appropriate, Global HOPE supplements additional superspecialty training to build the capacity to deal with specific disease groups, with profound results. For example, to address the absence of structured brain tumour diagnosis and care, partnership with Global HOPE facilitated an additional year of training in neuro-oncology at Texas Children's Hospital (Houston, TX, USA) for a Ugandan paediatric haematology-oncology graduate. Within 2 years of programme completion, a coordinated multidisciplinary neuro-oncology service was established at Mulago National Referral Hospital in Kampala, and subsequently the number of brain tumours being diagnosed at this hospital has substantially increased, whereas previously they were seldom diagnosed.

Paediatric cancer nurses

Specialised clinical nurse training is a rarity in sub-Saharan Africa. Global HOPE has supported its partners in sub-Saharan Africa to train nurses in specialised paediatric cancer care using a complement of innovative educational

African pathologists and laboratory leaders via online virtual pathology conferences, access to lectures, and onsite observerships at Texas Children’s Hospital.

Paediatric cancer diagnostics

Diagnostic accuracy and precision are crucial components of paediatric oncology care. Diagnosis of cancer based only on clinical history and physical examination is still common practice in sub-Saharan Africa. For cases when a tissue biopsy sample is obtained, haematoxylin and eosin microscopy and minimal immunohistochemistry are often the only available tests. Turnaround times can sometimes be weeks or months. Diagnoses based on these few characteristics are often inaccurate, including spurious diagnoses of cancer in children with inflammatory and infectious lesions. To enhance evidence-based paediatric cancer diagnosis in sub-Saharan Africa, Global HOPE uses the following three-pronged approach: (1) train existing pathologists, scientists, and technicians in paediatric cancer pathology; (2) provide requisite diagnostic equipment; and (3) identify sustainable supplies and provide cost-effective equipment maintenance. This approach has been impactful in improving access to real-time accurate diagnoses and to laboratory tests required for monitoring patients during treatment.

Global HOPE aims to increase the diagnostic capacity of local laboratories in sub-Saharan Africa, with consideration given to the local capabilities and limitations. An example of a laboratory success story is immunophenotyping of childhood leukaemia and lymphoma with flow cytometry. Although many countries in sub-Saharan Africa have advanced flow cytometry facilities, they have traditionally been used for immunology research rather than for cancer diagnosis. Global HOPE has leveraged these facilities to add capacity for immunophenotyping of tumour samples to diagnose haematological malignancies, which comprise approximately 50% of cases of childhood cancer. In Uganda, implementation of flow cytometry has substantially improved the rapidity of diagnoses, from several weeks to 12–24 h, and enhanced the precision of diagnosis to enable deployment of risk-adapted treatment approaches from high-income countries. Similar initiatives have transformed the diagnosis of childhood haematological cancers in other centres supported by Global HOPE.

An additional challenge in sub-Saharan Africa settings is the ability to obtain routine blood counts and chemistries at any time. Global HOPE has been implementing point-of-care clinical diagnostics programmes to monitor critically ill children in hospital who are receiving cancer treatment. This has the potential to reduce treatment-related mortality. In an effort to increase diagnostic precision and enable risk-adapted therapy, Global HOPE is also developing strategies to implement rapid molecular diagnostics in sub-Saharan Africa. As a pilot, Global HOPE



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is assessing a gene fusion assay in Uganda to characterise the genomic subtypes of paediatric tumours. This analysis could be used to determine a precise diagnosis, suggest prognosis and risk stratification, and define the appropriate drug needed to deliver specific and targeted therapy. If successful, this assay will also be expanded to detect copy number changes including gene amplification, another genomic feature that correlates with prognosis in some paediatric cancers.

For more on the **application of risk-adapted treatment approaches in Uganda** see *Blood Advances* 2018; **2** (suppl 1): 21–23

For future **projections of childhood cancer incidence** see **Editorial** *Lancet Child Adolesc Health* 2022; **6**: 445

Conclusion

The high prevalence of childhood cancer in sub-Saharan Africa reflects the extremely youthful population. This crisis is projected to worsen due to rapid population growth; by 2050, 50% of all the world’s paediatric cancers are projected to occur in sub-Saharan Africa. Given the enormity of this

For more on the WHO Global Initiative for Childhood Cancer Target see <https://siop-online.org/who-global-initiative-for-childhood-cancer/>

crisis, immediate acceleration of paediatric cancer control is imperative. By educating teams of clinicians and facilitating clinical operations within their hospitals, Global HOPE and its partners have built a durable foundation and effective model to deliver evidence-based paediatric cancer control in sub-Saharan Africa. Global HOPE's collaborative capacity-building initiatives have shown that the high mortality of children with cancer in sub-Saharan Africa is not necessarily inevitable. Since the launch of the Global HOPE initiative, more than 10 000 children with cancer have been treated at hospitals in sub-Saharan Africa that are supported by this growing trained workforce, resulting in 2-year overall survival rates of approximately 50% (unpublished). This estimate is on track to meet the WHO's Global Initiative for Childhood Cancer target of increasing the survival rate to 60% among children with cancer worldwide by 2030. To mitigate the impact of the childhood cancer crisis,

countries in sub-Saharan Africa must make childhood cancer a priority and develop national childhood cancer plans that emphasise building the size of the specialised childhood cancer workforce. Additional initiatives must focus on strengthening the clinical ecosystem for the care of children with complex chronic diseases. Enhanced investment by sub-Saharan Africa governments in child health is critically important to address the childhood cancer challenge.

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