



THE DEVELOPMENT OF A NATIONAL DIABETES PROGRAMME IN TANZANIA

Lessons learnt in the transition from a donation supported project towards sustainable diabetes diagnosis and care

THE DEVELOPMENT OF A NATIONAL DIABETES PROGRAMME IN TANZANIA

Lessons learnt in the transition from a donation supported project towards sustainable diabetes diagnosis and care

March 2023

Hans Hogerzeil

Consultant

For correspondence: hans.hogerzeil@kpnmail.nl

Updated 26 June 2023

Cover image by David Sluka from Pixabay



Publisher

Health Action International

Overtoom 60 (2) | 1054 HK Amsterdam

The Netherlands

+31 (0) 20 412 4523

HAIWEB.ORG

Disclaimer

The ACCISS Study is supported by The Leona M. and Harry B. Helmsley Charitable Trust. The analysis included in this report is that of the authors alone and does not necessarily reflect the views of the Helmsley Charitable Trust. All references and conclusions are intended for educational and informative purposes and do not constitute an endorsement or recommendation from the Helmsley Charitable Trust.



Contents

Abbreviations	3
1. Introduction	4
2. The History of the Diabetes Programme in Tanzania	4
1973-1975: Tanzania’s First Diabetes Clinic	4
1975-2000: Early Research on Diabetes in Tanzania	5
2004: Start of Donor Support for Children with Type 1 Diabetes.....	5
2005 – 2021: Towards a National Diabetes Programme.....	7
Estimated Cost of Donor Support	9
Impact of the Donor Supported Programme.....	11
Taking Stock	11
3. The Supply of Insulin: Transition Towards Integration	12
2017-2019: First effort to bring donated supplies into the public supply system	13
2020 to Present: Second Effort to Bring Donated Supplies into the Public Supply System.....	13
Insurance Coverage for Diabetes Care and Support	16
Care for People No Longer Eligible for the Donor Supported Programme	17
4. Lessons from Tanzania (2005-2021)	18
1. Immediate and Continuous Involvement of the MOH	18
2. MOH is Convinced that Treatment of Type 1 Diabetes is Possible.....	19
3. Concurrent Policy Developments in Tanzania	19
4. The Presence and Perseverance of a Number of National Champions.....	20
5. Remaining Challenges	20
1. The Public Supply of Insulin Must be Regularly Monitored.....	20
2. Free Insulin Through the CHF Must be Streamlined.....	21
3. More Health Workers Must be Trained in Diabetes Care	21
4. More Glucose Test Strips and Syringes Must be Reimbursed	21
6. How does Tanzania Fit in the 10-step Transition Process?	21
7. Lessons for Other Countries	24
8. Conclusion	25
Acknowledgements, persons consulted	27
References	28

NOTE

This is a report by the Addressing the Challenges and Constraints of Insulin Sources and Supply (ACCISS) study, executed by Health Action International (HAI). It was written by Hans Hogerzeil based on the published and grey literature, and on detailed information supplied by many persons, including Anita Belindi, David Beran, Julie Cliff, Nina Essex, Margaret Ewen, Molly Lepaska, Happy Nchimbi, Graham Ogle, Kaushik Ramaiya, Andrew Swai, and John Yudkin. This is a living report, which is being updated regularly. All comments, corrections and additions are very welcome and should be sent to hans.hogerzeil@kpnmail.nl

Abbreviations

CDiC	Changing Diabetes in Children
CHF	Community Health Fund
GPSA	Government Procurement and Supply Agency
LFAC	Life For A Child
MNH	Muhumbili National Hospital
MOH	Ministry of Health
MSD	Medical Supplies Department
NCD	Noncommunicable Diseases
NHIF	National Health Insurance Fund
PORALG	President's Office for Regional and Local Government
TDYA	Tanzania Diabetes Youth Association
TDA	Tanzania Diabetes Association
TANCDA	Tanzania NCD Alliance
WDF	World Diabetes Foundation
\$	United States Dollars

1. Introduction

A 2019 review of the impact of insulin donation programmes in ten low- and middle-income countries (LMICs)¹ led to the formulation of a ten-step process for the transition from a donation-supported project to a national diabetes programme. This report details the history of such a transition programme in Tanzania.

Tanzania can be considered an example of how strong in-country leadership and a donation-supported project to diagnose and treat children with type 1 diabetes can pave the way towards the development of a sustainable national diabetes programme. The country has been in a transition from a donation-supported project to a national diabetes programme since 2005. The first donation projects included financial and technical support, as well as free insulin and essential supplies from Eli Lilly and Novo Nordisk. Since then, Tanzania has witnessed the establishment of dedicated clinics for children and youth with type 1 diabetes in 38 zonal and district hospitals across the country, a national register of patients with type 1 diabetes, and national clinical guidelines for the diagnosis and treatment of diabetes, among other successes.

In looking at how Tanzania's experiences may be emulated by other similarly placed low- and middle-income countries in the process of establishing national diabetes programmes, as well as for potential donors involved in such efforts, this report provides practical lessons and recommendations, such as the systematic collection of data on diabetes as well as making use of concurrent national developments. It also outlines the successes of the transition and which factors were behind these, such as the involvement of the Ministry of Health and continuous efforts by national champions. Ongoing challenges will also be identified and highlighted.

2. The History of the Diabetes Programme in Tanzania

1973-1975: Tanzania's First Diabetes Clinic

In the 1970s people living with diabetes in Tanzania were diagnosed and treated at general medical clinics across the country. In 1973 Dr Steve Spencer, the head of the medical department at Muhumbili National Hospital (MNH) in Dar es Salaam, asked Dr Nina Essex to set up a diabetes clinic at MNH. It was felt at the time that bringing all diabetes patients together into one national diabetes clinic would facilitate better record keeping.² People with diabetes attending the new clinic were almost exclusively living with type 2 diabetes, and most were prescribed insulin. For some patients, insulin was not needed, so they were switched to oral hypoglycaemics, which most experienced as a very positive change. All people living with diabetes were registered in a new national register.

In October 1974, the diabetes clinic was taken over by Dr Julie Cliff, an expatriate doctor paid by the Millbank Memorial Fund. The clinic was supported by Prof A.M. Nholohi and Dr G. Kombe, the medical superintendent of MNH; Ms M. Mwampeta was the Nursing Officer in charge. Besides the salary of Dr Cliff, there was no external financial support for the diabetes clinic; the general running costs were absorbed by the hospital.

1975-2000: Early Research on Diabetes in Tanzania

In 1975, the diabetes clinic was taken over by Dr John Yudkin, and later by Dr Donald McLarty. During this period some research studies were performed, which described diabetes in Africa for the first time. John Yudkin and Peter Mhando studied the level of complications in 139 type 2 diabetes patients who attended the diabetes clinic in July-September 1975.³ About half (48%) of patients were on insulin, and 78/139 (71%) had at least one complication, such as peripheral neuropathy (32%), retinopathy (25%), hypertension (26%) and proteinuria (14%).

In 1985, the Tanzania Diabetes Association (TDA) was established. From 1986-1989 a WHO/AFRO survey of NCD risk factors was conducted by McLarty *et al.* among 6,299 persons older than 15 years living in six villages in Tanzania.⁴ This survey found that there was only 1% diabetes, 7.8% impaired glucose tolerance, and 3-5% hypertension in this population. An important finding was that only 7 (13.5%) of 53 people with diabetes had been known to have the condition; 34 (74%) of the other 46 people were symptom-free. National experts wanted to start a prevention programme but did not get support from the Ministry of Health (MOH) as the MOH concluded that noncommunicable diseases (NCDs), including diabetes, were not a significant problem in Tanzania.

In 1993, Andrew Swai *et al.* published their prospective ten-year survey (1982-1991) on the annual incidence of type 1 diabetes in children and adolescents aged 10-19 resident in Dar es Salaam, who were newly attending the diabetes clinic at MNH.⁵ In total 86 new patients were registered, and the incidence was estimated at 1.5/100,000 population aged 0-19 years. The authors concluded that type 1 diabetes in children was rare in sub-Saharan Africa.

Around the year 2000, a verbal autopsy study in the Adult Morbidity and Mortality Project (AMMP), started by McLarty,⁶ showed that mortality mostly occurred at home. In three districts there was up to 27% mortality due to NCDs (including cardiovascular diseases). A surveillance programme was started with external support from Newcastle University. After the death of McLarty, the AMMP stopped, but surveillance continued in the Tanzania Essential Health Interventions Programme (TEHIP), which later became the National Package of Health Interventions.

2004: Start of Donor Support for Children with Type 1 Diabetes

In 2004, Dr Kaushik Ramaiya started fundraising for a new national programme for children with type 1 diabetes. In 2005 the International Diabetes Federation (IDF) responded with a support programme for the TDA, through Life For A Child (LFAC), with additional support of the World Diabetes Foundation (WDF). Tanzania was one of the first three countries (with Rwanda and Democratic

Republic of Congo) in which LFAC became operational. This LFAC support was made possible after Eli Lilly employees raised \$100,000 for these projects.

By 2005, about 10,000 people living with diabetes (mostly type 2 diabetes) were attending the clinic at MNH. Swai and colleagues could no longer manage these large numbers in one location. They began training staff in regional hospitals and referring patients to newly established regional clinics. Swai also introduced the condition that patients seen at MNH needed an official referral.

Around this time, problems started arising with the availability of insulin. Insulin was officially free of charge in the public sector but was mostly out-of-stock in MNH. In the private sector it was highly priced.

The LFAC Memorandum of Understanding in 2009⁷ mentions support in the form of “*insulin as required and agreed in advance, other supplies (if agreed), and funds to cover the needs (if agreed in advance)*”. The memorandum focuses on the receipt, storage and exclusive use of the donated insulin for the children in the programme, and the limited liability of the donor. There is no mention of a commitment by the recipient organisation or national government to gradually take over the supply of insulin.

LFAC wanted a national expert to oversee children with type 1 diabetes and expand the service to the rest of the country. The first dedicated diabetes clinic for children was established within the existing diabetes clinic at MNH, with Sr Elisabeth Licoco in charge until her retirement in 2012. She started with 30 children registered with type 1 diabetes. High average initial values of 12.6% glycated haemoglobin (HbA1c) were reported by Edna Majaliwa,⁸ who later became the first paediatric endocrinologist of the country.

Initially, LFAC supplied funds for insulin to TDA, who then purchased the necessary insulin from the Medical Supplies Department (MSD) and sold it to people living with diabetes at MSD prices. LFAC funds were also made available to regional hospitals for the same purpose. However, this system was later abandoned when some regions objected, as the official policy was that insulin should be supplied to people free of charge. From 2009, LFAC provided human insulin donated by Eli Lilly free of charge. LFAC also started assisting in supplying blood glucose meters and test strips (which cost patients more per month than insulin) donated at a markedly reduced price by Trividia Health, and from 2010 with syringes, donated by Becton Dickinson. LFAC also funded HbA1c testing, educational materials, staff, transport and education needs. It also conducted a LFAC/ International Society for Pediatric and Adolescent Diabetes workshop and supported a first three-day children’s diabetes camp in Dar es Salaam in 2007.

In 2009, Novo Nordisk started their Changing Diabetes in Children (CDiC) programme in Tanzania, providing insulin free of charge to children and adolescents from 0-19 years of age. Initially, a five-year contract was agreed with the MOH, with the understanding that the MOH would ultimately take over the free supply of insulin and test strips. There was also financial support for strengthening the health system, training, and some infrastructure projects.

TDA then divided the donated insulin between the various categories of patients, based on the donor's different conditions. LFAC donations were used to support all young people below 26 years of age at MNH, and all persons diagnosed between 18-25 years elsewhere in the country. CDiC donations were used for all children diagnosed before the age of 15 in the country, except at MNH. However, when the programme grew rapidly in the following years, CDiC support remained limited to 14 clinics, with the rest supported by LFAC. In 2014, the MOH negotiated a project extension of five years, until 2019, with both donors. The extension of CDiC included an increase in the free supply of human insulin but a gradual reduction in financial support for training and strengthening the health system, and a provision that the programme would stop in 2019. The LFAC programme committed to continuing without an end date as long as resources were available, and the needs were still there. In 2019 a further extension of the CDiC programme was agreed upon, with a continued supply of donated insulin until 2024.

2005 – 2021: Towards a National Diabetes Programme

Government Support

Starting in 2005, NCD staff at the MOH gradually increased from one to a full NCD department with six staff members from 2016 onwards. The prevention and care of diabetes was increasingly incorporated into the national NCD programme. Over these years, the TDA and the MOH together gradually expanded the number of diabetes clinics in the country.

Staff and Training

By the end of 2019, staff members from all 186 district hospitals had been trained and 134 diabetes clinics were operational, catering for the needs of patients with type 1 and type 2 diabetes. The training was provided by the TDA, MOH, and the Office of the President, with financial support from the WDF. In every diabetes clinic, two medical doctors and two nurses were trained in diabetes diagnosis and care, together with other staff working in Mother and Childcare, tuberculosis/leprosy, ophthalmology, and nutrition; the training was given per region in groups of about five district hospitals at a time.

From the start of the programme in 2005, healthcare staff training for the new diabetes clinics was performed in close collaboration between TDA, MOH and the Office of the President. This was done to ensure the sustainability of the programme in the case of donor support ending. The MOH convened the training sessions, but the TDA arranged for the content and gave financial support from funds received from WDF.

In 2019, WDF was awarded a major grant for Tanzania from the Novo Nordisk Foundation⁹ whereby funding for scale-up could be provided to TDA, MoH and the Office of the President for a combined rural health worker training programme in Dodoma, given by general health care trainers from the zonal level as part of the regular public sector (re)training programme of health workers. After the programme, training of rural health workers in diabetes care and support became integrated into existing and expanding governmental training programmes on NCDs. This replaced the need for specific training courses on diabetes, which had for many years been funded by donors and run by the TDA.

By the end of 2021, manuals on the diagnosis and treatment of NCDs had been created and regular training programmes were run in seven zonal training centres. By that time, a total of 567 health centre staff had been trained in managing NCDs. Besides in-person training courses, there is also a MOH/Information Technology hub with online health learning programmes. TDA has been working with the MOH Digital Health Unit in Morogoro to upload all the training material by health care providers. This was in process at time of publication, but in the interim, with assistance of UNFM, France, NCD training modules have been uploaded to the hub. An important factor in promoting staff training in NCD management is the new (2021) regulation that all health staff need training points to maintain their license (20 points for doctors, 15 points for nurses); the NCD training is one of the registered training programmes for this purpose.

At the other end of the clinical spectrum, six paediatric endocrinologists have been trained since 2005, mostly in Kenya, to support the diagnosis and treatment of children with type 1 diabetes, and to manage complications in zonal hospitals. In several district hospitals, facilities for in-patient intensive care of NCD complications were also established. The latter programme was only partially successful because, in some districts, the trained staff did not apply what they had learnt, the intensive care bed was not established, and donated equipment was not used (and later disappeared).

Diabetes Clinics

By 2021, 38 hospitals (of which two are in Zanzibar) ran separate clinics for children and youth with type 1 diabetes with more than 10 registered children and youth per clinic; the other hospitals held clinics for people with both type 1 and type 2 diabetes. In these combined clinics the few people living with type 1 diabetes could be overlooked in the much larger group of people with type 2 diabetes - with less specific support and often less accurate patient registration and statistics. From 2020 the MOH encouraged the 153 district hospitals with such mixed diabetes clinics to hold separate clinics for children and youth with type 1 diabetes, in order to provide them with focused care and support. Due to continuous attrition, staff in the district hospitals also required further rounds of training.

For many people living with diabetes, the distance to the nearest district hospital can be too long and travel too expensive. To increase the number of timely diagnoses and to bring access to care closer to people's homes, a decision was made to offer diabetes care at the primary health care level as well. Thus, essential diabetes treatment at the primary care level was included in the 2019 version of the national treatment guidelines, and essential diabetes products were included in the national list of essential medicines for that level of care. The training programme in diabetes care and support was expanded to doctors and nurses in health centres. The rural diabetes clinics were further supported by a WhatsApp group run by the TDA, where practical questions could be answered. Despite the expansion of care, challenges still remain, including identifying and properly diagnosing children with type 1 diabetes who fail to reach the health care facility or are misdiagnosed. In 2022, it was decided to add special focus on the western part of the country to address these issues.

Throughout 2021, several health centres in some of the larger cities (which often treat over 400 people per day) were supported to establish separate diabetes clinics and supply insulin to patients. These urban health centres also function as general outpatient departments. From 2022, within the new national NCD programme, all (> 550) health centres will gradually be provided with training on NCDs; this will include early diagnosis of type 1 diabetes and appropriate triage for referral at higher levels of care. TDA will also help establish specific type 1 diabetes clinics in those regional hospitals not yet offering such service.

Clinical Guidelines

In 2021 and 2022, the national clinical guidelines for diabetes, which had been developed in 2018, were updated. They are closely linked to the East African diabetes guidelines and introduced practical disease management guidelines, e.g., on using and discarding syringes.

Additional Activities

In most clinics, staff had insufficient time for detailed patient counselling. In the diabetes clinic at MNH, young people with type 1 diabetes and diabetes nurses organised dedicated counselling services including education, empowerment and support programmes for children and youth with type 1 diabetes. In November 2019, during the annual NCD week in Dodoma, the national NCD programme was launched with a symposium on diabetes advocacy, screening and counselling. This was a clear statement by the government that diabetes care was to be further integrated into the national NCD programme.

TDA has been making efforts to register all children attending type 1 diabetes services nationwide in the dedicated clinics by the end of 2021. However, the challenge has been obtaining correct data with regards to weight, blood pressure and HbA1c. Tanzania Diabetes Youth Alliance (TDYA) has been working with IT Hub at COSTECH to develop an electronic smart card for each child with type 1 diabetes which can be linked to Health Management Information System of the MoH and PORALG. The smart card will carry all relevant details of the child and will register each clinic visit and supplies received so as to track the supply chain but also clinic attendance.

Estimated Cost of Donor Support

There are no public records of the cost of donor support for Tanzania. LFAC and CDiC only publish the total annual figures of their support programme, not specified per country. Based on some published and personal information from LFAC, only a rough estimate can be made.

The 2015 London School of Tropical Medicine and Hygiene's evaluation of the LFAC programme¹⁰ mentions for 2014 the following LFAC total expenditure for 35 LFAC countries: \$6.3 million (83%) in-kind donations, \$0.9 million (12%) direct support and \$0.4 million (5%) programme costs; a total of \$7.7 million. These figures suggest an average amount per recipient country of around \$200,000-250,000 per country per year, of which about \$25,000 in direct financial support, about \$180,000 in in-kind donations, and about \$11,000 in LFAC programme costs and overheads.

In a personal communication, LFAC estimated the average direct financial support by LFAC to Tanzania for the period 2009–2021 at \$30,000–\$100,000 per 12–18 months, which comes to \$30,000 to \$67,000 per year.¹¹ The value of the donations in-kind is estimated by LFAC at around \$650/child/year (table 1). With an average of 800 children over the period 2009–2021 (1,753 registered children in 2019) this would come to an estimated value of \$520,000 of LFAC in-kind donations per year.

There is a difference between the LFAC assigned value of the donations in-kind and the actual public procurement prices in Tanzania. According to the WHO Guidelines for Medicine Donations,¹² donations in-kind need to be valued against the latter. Following this standard, the average value of the LFAC in-kind donations should be estimated at \$286 – 413 per child per year (table 1) making an average total of \$228,000 – \$330,000 per year (or \$ 258,000 – \$397,000 including direct financial support). The estimated total value of the LFAC support over the last twelve years is then \$3.1 – 4.8 million.

Table 1. Estimated value of LFAC donations to Tanzania, per child per year

	Number /child /year	LFAC assigned value* (US\$)	Value of LFAC Donation (US\$)	2019 Public procurement price Tanzania ¹³ (US\$)	Value based on Tanzania public procurement price (US\$)
Insulin vial	18	10	180	1.8 – 2.4	32.4 - 43.2
Blood glucose meter	1	30	30	19 - 25	19 - 25
Blood glucose meter test strip	550	0.50	275	0.33 - 0.52	182 - 286
Insulin syringe	100	0.20	20	0.05 – 0.11	5 - 11
HbA1c cartridge	4	12	48	n.a. (12)	n.a. (48)
Transport			100		0
Total value /child/year			648		286 – 413

**The LFAC value is calculated as the difference between the price LFAC pays (sometimes zero) and the estimated market value.*

In 2010, the CDiC programme was launched in Tanzania, as a collaborative effort between Novo Nordisk, the World Diabetes Foundation, Roche Diabetes Care, and the TDA. The programme was started for five years, and twice extended with another three years. The extension included the continuous supply of insulin and blood glucose monitoring equipment. Other components included quarterly Hb1Ac monitoring, screening for complications, diabetes camps and patient education materials in English and Swahili.

The enrolment age of 0-19 age was later revised to 0-25 years. The programme has reached over 1800 children since its inception.

From 2015 onwards, over US\$550,000 has been donated towards project activities and management. The donation of supplies amounted to 121,000 vials of insulin, 32,900 packs of test strips, and 470 blood glucose meters. Using the same monetary equivalent as for the LFAC donation (reflecting the public procurement price in Tanzania) the total value of Novo's donations in kind can be estimated at US\$770,000 - US\$1,116,000, bringing the total value of the support programme to US\$ 1,2 - 1,6 million over 11 years.

Putting the two programmes together, the total value of their support over 2009-2021 can then be estimated at US\$ 4,5 - 6,4 million over 13 years, or about US\$350,000 - 500,000 per year.

Impact of the Donor Supported Programme

In a complex and intensive collaboration between TDA, the MOH and external donors it is not easy to assign causality within the donor supported programme to any of the partners. Yet it seems likely that the programme has facilitated a steady increase by the MOH and the TDA in the number of diabetes clinics established in the country, and in the number of people with type 1 diabetes diagnosed and treated. At the start of the donor programme in 2005, there was just one diabetes clinic in the country; by the end of 2019, all referral hospitals and all 187 district hospitals had dedicated diabetes clinics, of which about two-thirds had separate clinics for children and youth. The regular and increasing in-kind donation of insulin and other supplies has played a key role in this development.

In 2003, there were about 50 children known with type 1 diabetes; in September 2019, 2,800 children with diabetes were registered with the TDA (1,047 with CDiC and 1,753 with LFAC). Since 2009, there have been cumulatively 3,888 children and youth in the programme, of which 904 have exited (>25 years) and 184 have been lost to follow-up or died. By the end of 2019, the trend was an increase of about 150 newly diagnosed children per year.

The health indicators have improved, although much still needs to be done. The proportion of children with high (>11%) HbA1c values decreased from 72% to 50%; serious acidosis decreased from 10% to about 0.6%. Yet only half of the children attend school regularly; 32.6% had missed school and three-quarters showed poor performance.^{14 15}

A recent retrospective (2010-2016) study in Tanzania concluded that many patients with type 1 diabetes still had poor metabolic control. Much data was missing, but there was a high prevalence of retinopathy (21.5%) and neuropathy (29.4%) despite the short mean duration of diabetes (6.2 ±4.1 years).¹⁶

Taking Stock

By 2019, the situation for people living with diabetes in Tanzania had drastically improved in many ways over the previous five years.¹⁷ Firstly, more insulin options were available. In 2015 there were only one or two brands of human

insulin on the market; by 2019 there were several options, including biosimilars. Some analogues were also becoming available in the private sector. Biosimilar insulins are priced below or above the price of originator products, depending on the supplier and the sector where supplied (public sector, faith-based or private).¹⁰

Secondly, between 2015–2019 the quality of care, information and counselling for people living with diabetes had much improved. Thirdly, people living with diabetes have become more self-empowered, are willing to ask many more questions, and have become advocates to improve access to insulin. Fourthly, there are many more children and youth with NHIF coverage, replacing the need for insulin donations. Finally, the number of dedicated MOH staff for NCDs had increased from one person in 2005 to a full NCD department in 2019, with six staff members.

These developments have continued in recent years. Serious supply problems of insulin in 2018 and 2019 were tackled in 2020 and 2021 (Chapter 3). The training programmes for health workers and the care and support of people living with diabetes were integrated into the national NCD services. The national Universal Health Coverage bill was introduced in the Parliament in February 2023 but has been returned for further stakeholder discussions.

The Tanzania national diabetes programme is well on the way to serving most people living with diabetes in the country. In chapter 4 we attempt to identify the most important success factors in the transition from a donor supported project to a national diabetes programme. But first, we must describe one specific aspect of the transition: the supply and distribution of insulin.

3. The Supply of Insulin: Transition Towards Integration

In the early years of the programme, insulin was routinely provided free of charge in the public system. From 1993 onwards, medicines supplied in the public sector were subject to a 50% co-payment by the patient although insulin, as a life-saving medicine, was exempted from this. Yet the system did not work very well for insulin because the loss of co-payment income by the hospitals was not subsidised by the government and had to be absorbed within the hospital budget. Many hospitals, therefore, preferred to procure only medicines from MSD for which they could charge the co-payment, and chose not to supply insulin at all.

From 2005 onwards, all insulin for the gradually increasing number of children and youth with type 1 diabetes enrolled in the TDA programme was donated by two donors, Eli Lilly (2005) and Novo Nordisk (2009), and distributed by the TDA to the diabetes clinics. The supply of insulin for people with type 2 diabetes and for adults with type 1 diabetes no longer eligible for the donation programme remained the sole responsibility of the MOH. MSD therefore also continued to procure and distribute insulin as part of the standard public supply of essential medicines, but not all hospitals chose to supply insulin free of charge for the reasons mentioned above. This situation later improved with the increasing number of people covered by the national insurance funds (see below).

2017-2019: First effort to bring donated supplies into the public supply system

In 2017, it was agreed, as part of the extended agreement with Novo Nordisk, that from 2018 the President's Office for Regional Administration and Local Government (PORALG) and the MOH would receive the insulin donated by Novo Nordisk and distribute it to health facilities, as is the case with other vertical disease programmes. The TDA would assist in the distribution by estimating the quantities needed for each diabetes clinic. The role of the TDA was to provide the MOH with the current list of clinics and the number of children and youth with type 1 diabetes requiring insulin. MSD was to provide information regarding the process to the MOH, with a copy to TDA.

In 2018, MSD began the clearing process from the port, storing and distributing donated supplies, similar to other vertical health programmes. The next Novo Nordisk consignment was received by MSD and distributed in the spring of 2019. The first LFAC/Eli Lilly donation to MSD arrived in September 2019.

Teething problems occurred in the first consignments of donated insulin with MSD and the rest of the supply system. Firstly, there was no public budget for the customs clearance costs. Secondly, MSD still had some excess stock of a biosimilar human insulin they had earlier purchased for people with type 2 diabetes, but which had not yet been called forward by the districts. Because this insulin was close to expiry, MSD decided to distribute this biosimilar insulin first, keeping the donated originator insulin for later. This decision was justified from a stock-management point of view but created confusion for some of the children and young people with type 1 diabetes, as they were suddenly given a brand of insulin they were not used to. The potency was not always the same and health workers were not given clear guidance on switching between brands. It also created the impression that MSD was diverting donated insulin to adults not registered in the donation programmes.

In 2019, the responsibility for the clearance of supplies was transferred to the Government Procurement and Supply Agency (GPSA). This transfer of responsibility made matters worse as GPSA had no experience in clearing medical supplies. TDA frequently complained to MSD and finally requested a meeting with the Director-General of MSD, GPSA, MOH and PORALG, to discuss and resolve the issue. At this meeting, it was decided to return responsibility for receiving and distributing all donated insulin and related supplies to TDA – which brought the situation back to that of 2017. The first transition effort had failed.

2020 to Present: Second Effort to Bring Donated Supplies into the Public Supply System

By the end of 2020, it was decided that a second attempt to move the donated supplies towards the public supply system would be made, making use of the lessons learnt from the first effort.

Two developments facilitated the second attempt. Firstly, the COVID-19 pandemic situation helped to improve the public supply system, further

strengthening the use of “pull” rather than “push” systems. Secondly, a change in MOH leadership also helped, with the appointment of a new Director for Clinical Services, Chief Medical Officer, and Permanent Secretary for Health. Intensive discussions were held with MOH staff, and the following bottlenecks were identified:

- 1) Most medicine supply in public hospitals was either reimbursed by the NHIF or paid by uninsured patients; hospital pharmacies operated on a business model of selling medicines and had no administrative mechanism for supplying medicines free of charge, such as the donated insulin and other diabetes supplies.
- 2) There were also erratic “push” distributions by MSD of insulin products that were close to expiry, which hospital pharmacists decided to issue first.
- 3) The hospital pharmacists decided which medicines to issue to patients, not the TDA.

In February 2021, a national assessment of the insulin supply system was made involving systematic interviews with key staff in five zones (Dar es Salaam, Mbeya, Dodoma, Tabora and Kilimanjaro) from the five zonal offices, nine regional hospitals, seven district hospitals and seven health centres, as well as 45 diabetes patients.¹⁸ The main conclusions of the survey were:

- 1) In 2020 there had been supply shortages of insulin and blood glucose test strips in many public facilities, although there were no stock outs in MSD; some regional hospitals did not receive any insulin for 12 months; many hospitals only had one type of insulin in stock.
- 2) Zonal offices did not have information on the allotted amounts; there was no information from MSD on the quantities to be supplied to facilities; there were instances of double insulin supply (donor provided and purchased by the MSD) there was no clear information on donated supplies.
- 3) Most hospitals had little knowledge on the availability of donated supplies and did not differentiate between procured and donated insulin. Most regional hospitals had mixed diabetes clinics of adults with type 2 diabetes and (a few) children with type 1 diabetes. Most district hospitals had mixed clinics for all NCDs, with few staff trained in care for people living with diabetes.

In hindsight, it can be concluded that the first MSD takeover of the donated supplies was insufficiently discussed with the zonal managers and the clinical pharmacists in the regional and district hospitals; and that no specific administrative provisions had been made for supplying donated insulin free of charge in a distribution chain that was otherwise based on direct payment and reimbursement.

In May 2021, a two-day national meeting was held in Dodoma, with representatives of all 36 registered diabetes clinics attending (medical officers, diabetes nurses, and pharmacists), together with MOH officials, MSD zonal and regional managers, and the TDA. The specific disease burden and life-saving therapeutic needs of type 1 diabetes were discussed, as were the above bottlenecks. There, standard operation procedures were developed.¹⁹

In the new system, operational since mid-2021, the diabetes clinics prepare the estimated needs and the request for supplies, which is signed by the hospital pharmacist and the medical officer in charge. This request is received by the TDA.

In the first phase of the second transition, TDA arranges for the supply and distribution of the donated supplies directly to the clinics. This worked very well for the last two three-month distribution cycles in 2021.

In July 2021, another meeting took place between the Tanzania NCD Alliance, TDA, MOH (NCD department) and MSD, to plan for the second phase of the second transition. It was decided that all donated insulin would again be shipped to the MOH/NCD department and cleared by the government clearing agency (with payment by TDA, as there was no MOH budget line for the clearance of donated items). The goods were again distributed by MSD, with newly created separate product codes for the donated supplies. TDA continued to receive the requisitions from the 36 clinics, as the basis for a distribution plan presented to the MSD.

In November 2021, all zonal managers agreed on these administrative procedures and took ownership of it. In the final phase of the second transition, starting early in 2022, all requisitions go directly to MSD, with a copy to TDA. The goods are cleared by GPSA/MSD and sent to the zonal stores, using the special MSD product codes. The introduction of this new system coincided with the extended use of an online ordering system through which clinics can order supplies directly from MSD.

In 2022, TDA will pay for the clearance and distribution costs of the donated supplies, in line with WHO's guidelines for medicine donations²⁰ and will arrange for an annual meeting of the diabetes clinics and the regional and zonal managers, where a progress report will be prepared and presented, and supply challenges will be discussed. In that same annual meeting other issues will be on the agenda, such as a review of children lost to follow-up. Progress so far has been good, but MSD storage and distribution costs (as charged by MSD to the TDA) have proved considerably higher than those paid previously by the TDA to private distributors.

In 2022, there are four sources of insulin in the country: originator human insulin donated by LFAC (Eli Lilly) and CDiC (Novo Nordisk) for children with type 1 diabetes; biosimilar human insulin procured by MSD (often Wockhardt) for adults with type 1 and type 2 diabetes in the public sector; and originator and biosimilar products supplied in the private sector. Most recently, LFAC has also commenced providing a glargine biosimilar insulin from Eli Lilly, in cartridge form with reusable insulin pens. The impact of this insulin compared to human insulin will be studied in Tanzania. Forecasting and ordering the right quantities remains a challenge for MSD. A new forecasting tool, under development by PATH and tested in Kenya and Senegal and given to MSD in 2022, may help.²¹

Insurance Coverage for Diabetes Care and Support

In 2000, following the period of co-payment for medicines introduced in 1993, the MOH started a National Health Insurance Fund (NHIF), initially for all public employees. It was later extended to the employees of some private enterprises. Around the same time, a Community Health Fund (CHF) was also established, covering some limited services at district hospitals. However, the CHF did not work satisfactorily and was considered by some consumers as not worth the premium they were charged. Overall, the free supply of insulin in the public sector remained erratic. This situation was one of the main reasons for seeking donor support in 2005 and 2009.

While insulin for children and youth was covered by the donation programmes, adult NHIF members also had access to human insulin. The NHIF reimburses the cost of one to two vials of human insulin, 25 glucose test strips and five disposable insulin syringes per month. By the end of 2018, the NHIF covered 7% of the population with 3.6 million beneficiaries through 870,345 members. Of the NHIF-participating facilities, 76% were public, 10% faith-based, and 14% private. In 2018, the scope of the NHIF was expanded to children below 18 years, including those with type 1 diabetes. By 2022, the NHIF package covered free insulin and syringes, 25 strips per month, three HbA1c tests per year, two to three lipid level tests, and an annual eye check. It is important to note that the NHIF reimbursement is not linked to the donated insulin.

In September 2019, the government announced the introduction of three price levels of NHIF coverage. For example, for the age-group 18-35, it was TSh 192,000 (\$83), TSh 384,000 (\$166) or TSh 516,000 (\$224) per year, with different ranges of health coverage. By the end of 2021, adults (including patients with type 1 diabetes above 26 years of age, which are no longer eligible for the donation programmes) can join the NHIF. For students, the annual premium is TSh 56,000 (about \$25). The full annual premium of about \$400 is sometimes covered by employers. For an adult on insulin, the full \$400 NHIF premium is cheaper than the out-of-pocket cost of the diabetes services and supplies alone. After five years of coverage, the package even includes renal dialysis.

The National Health Insurance Fund (NHIF) covers approximately 8% of the Tanzania population. This scheme covers insulin, syringes and to certain extent 25 strips/ month. There is also Community Health Fund (CHF) and Improved Community Health Fund (ICHF), whose coverage is approximately 7.6%. Other insurance coverage includes the National Social Security Fund (NSSF) SHIB scheme, covering 0.3% of the population, and private insurance coverage is 1%. Except for NHIF and private insurance schemes, supply of insulin and other diabetes commodities is erratic.

In 2019, adults could join the CHF for TSh 240,000 per year (\$120) and get access to free insulin. The only problem with the CHF is that free access to insulin is not a reimbursement system but depends on supply in the public sector, which in turn depends on district hospitals procuring the insulin from MSD from their budget line for medicines. If they chose not to, there is no free insulin in that hospital for CHF members despite them being entitled to it.

In 2021, a bill to introduce Universal Health Coverage was listed before parliament. It will need two or three readings before it could be accepted and enacted.

In conclusion, there is a positive trend to increasing the number of people in Tanzania with health insurance (7% by the NHF and 25% by the CHF by the end of 2019), with both insurance funds covering the basic costs of diabetes treatment and care. The possibility for children below 18 years with type 1 diabetes to join the NHF is also very helpful in ensuring access to essential diabetes care. For the poorest of children, TDA now pays the NHIF membership from donor funds. For TDA's donors, such as the LFAC, this is a good alternative to donated insulin and supplies.

Care for People No Longer Eligible for the Donor Supported Programme

When young adults with type 1 diabetes reach 26 years of age, they can no longer receive free insulin or supplies from the insulin donation programmes. From that moment onwards there are three options for them to continue receiving insulin.

First, they can purchase human insulin out-of-pocket, for about TSh 18,000 (\$7.50) per vial, or TSh 30,000-50,000 (\$13-22) per vial for insulin analogues, or TSh 120,000-160,000 (\$51 - \$68) per month for pens. These were the prices as reported in 2018 by the Tanzania Diabetes Youth Association (TDYA).²² In 2019, a systematic price survey put the median prices for regular and NPH human insulin in private pharmacies at TSh 17,000 (\$7, range \$5-11), and mixed human insulin at TSh 18,000 (\$7.50, range \$7 - \$11). In private hospitals, median prices of human insulins were slightly higher (and more variable) and analogue insulin glargine was TSh 20,000 (\$8.50, in one private hospital only).²³

Second, they can join the National Health Insurance Fund (NHIF) for TSh 192,000 (\$83 per year) for the lowest level coverage. The third option is that they can join the CHF. The CHF is the least reliable option, as insulin is not always available in public hospitals and, if it is, many hospitals charge a 50% co-payment. More details on the availability, price and affordability of insulin, blood glucose meters, test strips and insulin syringes in the public and private sector in Tanzania is published in the systematic study quoted above.²⁴

For children and youth newly diagnosed with type 1 diabetes, the future transition out of the donor supported programme is not a problem. Upon entry in the TDA, young people who are eligible are provided NHIF membership with support from LFAC and CDiC programmes (TSh 54,000 or \$23 per child per year in 2019; TSh 56,000 in 2021). The NHIF then covers essential diabetes care with insulin and test strips, and the TDA supplies patient and parent education. After they reach the age of 25, they can continue the NHIF insurance themselves (see above).

The diabetes clinic in MNH has been arranged as follows since 2019: Mondays are reserved for children with type 1 on TDA/donated insulin; Tuesdays, for children and adults with type 1 and type 2 diabetes on NHIF; and Thursday is for the exempted (with referral letter) who receive free insulin.



Left: The diabetes clinic at Muhumbili National Hospital. Right: counselling room for young people with type 1 diabetes, directly accessible from the street

Most young people in Tanzania have a mobile phone. There is a very active WhatsApp group of young people with type 1 diabetes with 169 members (in 2019), run by the TDYA. Most participants were recruited for the group during the two diabetes camps for 18–25 year olds held in 2017 and 2018. Some doctors and nurses also participate in the group, responding to more technical medical questions when they arise. Many questions are raised in this group regarding the transition out of the donation programme (e.g., how to enrol for the NHIF, where to get insulin, how to deal with fluctuations in glucose control, and questions regarding reproductive health and pregnancy). For this reason, the plan is to split the group into various age groups. Some of the leaders of the TDYA support young people on an individual basis, for example, seven youths are being actively supported by TDYA youth leader, Anita Bulindi.

TDA is working with Ministry of Health (MoH) and President Office Regional & Local Government (PORALG) to explore the possibilities of using the existing HMIS system at different level of health care to establish the tracking database for children with type 1 diabetes. This will be more sustainable.

4. Lessons from Tanzania (2005-2021)

In discussions with key stakeholders, a number of success factors were identified that have contributed to the positive achievements of the national diabetes programme. These are discussed below.

1. Immediate and Continuous Involvement of the MOH

From the start of the donor supported activities in 2005, the MOH was involved in the project through its dedicated NCD officer. Although initially believed to be of low priority because of the perceived low diabetes prevalence in the country (as reported in the studies by McLarty and Swai), MOH officials never objected to the increased focus on people living with type 1 diabetes. Over time, with increasing numbers of diabetes clinics and registered patients, the MOH's attitude became increasingly supportive. The first key success factor was therefore the immediate and continuous involvement of the MOH in the donor supported programme; and the involvement of MOH staff in all training programmes and meetings.

2. MOH is Convinced that Treatment of Type 1 Diabetes is Possible

The early and supportive involvement of the MOH ensured that they were interested in the outcomes of the programme. These included, first, factual evidence on the rising numbers of clinics and patients, and the improved health outcomes that the programme reported on and frequently shared with the MOH. The second factor was the proof of concept, delivered by the TDA and the donor supported programme, that children with type 1 diabetes could be successfully diagnosed and treated without medical specialists, such as paediatric endocrinologists. The final argument was the proof, delivered by the programme, that the necessary health system and services are possible even within limited budgets.

Box 1. Four reasons that convinced the Ministry of Health that treating type 1 diabetes was important and feasible in Tanzania:

- 1) Direct and continuous involvement of the MOH in the planning and activities of the donor supported diabetes projects.
- 2) Concrete data on the number of clinics, patients and improved health outcomes.
- 3) Proof of concept that type 1 diabetes can be diagnosed and treated without the need for many medical specialists.
- 4) Concrete proof that diabetes services are not very expensive and can be carried out even in resource-limited settings.

3. Concurrent Policy Developments in Tanzania

The success of the ongoing transition was also thanks to other developments in Tanzania at the same time. First, the concurrent establishment of the NHIF offered a good opportunity to include essential diabetes care in the package. Second, the government became increasingly interested in the prevention and treatment of NCDs in general. Third, the government increased public investment in health care and essential medicines in general. For example, the government budget for essential medicines tripled between 2016 and 2019.

Box 2. Concurrent positive developments in Tanzania

1. Establishment and development of social health insurance in the country.
2. Increased government interest in preventing and treating NCDs.
3. Increased government investment in health care and essential medicines.

The TDA made use of these developments by ensuring that care and support for people with type 1 diabetes were included in these general expansions in public health care. An example of this connection with the MOH was that the TDA assisted the MOH in the development of the first national NCD plan (2010-2015), likewise with the second national NCD plan (2016-2020).

This assistance included input from TDA experts and some consultants paid by TDA donor support. TDA was equally involved in the preparations for the third national NCD plan.

4. The Presence and Perseverance of a Number of National Champions

The final factor for the success of the programme has been the continuous involvement and tireless efforts of a number of national champions. While the first diabetes clinic in the 1970s was started by expatriate doctors as part of the external technical support by UK institutions to Muhumbili National Hospital, the national diabetes programme was developed over three decades by a group of very able, dedicated national champions, such as Prof Andrew Swai and later Prof Kaushik Ramaiya, supported by many colleagues in diabetes care. It was their clinical, scientific, advocacy and diplomatic skills that were, and remain, essential for the programme's success.

Box 3. Motivation of a champion

In 1997, as a young clinician, Dr Kaushik Ramaiya saw a one-year-old baby from Zanzibar whose father complained that he could no longer afford the huge daily number of nappies. After a wrong diagnosis of a urinary infection, the final diagnosis of type 1 diabetes was made. This was the first time Dr Ramaiya ever saw a young child with diabetes and he started to wonder how many such children were in the provinces. At the same time, John Yudkin's paper was published, stating that the average survival of African children with type 1 diabetes was about six months. Ever since, Dr Ramaiya has worked tirelessly to prove that Yudkin's estimate was not a fait accompli and that Tanzania could do better.

5. Remaining Challenges

Although the MOH was not immediately convinced of the need, there has never been any opposition to the type 1 diabetes programme. Initially, the national HIV programme did not support the integration with diabetes care; but since 2018-19 an international research collaboration has started.²⁵ Yet, some technical challenges remain.

1. The Public Supply of Insulin Must be Regularly Monitored

Challenges with the timely ordering, clearance, and distribution of donated and publicly procured insulin, which occurred in 2018 and 2019, were discussed and addressed in 2021 and 2022. The final outcome is yet to be seen and the supply system needs continuous monitoring and the findings made public. In general, we can now conclude that the public supply of insulin suffers from the same problems as other public sector medicine supplies. However, this is not good enough as the continuous and general availability of insulin is literally a matter of life and death for people living with type 1 diabetes or with insulin-dependent type 2 diabetes.

Insulin should be treated with special attention, e.g., with more frequent stock controls, higher reserve-stock levels, and more frequent deliveries to the zonal and district hospitals. The supply of this life-saving medicine simply cannot be erratic or interrupted.

2. Free Insulin Through the CHF Must be Streamlined

The supply of insulin to members of the CHF who are entitled to free insulin in diabetes clinics in district hospitals needs to be ensured. As the CHF is based on free supply (not reimbursement), the public supply is essential for people to receive the medicine they are entitled to (and have paid for through premiums). This should also apply to the supply of necessary syringes and test strips. Financial compensation to the district hospitals for the lack of patient co-payment for insulin is needed to remove the financial disincentive for hospitals to stock and deliver insulin.

3. More Health Workers Must be Trained in Diabetes Care

More health workers at the health centre level need to be trained and supported, to increase early diagnoses of people with type 1 diabetes, bring the treatment closer to their homes; and compensate for frequent staff movement and attrition. The integration of basic diabetes training into the regular curriculum of the government in-service training programme is a good step in this direction; however, continuous training of new rural staff remains needed. The same applies to the frequent changes in key positions in the government, e.g., MSD staff. The same in-service training in the new national approach to diabetes prevention, diagnosis, treatment and patient support also needs to be part of all (para)medical undergraduate training programmes.

4. More Glucose Test Strips and Syringes Must be Reimbursed

The number of glucose test strips for people with type 1 diabetes reimbursed by the NHIF needs to be increased, from two to at least four tests per day. The lack of testing during the day is a contributing factor to poor metabolic control. The number of insulin syringes reimbursed (currently five per month) also needs to be increased to ensure patient safety.

6. How does Tanzania Fit in the 10-step Transition Process?

In 2019, an evaluation of the impact of several donor supported diabetes programmes in low- and middle-income countries (LMICs), including Tanzania, proposed ten steps to phase out an insulin donation programme²⁶ (Box 4). The ten steps were partially based on the experiences in Tanzania, and it may be useful to assess where the programme currently stands.

Box 4. Ten steps to phase out an insulin donation programme

- 1) In countries where the public sector is unable to provide insulin and where high prices in the private sector make insulin unaffordable, the pharmaceutical industry and other donors should support a national diabetes programme with a free basic package of patient education, diagnosis and treatment for as many children and youth with type 1 diabetes as possible, thereby preventing the almost certain death they would otherwise face; and create a national patient register for follow-up and reporting.
- 2) The pharmaceutical industry and other donors should collaborate with the national diabetes programme to create a national continuum of care for type 1 diabetes from childhood to early adulthood, e.g., by combining in every eligible country the CDiC donation programme (till age 18), the LFAC donation programme (till age 25) and the Base of the Pyramid and other insulin discount programmes (for adults).
- 3) The national diabetes programme should collaborate with the Ministry of Health to strengthen national health systems to prevent, diagnose and treat acute and chronic complications of type 1 diabetes.
- 4) Donors and the national diabetes programme should provide detailed information on key aspects of the support programme, such as the number and basic characteristics of recipient patients; the number, type and value of diagnostic tests and medicines donated; the nature and cost of other programme activities supported; and basic health outcomes such as mortality, weight gain, mean HbA1c levels, and frequency of complications.
- 5) The national diabetes programme should deliver to the Ministry of Health, national health insurance systems and donors the proof of concept that type 1 diabetes can be successfully and cost-effectively diagnosed and treated in LMIC, with improved health outcomes for patients.
- 6) The national diabetes programme should support the Ministry of Health in developing and implementing a national diabetes policy and implementation plan, as a public commitment and guide for action towards achieving universal access to decentralised health services for the prevention, diagnosis and treatment of diabetes, as part of the progressive realisation of the right to health.
- 7) The national diabetes programme should encourage the government to include the diagnosis, care and treatment of diabetes in all social health insurance programmes.
- 8) The pharmaceutical industry should create or strengthen existing differential pricing mechanisms to make essential insulin products affordable to national governments and social health insurance schemes, and participate in pooled procurement initiatives when applicable.

- 9) The national diabetes programme should encourage the Ministry of Health to integrate the prevention, diagnosis and treatment of diabetes and its complications with the delivery of nutritional advice and services for the prevention and treatment of other chronic conditions (e.g., HIV, tuberculosis, leprosy, hypertension).
- 10) The pharmaceutical industry and other donors should phase out their support for the national diabetes programme as soon as these objectives have been achieved.

When looking at this ten-step model, we can conclude that steps one to five have been successfully completed in Tanzania. The TDA has delivered a convincing proof of concept that type 1 diabetes can successfully be diagnosed and treated in Tanzania, without the need for large numbers of specialist endocrinologists and expensive equipment. Yet the reported sub-optimal health outcomes of the programme (Chapter 2) show that more needs to be done to further improve metabolic control.

The remaining steps show a mixed outcome. Although there is a national NCD five-year plan, no specific national diabetes policy and implementation plan (Step 6) have been developed and published in Tanzania. Such a plan should serve as a public commitment by the government and as a guide for action towards achieving universal access to decentralized health services for the prevention, diagnosis and treatment of diabetes, as part of the progressive realization of the right to health.

Integration of diabetes care into social health insurance (Step 7) is underway in Tanzania, with about one third of the population covered by the NHIF or the CHF. Here, the remaining challenges are ensuring a reliable public supply of insulin in rural facilities for patients enlisted in the CHF, and the need to include the rest of the population in the insurance scheme.

A reliable system of intra-country differential pricing (Step 8) has not been established by the pharmaceutical industry, although this is a logical follow-up to donations. Eli Lilly has no differential pricing system at all. Novo Nordisk has made a public commitment to supply the public sector in LMICs with human insulin at a maximum price of 20% of its price in industrialised countries. The company has published this reduced price in its annual report, but not the list of countries and the actual volume of insulin per country sold at this price. Its Base of the Pyramid scheme only covers four countries, and Tanzania is not one of them. Until the end of 2021, neither company has participated in UN or other non-profit international procurement schemes (other than emergency supplies for humanitarian disasters).

Integration of the prevention, diagnosis and treatment of diabetes and its complications (Step 9) with the delivery of nutritional advice and with services for the prevention and treatment of other chronic conditions such as HIV, tuberculosis, leprosy, and hypertension is well underway in many district hospitals. The training of rural health workers in diabetes care has been integrated into the national in-service curriculum. Here, the challenges are to further integrate the care for people living with type 1 diabetes into general

services for diabetes and NCDs, without losing the specific attention these patients need; and to expand the care and treatment of diabetes to rural health centres with limited health worker capacity and small numbers of people living with diabetes.

The final step, i.e., the withdrawal of the donors after a successful transition (Step 10), has not yet been taken by the donors. Currently, all donated insulin and other commodities are delivered to Medical Stores Department (MSD) and distributed by "pull" system based on the numbers registered at respective type 1 diabetes clinics. The company has not yet taken the next logical next step, which is a scheme of intra-country differential pricing, with guaranteed low prices of human insulin to the public and faith-based sector as a replacement for the donations. Through the major grant for scale-up in Tanzania received by WDF from the Novo Nordisk Foundation, WDF has started to give financial support to the integrated in-service training for health staff. Eli Lilly has committed to the continuation of the LFAC programme in the coming years.

While five-year periods for donor support are reasonable and practical, much more time is needed for the successful transition of a donor supported project towards a sustainable national diabetes programme. In Tanzania, the donor supported programme started in 2005, but by 2021 the transition towards a national diabetes programme has not yet been completed.

7. Lessons for Other Countries

A high degree of modesty is warranted when trying to extract possible lessons for other countries, even for other LMICs in Sub-Saharan Africa, as their historical background and current situations are often very different. Any lessons from Tanzania in the transition of a donor supported project towards a national diabetes programme may only be useful for countries with similar general conditions as Tanzania: a favourable and stable political environment, with a government interested in promoting public health, moving towards universal health coverage through social health insurance, and sufficient staff to implement it. If these conditions are met, a few lessons from Tanzania could perhaps be valid in the practical application of the ten-step transition process.

Box 5. Practical lessons and recommendations for a successful transition from a donor supported project towards a national diabetes programme

- 1) Ensuring long-term efforts by one or more dedicated national champions, willing to remain closely involved in the development of the national diabetes programme.
- 2) Planning for a long-term development process (10-20 years), with financial and technical support for training and development activities, and free supplies of insulin and essential insulin supplies, at a cost of around \$300-\$500/child/year.

- 3) Closely involving the MOH through frequent participation in meetings and training programmes, and frequent sharing of results of the donor supported project.
- 4) Convincing the MOH that diabetes diagnosis and treatment are feasible and affordable, by promoting cost-effective treatment, using human insulin and treatment by trained general medical staff (not by medical specialists).
- 5) Systematically collecting data to document the disease, the programme activities, the health outcomes, and expenditure.
- 6) Creating and supporting diabetes clinics all over the country, with the integration of diabetes care with general NCD services in district hospitals, and integration of diabetes training into standard in-service health worker training programmes (no vertical training programmes for diabetes only).
- 7) Making use of concurrent national developments, e.g., national NCD policies, increased investment in health and essential medicines, and the development of universal health coverage through national health insurance.
- 8) When integrating the distribution of donated insulin with regular medicine supplies, ensuring specific arrangements for the distribution of free products within an administrative system otherwise based on payments; this may include the payment of clearance, storage and distribution costs by the donor, and waiving of patient co-payments at the facility level.
- 9) Including essential diabetes care into social health insurance reimbursement schemes for the monthly supply of insulin, syringes and test strips will gradually replace the need for donated insulin. An insurance system based on free supply of insulin in public facilities remains vulnerable to supply problems and stock outs.
- 10) Including people living with diabetes in the programme, to help ensure their needs are met and to support children and youth newly diagnosed with type 1 diabetes.

8. Conclusion

In Tanzania, the catalyst for developing national services for type 1 diabetes was delivering the proof of concept that this was an important health problem that could be successfully diagnosed and treated at a relatively low cost. Essential features have, from the start, been sufficient donor funding and support given towards strengthening the national health system, and that type 1 diabetes care was integrated within existing clinical services, and later within the national NCD programme. This prevented the development of a vertical diabetes project. Insulin donations alone would certainly not have resulted in a sustainable national diabetes programme.

The development of the national diabetes programme has benefited greatly from several extremely gifted and dedicated national champions, such as Prof Andrew Swai and Prof Kaushik Ramaiya, who have promoted and developed the

programme from scratch to its current size. In the words of Prof Ramaiya, essential components for success have been “*patience, persistence and showing results*”. In addition, the programme has been carried out by large numbers of very dedicated doctors, nurses, and people living with diabetes who support education and empowerment. Fortunately, there are now numerous specialists, general doctors and diabetes groups in the country, who can help ensure the further consolidation of the programme within the scope of the strengthened national health system (the new national NCD programme, and the growing National Health Insurance Fund). The diagnosis and care for people with type 1 diabetes have irrevocably been established within the Tanzanian health system, and its development will, from now on, remain on a par with that of other diseases. For the sake of people living with diabetes, and for other countries embarking on a similar programme, regular monitoring and evaluation remains crucially important.

Acknowledgements, persons consulted

Anita Belindi, Tanzania Diabetes Youth Association, Dar es Salaam
David Beran, University of Geneva, Geneva
Julie Cliff, London
Nina Essex, London
Marg Ewen, Health Action International, Amsterdam
Molly Lepaska, Health Action International, Amsterdam
Happy Nchimbi, Tanzania Diabetes Association, Dar es Salaam
Graham Ogle, Life For A Child, Australia
Oladele Olagundoye, Novo Nordisk, Middle Africa
Kaushik Ramaya, Tanzania Diabetes Association, Dar es Salaam
Andrew Swai, Tanzania Diabetes Association, Dar es Salaam
John Yudkin, London

References

1. Hogerzeil HV, Recourt S. The importance of insulin donations for children in 43 low- and middle-income countries. *Journal of Public Health Policy*, 2019; 40(2), 253-263. DOI 10.1057/s41271-018-00159-w.
2. Essex NL, Cliff JL. Analysis of treatment of diabetes mellitus at Muhumbili Hospital, Dar es Salaam. In: Benett FJ, Nhoholi AM, Nsanzumuhire H (eds) *Degenerative Disorders in the African Environment – Proceedings of the 1975 Annual Scientific Conference of the East African Medical Council*. East African Literature Bureau, 1975; 85-87.
3. Mhando PA and Yudkin JS. The pattern of diabetic complications in African patients in Dar es Salaam. *Trop Geograph Med* 1980 (32): 317-323.
4. McLarty DG, Kitange HM, Mtinangi BL, Makene WJ, Swai ABM, Masuki G, et al. Prevalence of diabetes and impaired glucose tolerance in rural Tanzania. *Lancet* 1989, Vol 33, 871-875.
5. Swai ABM, Lutale JL, McLarty DG. Prospective study of incidence of juvenile diabetes mellitus over 10 years in Dar es Salaam, Tanzania. *BMJ* 1993; 306: 1570-72.
6. CDC. Cause-specific adult mortality: evidence from community-based surveillance--selected sites, Tanzania, 1992-1998. *MMWR Morb Mortal Wkly Rep*. 2000 May (19):416-9.
7. The MOU between LFAC and Tanzania has been lost. This information has been taken from a similar MOU with Rwanda, signed 13 November 2009.
8. Majaliwa ES, Munubhi E, Ramaoya K, Mpembeni R, Sanyiwa A, Mohn A, Chiarelli F. Survey on acute and chronic complications in children and adolescents with type-1 diabetes at Muhumbili National Hospital in Dar es Salaam, Tanzania. *Diabetes Care* 2007; 30: 2187-92.
9. The Novo Nordisk Foundation is an independent foundation which supports scientific, humanitarian and social causes. The Novo Nordisk Foundation is the majority shareholder of Novo Nordisk. The foundation is performing and supporting activities that would be difficult for Novo Nordisk company to do.
10. Atkinson S, Sigfrid L, Eeles M, Atkinson Z, McKee M. From surviving to thriving: evaluation of the international diabetes foundation – life for a child programme. London School of Tropical Medicine and Hygiene; 2015. <https://lifeforachild.org/wp-content/uploads/2017/12/Evaluation-of-the-IDF-Life-for-a-Child-Program.pdf>. Accessed 3 May 2022.
11. Graham Ogle (LFAC), personal communication.
12. Guidelines for medicine donations, third rev. Geneva: World Health Organization, 2011; p. 12.
13. The availability, price and affordability of insulin, syringes, glucometers and test strips in Tanzania. Tanzania: NCD Alliance, 2020.
14. Ramaiya K. Insulin programmes in Sub-Saharan Africa: Tanzania. Presentation at the Third African Diabetes Conference, 19-22 April 2017, Yaoundé.
15. Muzi KC, Majaliwa ES. Type 1 diabetes updates: Tanzania. *Indian K Endocr Metab*. 2015; 19 (supplement)
16. Najem S, Majalima ES, Ramaiya K, Swai ABM, Jasem D, Ludvigsson. Glycemic control and complications of type-1 diabetes among children in Tanzania. *J Clin Transl Endocrinology* 2021. See: <https://www.sciencedirect.com/science/article/pii/S2214623720300983>.
17. Kaushik Ramaiya (personal communication).
18. Assessment report: Supply chain system of donated insulin, strips and glucometers. Dar es Salaam: Tanzania Diabetes Society, February 2021.
19. Supply chain system for type 1 diabetes supplies: Stakeholders Meeting, Dodoma, 6-7 May 2021. Dar es Salaam: Tanzania Diabetes Association, 2021.
20. Kaushik Ramaiya (personal communication).
21. Kaushik Ramaiya (personal communication).
22. Estimated prices reported by the Tanzania Diabetes Youth Association in 2018 (Anita Belindi, personal communication).
23. Majaliwa ES, Munubhi E, Ramaoya K, Mpembeni R, Sanyiwa A, Mohn A, Chiarelli F. Survey on acute and chronic complications in children and adolescents with type-1 diabetes at Muhumbili National Hospital in Dar es Salaam, Tanzania. *Diabetes Care* 2007; 30: 2187-92.
24. Majaliwa ES, Munubhi E, Ramaoya K, Mpembeni R, Sanyiwa A, Mohn A, Chiarelli F. Survey on acute and chronic complications in children and adolescents with type-1 diabetes at Muhumbili National Hospital in Dar es Salaam, Tanzania. *Diabetes Care* 2007; 30: 2187-92.
25. Kaushik Ramaiya (personal communication).
26. Hogerzeil HV, Recourt S. The importance of insulin donations for children in 43 low- and middle-income countries. *Journal of Public Health Policy*, 2019; 40(2), 253-263. DOI 10.1057/s41271-018-00159-w.