ANNUAL REPORT 2021



Tropical Diseases Research Centre

1. 51. 34

A culture of excellence in health research

+260212620737 info@tdrc.org.zm

List of Acronyms

(ACTs)	Artemisinin Combination Therapies
AL	Artemether-Lumefantrine
AGYW	Adolescent Girls and Young Women
AIDS	Acquired Immune Deficiency Syndrome
ANC SS	Antenatal Clinic Sentinel Surveillance
CDC	Centre for Disease Control
СТХ	Cotrimoxazole
DREAMS	Determined, Resilient, Empowered, AIDS-free, Mentored, and Safe
DP	Dihydroartemisinin-Piperaquine
DQA	Data Quality Assurance
EDCTP	European and Developing Countries Clinical Trial Partnership
GCP	Good Clinical Practices
HIV	Human Immune Virus
IPT	Presumptive Treatment in Pregnancy
IRS	Indoor Residue Spraying
KAP	Knowledge, Attitudes and Practice
LAN	Local Area Network
МОН	Ministry of Health
NHRA	National Health Research Authority
NMEP	National Malaria Elimination Programme
PBX	Private Branch Exchange
RITA	Recent Infection Testing Algorithm
SOPs	Standard Operating Procedures

- TAFS Technical Administrative Financial
- TDRC Tropical Diseases Research Centre
- TV Trichomonas Vaginalis
- UTH University Teaching Hospital
- QA Quality Assurance
- QMS Quality Management System
- ZAP IT Zambia assessment of prevention and identification of TB:
- ZITF Zambia International Trade Fair

The Board Chairman and Director's Statement

The year 2021 posed significant challenges as the world grappled with COVID-19, yet the Centre's resilience and agility, backed by our team's professionalism, enabled us to surpass our operational expectations. We not only maintained our research amidst the pandemic but expanded in both project scope and staffing, emphasizing our commitment to disease prevention and control. The details of these efforts are detailed in this report.

We are pleased to report that our laboratories have continued to undergo external reviews to promote quality improvement and uphold international standards. These reviews focus on elements that influence the achievement of desired results, ensuring the satisfaction of our users. Since 2019, the Centre has upheld its SADCAS accreditation by implementing a laboratory Quality Management System (QMS) based on ISO 15189:2012. During a 2021 reassessment, the Centre received recommendations to continue its accreditation for previously accredited areas, including Immunology, Parasitology, Clinical Chemistry, and Mycobacteriology, and to extend its scope to cover Microbiology, Molecular Biology, and Haematology. Additionally, the Centre's COVID-19 Laboratory underwent an assessment by the Testing Certification Program (CoLTeP)-ASLM and achieved a 98% score, earning a 5-star rating. This achievement positioned the TDRC COVID-19 laboratory as one of the select labs in the country authorized to issue internationally recognized traveler COVID-19 negative certificates.

Our core research remained focused on malaria, HIV/AIDS, TB, and micronutrient studies. Recognizing the importance of understanding immunity in populations, we expanded our research scope in the past year to encompass seroprevalence studies, with a particular emphasis on measles and rubella.

We are pleased to share findings from a clinical trial titled "Efficacy, Safety, and Tolerability of Pyronaridine-artesunate in Asymptomatic Malaria-infected Individuals." The study aimed to evaluate the effectiveness of Pyronaridine-artesunate given over three, two, and one day by assessing PCR-adjusted adequate parasitological response at Day 28 in asymptomatic P. falciparum carriers. The results demonstrated a 100%

efficacy rate for the 3-day and 2-day regimens through day 63, while the 1-day regimen showed a slight decrease to 94.4% efficacy. These findings suggest pyronaridine+artesunate as a potential choice for mass drug administration in malaria control.

We extend our profound gratitude to our research partners, including funders, volunteers, research participants, advisory groups, and government entities, for their unwavering support. Lastly, a heartfelt commendation goes to the Board, Management, and the entire TDRC staff for their dedication and commendable efforts throughout 2021.

Dr. Godfrey Biemba

Dr. Gershom Chongwe

Board Chairman

Director & Chief Executive Officer

Acknowledgements

The Directorate would like to express deepest appreciation to all those who provided input to complete this report. A special gratitude to all the Heads of Departments whose contribution towards the compilation of this report was exceptional.

1 Introduction

The Tropical Diseases Research Centre (TDRC) was established as a national research Centre in 1981, and since then the institution has gone through significant transformations, broadening its research mandate over the decades. While initially focusing on tropical diseases for which it was created, such as like malaria, schistosomiasis, trypanosomiasis, and filariasis, TDRC's mandate has evolved to address emerging diseases and health conditions, including HIV/AIDS, Tuberculosis (TB), diarrheal diseases, and vitamin A deficiencies, among others. These research efforts empower policymakers with evidence-based insights for crafting policies and guidelines.

In light of health sector reforms and policy changes in the country, TDRC has adapted, ensuring its relevance not just to Zambia but to the broader regional and global health landscape. Our mission is to generate evidence that is critical for disease prevention and control.

TDRC's key focus areas include:

- Research and training on nationally significant diseases and health issues.
- Technical support for national control programs.
- Information dissemination, advocacy, and research promotion.
- Infrastructure development and equipment upgrades.
- Collaborative training initiatives for external organizations.
- Fostering new local and international research and training collaborations.

The Centre is governed by the TDRC Act of 1982. The decision making is overseen by the Board which is appointed by the Honourable Ministry of Health (MOH). This Board supervises the Management Committee, spearheaded by the Director, supported by a Deputy Director and Board Secretary.

The Centre comprises four departments: three are scientific - Public Health, Biomedical Sciences, and Clinical Sciences - and the fourth is the Administration department.

1.1 Public Health Department

As an integral part of TDRC, the Public Health Department aligns its strategic framework with national, regional, and international health priorities. This ensures that its goals and objectives resonate with the overarching vision of TDRC.

Focused on enhancing public health outcomes, the Department is structured into specialized units: Epidemiology, Behavioural Sciences, Health Systems, Biostatistics, and Data Processing. It takes the lead in research related to public health conditions as outlined in the TDRC strategic plan, aiding in their prevention and control. Key objectives encompass the development and evaluation of tools for disease prevention, along with the dissemination of findings through publications and reports.

To fulfil its mandate, the Department mobilises resources from governmental bodies like the Ministry of Health, as well as international grant opportunities. Their research spans a broad spectrum, from communicable diseases like malaria, HIV/AIDS, and TB to non-communicable diseases such as heart ailments and diabetes. While the department have extensively studied certain diseases, it can be acknowledged that some areas, like mental health, some categories of non-communicable diseases such as alcohol and substance abuse and trauma-related conditions, need further exploration.

Over the years, the Department has also been at the forefront of surveillance and epidemic control, addressing outbreaks like cholera, measles, typhoid and poliomyelitis. Beyond disease-specific research, the department has a mandate to anchor environmental health, sanitation, health promotion, and research in traditional remedies. In close liaison with other Departments in the Centre, the department collaborates with national and international research institutions, and the Ministry of Health, ensuring a holistic approach to public health challenges.

2

1.2 Biomedical Sciences Department

The Biomedical Sciences Department is one of TDRC's three research departments. Its primary role is to support public health decisions and clinical interventions for the MOH thro

ugh basic science research. The department, being the largest at TDRC, comprises four main units: Clinical Microbiology/Tuberculosis; Immunology-Haematology; Vector Biology-Parasitology; and Clinical Chemistry-Nutrition. Additionally, a Molecular Biology Laboratory serves these units and supports the Clinical Sciences and Public Health departments.

To effectively fulfill its mission in Zambia and beyond, TDRC emphasizes maintaining a robust core staff, acquiring essential laboratory equipment, and enhancing laboratory infrastructure. TDRC has undertaken initiatives to increase technical and scientific staff numbers, elevate research competencies through both long and shortterm training, acquire state-of-the-art laboratory equipment, upgrade lab facilities, and implement a Quality Management System. As a result, TDRC's biomedical laboratories have achieved ISO 15189 accreditation for Medical Laboratories.

The functions of the Biomedical Sciences Department include: • Supporting national surveillance programs and population-based surveys such as the Zambia Demographic Health Survey, HIV sentinel surveillance, and the National TB Survey. • Implementing research and public health programs, ensuring a well-trained core staff, and managing laboratory equipment and service contracts. • Offering training to local and international health professionals in research at both undergraduate and postgraduate levels.

1.3 Clinical Sciences Department

The Clinical Sciences Department oversees clinical trials and offers patient care services. It consists of two units: Clinical Research and Clinical Services. While the

former focuses on clinical research endeavors, the latter delivers health care via the Outpatient Clinic.

During the period under review, the department bolstered TDRC's research efforts through collaborative grant applications and clinical research in Nchelenge and Ndola. The Clinical Services Unit offered a holistic care package, including counseling, diagnostics, and curative services. Additionally, the department lent its expertise to National Disease Control Programs, with several scientists participating in National Technical working groups, regulatory and policy making bodies and a Data Safety and Monitoring Board.

1.4 Administration Department

The Administration Department's mission is to maintain a skilled, well-supported, and motivated team, guaranteeing safe, ethical, cost-effective, and high-quality services. It encompasses eight units: Human Resource, Accounts, Procurement, Stores, Library and Information Services, Secretarial, Transport, and Security. Its primary goal is to bolster the Centre's operations by ensuring the peak performance of each departmental unit.

2 Scientific Accomplishments

The Centre has continued to pursue research projects and scientific initiatives in partnership with renowned local and international research institutions and donor agencies. Malaria and HIV/AIDS dominated the research landscape this past year. Additionally, investigations into nutritional disorders and TB were also undertaken. This report delves into the key research projects from 2021, categorizing them into three main thematic areas such as Malaria, HIV/AIDS & TB, and Micronutrients research

2.1 Thematic area: MALARIA

Malaria is a primary health concern in Zambia, contributing significantly to morbidity and mortality. Despite the challenges posed by this disease, Zambia is ambitiously aiming for malaria elimination by 2021. Achieving this goal requires a collective effort, employing effective, evidence-based strategies. Recognizing the importance of this mission, TDRC has emphasized malaria research to furnish the necessary evidence supporting elimination efforts. TDRC spearheads epidemiological studies, entomological research, and clinical trials to deepen our understanding of malaria's impact, assess the effectiveness of current control measures, and bolster malaria product development both nationally and globally.

In 2021, several studies were underway at TDRC. The specifics of each study are detailed below:

2.1.1 Management of Malaria in African Countries: A multicenter, prospective, non-interventional study

The recent World Malaria Report (WHO 2018) pointed out significant gaps in the access to and uptake of malaria interventions. This underscores the importance of early diagnosis and treatment. To fully grasp malaria management in Sub-Saharan Africa, we must analyze patient demographics, real-world diagnostic methods, medical management, and adherence to established guidelines. By mapping local practices and understanding a patient's typical journey, we can pinpoint challenges both within communities and healthcare systems that could negatively influence clinical outcomes for this widespread African disease. The insights gained will be invaluable for policymakers striving to bridge the gap between recommendations and real-world practices.

This extensive, multicenter, prospective, observational study seeks to detail the diagnostic and treatment patterns for patients presenting with malaria symptoms in select African locations. It will also examine patients' demographic and socio-economic backgrounds, their actions before seeking medical care, and their adherence to standard recommendations. The study will further delve into the healthcare facility infrastructure, such as the availability and utilization of malaria diagnostic tests like rapid diagnostic tests (RDTs), and potential complications.

The study's primary goal is to outline the treatments prescribed (including adherence to WHO guidelines) for patients (spanning infants to adults) diagnosed with either uncomplicated or severe malaria in real-world African contexts. Having completed the data collection phase, the study is now in the analysis stage. The results will be instrumental in bolstering adherence to recommended diagnostic and treatment guidelines by healthcare professionals managing uncomplicated malaria cases.



2.1.2 Exploratory Study on Pyramax® Treatment for Asymptomatic Carriers of Plasmodium Falciparum mono-infections

This study, an open-label, multisite, randomized, three-arm outpatient examination, focused on asymptomatic individuals with *Plasmodium falciparum* mono-infection, aged over 5 years and weighing over 20kg. Of the 300 participants, 150 were from Zambia, evenly split among the three treatment arms.

Clinical Overview: Pyramax® (pyronaridine-artesunate) is a new artemisinin-based combination therapy (ACT) for treating uncomplicated P. falciparum and P. vivax malaria. Developed collaboratively by Shin Poong Pharmaceuticals and Medicines for Malaria Venture, it aims for rapid parasitemia reduction (from the artesunate) and minimization of recrudescence risk (through the slow elimination of pyronaridine). As of November 2017, Pyramax tablets were registered in 22 countries, with the granules registered in six African countries. Further registrations are ongoing.

Rationale: To achieve malaria elimination, it's vital to reduce the human malaria reservoir. This can be accomplished by treating asymptomatic P. falciparum carriers

through a mass drug administration to a whole population living in an endemic area. Pyramax offers a potential solution. However, there's concern that healthy individuals might not complete a 3-day treatment, potentially failing to clear the malaria infection. Yet, due to the significantly lower parasite densities in asymptomatic individuals, a shorter treatment, or an "incomplete" treatment might suffice. This study assessed the effectiveness of Pyramax, administered over one to three days, in clearing P. falciparum infection in asymptomatic carriers.

Data collection and analysis for this trial are complete, with results disseminated and published in peer-reviewed journals. The results demonstrated a 100% efficacy rate for the 3-day and 2-day regimens through day 63, while the 1-day regimen showed a slight decrease to 94.4% efficacy. These findings suggest pyronaridine+artesunate as a potential choice for mass drug administration in malaria control.



Pyramax study team after GCP training and certification prior to study initiation

2.1.3 Effects of metronidazole plus intermittent preventive treatment of malaria in pregnancy on birth outcomes: a randomised controlled trial in Zambia

Sexually transmitted and reproductive tract infections (STIs/RTIs), common during pregnancy, can lead to adverse birth outcomes, similar to the effects of malaria. Yet, preventive treatments in malaria-prone regions often overlook chemoprevention for STIs/RTIs. Additionally, the efficacy of the current Intermittent Preventive Treatment of Malaria for Pregnant Women (IPTp) **Sulphadoxine Pyrimenthamine (SP)** treatment has been undermined due to increased parasite resistance.

This study aims to determine if a combined treatment of an antimalarial with an effective anti-STI/RTI can outperform IPTp-SP alone in mitigating the adverse effects of malaria, bacterial vaginosis, and Trichomonas vaginalis infections during pregnancy.

Participants are placed into one of three treatment groups: a combination of metronidazole with IPTp-SP, IPTp using D**ihydroartemisinin-Piperaquine (DP)**, or just IPTp-SP. Funded by the Medical Research Council (MRC) UK and overseen by the London School of Hygiene and Tropical Medicine, the ASPIRE trial began on December 17th, 2019. By December 31st, 2021, 5023 pregnant women (93.2% of the target sample size) were enrolled and under observation. The findings from this study may influence future malaria chemoprevention policies for pregnant women.



Training of the ASPIRE study team in Nchelenge

2.1.4 IPTp-SP+ Trial: Evaluating the Enhanced Malaria Treatment Approach during Pregnancy

Malaria is a significant health threat to pregnant women in areas with high Plasmodium falciparum transmission. These women are more susceptible to infections and related complications. Malaria in pregnancy (MIP), often asymptomatic in high-burden zones, leads to numerous adverse outcomes like maternal anemia, perinatal mortality, low birth weight, and miscarriage. Hence, the World Health Organization (WHO) advocates for intermittent preventive treatment in pregnancy (IPTp) using sulfadoxine-pyrimethamine (SP) in areas with high malaria transmission.

IPTp involves presumptive antimalarial medication administration during regular 4-6 week antenatal care (ANC) visits. While IPTp-SP has effectively reduced MIP-associated complications, SP's effectiveness is diminishing due to increased drug resistance.

The WHO still advises IPTp-SP in areas with tolerable SP resistance levels, but alternative methods are being explored. This trial examines a combined approach: rapid diagnostic test (RDT) screening and treatment with dihydroartemisinin-piperaquine (DP) at the initial ANC visit alongside standard IPTp-SP, termed IPTp-SP+. This aims to enhance MIP prevention and maternal-birth outcomes in areas with notable SP resistance.

The study's main goals are to compare the efficiency of IPTp-SP, with or without the RDT screening and DP treatment during the first ANC session, and to evaluate the safety of both IPTp-SP and IPTp-SP+ by monitoring maternal and infant adverse events up to a year post-partum.

Sponsored by the European and Developing Countries Clinical Trial Partnership (EDCTP) with a €150,000.00 grant, this study wrapped up baby follow-ups in July 2021. Data processing and molecular lab analyses are currently underway, with results expected in 2022. The study's findings aim to influence MIP prevention strategies in malaria-endemic regions, potentially benefiting mothers and infants across Zambia and neighboring countries.



2.1.5 Pharcide Study: Evaluating the Pharmacokinetics of ACTs for Gametocyte Clearance in Zambian Children

Artemether-Lumefantrine (AL) stands as Zambia's primary treatment for uncomplicated malaria. However, the strategic use of antimalarial drugs often hinges on the transmission environment, which in turn is influenced by the drug's properties. In regions with low transmission, antimalarial drugs with potent anti-gametocyte activity are favored to push towards malaria elimination. Conversely, in areas with moderate to high transmission, drugs with a prolonged post-treatment protective effect are crucial to fend off reinfections. Among the artemisinin-based combination therapies (ACTs), AL showcases a pronounced anti-gametocyte impact, whereas Dihydroartemisinin-Piperaquine (DP) offers an extended post-treatment prophylactic effect. This study seeks to delineate the advantages of AL in gametocyte clearance versus DP and vice versa for post-treatment protection. The goal is to inform the deployment of AL in low-transmission settings and DP in moderate to high-transmission areas.

The study, funded by the National Institutes of Health, and sponsored by the Johns Hopkins Bloomberg School of Public Health. While data collection has concluded, the process of data cleaning and analysis remains in progress.

2.1.6 Clinical Trial: Evaluating the Efficacy of Daily Cotrimoxazole Prophylaxis for Malaria Prevention during Pregnancy

Background: Malaria in pregnancy (MiP) is a significant health concern in sub-Saharan Africa, leading to severe maternal and infant health complications. Though Plasmodium falciparum infections during pregnancy are often asymptomatic, they're associated with maternal anaemia, low birth weight, and increased infant mortality. In high-transmission areas, MiP is responsible for about 100,000 infant deaths annually in Africa.

Objective of the Cotrimal Study: The trial aimed to determine if cotrimoxazole (CTX) prophylaxis is as effective as the standard sulfadoxine-pyrimethamine (SP) prophylaxis in preventing low birth weights in HIV-negative pregnant women. The non-inferiority margin was set at 100 grams.

Methodology: In a non-inferiority design, HIV-negative pregnant women between 16 and 28 weeks of gestation and without malaria symptoms were randomized to receive either two daily CTX tablets or the standard SP-IPTp dosage. Women were monitored monthly until delivery, and the birth weights were recorded within 24 hours post-delivery.

Findings: Out of the participants, 81% (306 women) in the CTX group and 82% (307 women) in the SP-IPTp group had documented birth outcomes. Average birth weights were 3016 grams (CTX) and 3034 grams (SP-IPTp). The incidence of low birth weight did not significantly differ between the two groups. The upper limit of the one-sided

97.5% confidence interval for the mean birth weight difference between the groups was under the 100-gram non-inferiority margin in both the Intention to Treat and Per Protocol analyses.

Conclusion: The study concludes that daily CTX is as effective as SP-IPTp in preventing low birth weights during pregnancy. However, more detailed insights will be available once PCR adjusted results, which are still under review, are released.

2.1.7 Malaria Transmission and the impact of Control Efforts in Southern and Central Africa – ICEMR Project

Background: While sub-Saharan Africa has reported a significant decline in malaria cases, the decrease isn't consistent across regions. Intriguingly, Nchelenge district in Zambia still witnesses high malaria transmission, even as the southern parts of the country inch towards the pre-elimination phase of malaria. This ongoing eight-year study seeks to elucidate the reasons behind such persistent transmission in specific areas.

Objective: The research primarily aims to delve into both epidemiological and entomological factors that might be contributing to the continuous holoendemic transmission of malaria in Nchelenge.



ICEMR Project Assistants collecting data at a participating household in Nchelenge

2.1.7.1 Research Activities & Findings of the ICEMR Project

In the current reporting period, the COVID-19 pandemic affected the research schedule. Activities began in April, paused in June, and then resumed in August. From April to June, the focus was primarily on entomological surveys. The surveys saw the participation of 715 individuals from 186 households. Alarmingly, 378 individuals tested positive for malaria through RDTs, reflecting a positivity rate of 52.8%. Mosquito collections comprised 3209 from indoors and 1694 from outdoors, with the indoor mosquitoes showing higher blood feeding tendencies.

To ensure safety amidst the pandemic, field collections adhered to stringent measures, prioritizing the protection of both field workers and research participants from COVID-19. The ICEMR project remains committed to sharing its findings with key stakeholders, including the National Malaria Elimination Program (NMEP) and the President's Malaria Initiative, to inform better-targeted interventions.

2.1.7.2 Seasonality and impact of vector control on population genetics of Anopheles gambiae and An. funestus in Zambia.

This research is funded by the Pan-African Mosquito Control Association (PAMCA) with support from the Bill and Melinda Gates Foundation (BMGF). It delves into the molecular surveillance of significant malaria vector species across Africa and forms a part of the expansive "1000 Anopheles gambiae genomes" project. Insights from these studies are poised to reveal groundbreaking strategies for vector control.

The study aims to unravel the population genetics of malaria vectors, an area currently under-researched in Zambia. It will span across sites like Nchelenge, Ndola, and Choma, each representing distinct epidemiological landscapes within the nation. The focus will be on determining gene flow and identifying selection pressure from previous interventions. This will unveil genetic trends of vector populations over time and space, offering insights into the tracking, occurrence, and migration of resistance genes.

Over the past year, the research team collected specimens from key vector species within the An. gambiae Complex and the An. funestus Complex. These specimens serve as essential genetic samples, filling the current gaps in the broader initiative to map genetic variation and gene flow across these species complexes throughout Africa.



Mosquito collection using light traps

These genetic explorations contribute to the "Anopheles 10000" project at the Sanger Institute. The genetic data procured is made available in an open database, benefiting other nations or entities investigating these complexes. This shared knowledge aids in discerning vector biology aspects crucial for enhancing vector control strategies.

By understanding the genetics of these malaria vectors, the study will inform more targeted interventions, potentially revolutionizing the fight against malaria.

2.2 Thematic area: HIV/TB/STIs

In recent years, Zambia has grappled with a significant burden of HIV/AIDS and TB, as highlighted by the 2014 ZDHS, 2016 ZAMPHIA, and National TB Prevalence Survey reports. Recognizing the gravity of these health challenges, the Tropical Diseases

Research Centre (TDRC) has been at the forefront, actively spearheading research projects related to these diseases. In the year being reviewed, TDRC was immersed in three HIV/AIDS-specific research initiatives.

Over the years, TDRC has provided indispensable technical and scientific support to various national HIV/AIDS and TB surveillance programs and surveys. Noteworthy contributions include assisting with the Zambia Demographic Health Survey, the antenatal-based HIV sentinel surveillance, the Zambia Population-Based HIV Impact Assessment survey, and the National TB Prevalence Survey. Beyond this, TDRC is known for its contribution to TB diagnostics, monitoring the case-based surveillance of Antimicrobial resistance, which notably encompasses Drug-resistant TB.

One area that has drawn particular attention has been the prevalence of TB in the mining regions of Zambia. With the backing of the CDC and the Ministry of Health, TDRC has been meticulously examining the utilization of health services by both active miners and ex-miners. This has also involved evaluating the extent to which health services align with the guidelines set by the Ministry of Health. The insights and data generated from these research projects have been pivotal, not just in academic circles, but also in shaping health policies and guiding the direction of National disease control guidelines.

In 2021, the following key HIV/AIDS and TB research activities were undertaken:

2.2.1 Zambia Assessment of HIV and TB in the Mines:

TDRC collaborated with the CDC on the "Zambia Assessment of Tuberculosis (TB) and HIV in the Mines (ZATHIM)" to understand the health-seeking behaviors of Zambia's mining community. The study pinpointed the Workers' Compensation Act of 1999 as a major barrier. This Act fostered a fear of job loss among miners, deterring them from seeking TB care. In light of these findings, there's an ongoing review of the "TB in the mines" policy. The need for healthcare strategies for miners and a reevaluation of the 1999 Act became evident. In response, TDRC, backed by CDC-USG/PEPFAR, MOH, and the Ministry of Labour, initiated a TB control and prevention campaign in ten mining districts in 2021. This campaign harnessed various mediums, such as radio

shows, t-shirts, and brochures, to convey the message that TB is curable and preventable. A funds redirection was also executed to bolster these initiatives.

2.2.2 Estimating HIV Incidence and Detecting Recent Infection Among Pregnant Adolescent Girls and Young Women

Globally, 15% of women aged 15-24 live with HIV, with the majority in sub-Saharan Africa. About 380,000 Adolescent Girls and Young Women (AGYW) contract HIV each year. Challenges like gender norms, gender-based violence, and limited access to education and healthcare contribute to this. The DREAMS partnership aims to halve new infections in 10 sub-Saharan African countries, representing nearly 50% of new female cases worldwide. The focus is on AGYW attending their first antenatal care (ANC) visit during their current pregnancy in Zambia.

In Zambia, first-time pregnant women are routinely tested for HIV. The data helps estimate HIV incidence and gauge the DREAMS initiative's progress. Besides informing interventions for HIV-positive pregnant AGYW and their families, the study strengthens high-burden laboratory programs. While the LAg-based Recent Infections Testing Algorithm (RITA) is applied, there's also field validation of an experimental point-of-care (POC) recency test at TDRC. Though results from this POC test aren't shared with participants, the data aids in evaluating its diagnostic accuracy and utility.

Primary objectives include:

- 1. Estimating HIV incidence among pregnant AGYW aged 15-24 attending ANC in PEPFAR-funded facilities.
- 2. Tracking changes in these estimates over time.
- 3. Estimating the percentage of such AGYW with recent HIV infections among:
 - Those attending their first ANC visit.
 - Those newly diagnosed as HIV-positive during routine ANC testing.
 - Those at risk for recent HIV infection, i.e., those testing negative plus those with confirmed recent infections.

Secondary objectives encompass:

- 1. Incorporating recency testing into routine ANC service delivery for AGYW aged 15-24.
- 2. Validating the Asante rapid recency assay.

As of the report's conclusion, data analysis was in progress.

2.2.3 Zambia HIV Recent Infection Surveillance

3.1 The Zambia HIV Recent Infection Surveillance program, an extension of the DREAMS study, focuses on individuals aged 15 and up, encompassing both genders. Designed similarly to programs in other countries approaching HIV epidemic control, its purpose is to detect and monitor recent HIV infections through routine health testing services (HTS). Under the banner "TRACE" (Tracking with Recency Assay to Control the Epidemic), the initiative uses real-time rapid tests to track HIV infection rates. This real-time tracking identifies areas with rising infection rates, enabling the rollout of specific interventions. Seamlessly integrated into the standard healthcare system, the program remains active.





Mr. Evans Betha providing technical guidance during TOT training at Ridgeway School of Medicine, Lusaka



2.2.4 HIV and STI Bio-Behavioural Survey Among High-Risk Men in Selected Towns in Zambia

The HIV and STI Bio-Behavioural Survey in selected Zambian towns targets high-risk male populations, especially men who have sex with men (MSM), to gauge HIV/STIs prevalence, risk behaviours, and progress towards the 95-95-95 targets. Another assessment will focus on People Who Inject Drugs (PWIDs). This three-component survey also includes Female Sex Workers (FSW) and aims to estimate population sizes, and the prevalence of infections like HIV, syphilis, and Hepatitis B/C. Supported by a collaboration between TDRC, NAC, ICAP, and funded by CDC via ICAP, the survey's MSM component has been initiated, with PWID assessments planned for 2022 and FSW planning in progress.

2.2.5 TB DIAGNOSIS RESEARCH AND CONTROL PROGRAMMES

TDRC bolstered the MOH-National TB/Leprosy control program by aiding in TB case confirmation through culture and molecular methods, along with monitoring drug resistance. This support strengthens the MOH's TB diagnosis policy and fortifies the NTLP's TB laboratory functions in Zambia's Copperbelt, Luapula, and North-western provinces. Through USG-PERPFAR-CDC assistance, the TDRC lab-initiated reference TB culture and DST diagnostic services for various health establishments.

In 2021, the TDRC lab processed a significant number of samples for smear microscopy, culture, and DST. Zambia's TB diagnosis guidelines prioritize rapid molecular diagnostics, resistance testing for rifampicin and isoniazid, and stipulate DST methods for an array of medications used in routine treatment.

2.2.6 Diagnostics of TB Speed Paediatrics study on Pneumonia, HIV and severe Malnutrition

TDRC maintained its partnership with the University Teaching Hospital, focusing on paediatric tuberculosis diagnostics. The study's aim was to enhance the diagnosis of TB, especially in cases complicated by pneumonia, HIV, and severe malnutrition. From the participants at Arthur Davison Children's Hospital, 65 samples were analysed by TDRC. The findings were then shared with ADCH for patient care and brought to the attention of the lead researcher.

2.3 Thematic Area: NUTRITIONAL STUDIES

TDRC continues its research on nutritional health, focusing on vulnerable populations. Undernutrition, evident in conditions like childhood stunting and micronutrient deficiencies, carries both immediate and long-term consequences. Short-term effects include heightened infection risk and mortality, while long-term outcomes range from impaired growth and cognitive development to economic challenges and health complications like obesity. Conversely, there's a rising trend of overnutrition in Zambia, resulting in overweight and obesity issues. Such overnutrition is linked to cardiovascular diseases, type 2 diabetes, and specific cancers. TDRC's research aims to inform policies that address these nutritional challenges. The subsequent sections highlight our key nutritional research areas:

2.3.1 National Food Consumption and Micronutrient Survey

In a collaborative effort, TDRC joined forces with the National Food and Nutrition Commission (NFNC), National Institute for Scientific and Industrial Research (NISIR), and the University of Zambia (UNZA). This initiative, bolstered by technical expertise from UNICEF and funded by SIDA and the World Bank, aimed to evaluate Zambia's food consumption and micronutrient levels.

Rationale: Micronutrients, encompassing vitamins and minerals, play a pivotal role in health. The ideal nutrient source for young children is a diverse diet complemented by breastfeeding. However, in many regions, children's diets lack essential micronutrients, leading to widespread deficiencies. The consequences range from stunted growth and cognitive delays to disease susceptibility. For expecting mothers, micronutrient scarcity can result in severe complications, such as birth defects, stillbirths, or maternal mortality. Addressing these deficiencies is crucial in the broader battle against malnutrition and hunger. Effective strategies include dietary diversification, food fortification, nutrition education, public health measures, and supplementation.

Objective: This national survey sought to evaluate micronutrient intake, status, and the effectiveness of ongoing nutrition interventions in Zambia. The goal was to glean insights for crafting optimal intervention strategies at both provincial and national levels.

The nationwide survey delved into nutrient deficiencies and food consumption habits among children under five, adolescent girls, and women of reproductive age. Samples underwent analysis in Germany, the UK, and Tanzania, with salt and sugar tests conducted at TDRC. The gathered data forms a robust basis for refining nutrition policies and designing interventions.



Training of study laboratory and nursing staff

3 Other disease research and scientific activities

3.1 Strengthening Immunization through Sero-Surveillance (SISS)

In partnership with the Johns Hopkins Bloomberg School of Public Health, TDRC has been evaluating the impact of various immunization programs in Zambia. Initiated with an assessment of population immunity to measles and rubella, the study used samples from the 2015/16 ZAMPHIA survey to pinpoint potential areas for intervention and better outcomes.

Starting in 2019, the study branched into several sub-studies, each focusing on specific themes. During 2021, the team engaged in manuscript preparation for the PIRMZ substudy, analysed specimens from the SIA study, and strategized for the upcoming FIA survey.

3.2 Sequencing of genomes and targets of pathogens of common infectious diseases including Covid19, malaria, TB, HIV, Influenza.

With the acquisition of the Miseq Illumina sequencer from SADC and CDC's support for reagents and consumables, the molecular biology laboratory began its sequencing endeavors. Initially, the focus was on targeted sequencing of the SarsCov2 virus to identify prevalent strains in the country's northern region of Zambia. This information, vital for vaccine selection and epidemic control, is shared with the Zambia National Public Health Institute. The lab aims to extend its sequencing capabilities to other pathogens, including malaria, tuberculosis, HIV, and influenza viruses.



Genome sequencing training for laboratory staff from various health institutions hosted by TDRC

3.3 Diagnosis of COVID 19

The Centre played a key role in addressing the Covid-19 diagnostic requirements for Ndola and other provinces such as North-western, Luapula, and Muchinga. Beyond

offering timely diagnoses for potential cases and tracking the recovery of positive patients, the Covid-19 laboratory also became a trusted source for national and international travelers by providing reliable COVID-19 negative certificates.



3.4 Surveillance of Influenza Viruses in the Northern Region of the Country

TDRC continued support to the MOH influenza surveillance program. The TDRC has continued to collaborated with the virology lab of UTH under the support of CDC to monitor the prevailing strains of influenza viruses in the Copperbelt province.

4 Research Strengthening Activities

4.1 Laboratory Quality Management Systems Implementation

The Biomedical Sciences Department of the Tropical Diseases Research Centre (TDRC) initially achieved accreditation in 2019 for Immunology, Mycobacteriology, Clinical Chemistry, and Parasitology. This accreditation was maintained after a 2020 assessment. In 2021, TDRC sought to expand its accreditation scope to include

Haematology, Bacteriology, and Molecular Biology for SARS-CoV-2. After a remote assessment in August 2021, TDRC retained its initial accreditations and was granted new ones in Molecular Biology, Clinical Microbiology, and Haematology.

The current Scope of Accreditation, in line with ISO 15189:2012, includes:

- Clinical Chemistry
- Haematology
- Immunology
- Microbiology
- Molecular Biology
- Mycobacteriology
- Parasitology.

4.2 QMS Training

In 2021, the TDRC, in collaboration with partners like the Ministry of Health, CIDRZ, CLSI, ASLM, CDC, and others, emphasized the importance of Quality Management Systems (QMS). The TDRC management ensured staff participation in several QMS trainings. The Biomedical Sciences department of TDRC also hosted in-house refresher courses on QMS and safety. These training sessions and mentorship programs equipped the staff with the necessary skills and knowledge for effective QMS implementation and sustaining accreditation.

Name of training	Date	Staff Trained
ISO 15189 Quality management	29 Jan 2021 –	Mr. Kenny Situtu
system (QMS) mentorship at ZAF Hospital:	18 Feb 2021	
	28 Mar 2021-	
	17 Apr 2021	

	23 Aug 2021-10 Sep 2021	
QMS for Anatomic and Clinical Pathology Online Course	March-May 2021	Mr. Kenny Situtu
Root Cause Analysis and Corrective Action online training	03-07 May 2021	Ms Lungowe Mukubuta
Introduction to Quality Management System Online Course	29 July 2021	Mr. Ephraim Chikwanda, Mr. Sydney Mwanza Mr. Samson Mwale
PAMAfrica Quality Management System Online Training	Oct-Dec 2021	Mr. Ephraim Chikwanda
Continuous Medical Education	Jan-Dec 2021	All staff
Innouse QMS training	Jan-Dec 2021	All staff

4.3 Infrastructure Development and Improvement

TDRC's commitment to meeting ISO 15189 standards is evident in our ongoing laboratory renovations. These upgrades aim to ensure a safe and efficient work environment that aligns with the principles of a robust Quality Management System. Recent improvements include the refurbishment of the Microbiology Office and the Parasitology labs. These renovations were designed to optimize workflow and enhance safety protocols. Similarly, the Mycobacteriology Reference Laboratory underwent workstation modifications to ensure safety and improve the efficiency of TB and COVID-19 testing procedures.

Our dedication to excellence is further demonstrated by our equipment procurement initiatives. With support from the government and our partners, we've acquired several key pieces of equipment essential for compliance with ISO 15189 standards. A detailed list of these acquisitions, facilitated by CIDRZ and other partners, can be found in Table 2.2a.

Tabl	e: 2.2a Item	s Procured in 2021		
SN	Date	Description	Pack	Quantit
	Received		Size	У
1	2021/11/0 8	Parrot Shredder COM 0001679	Each	1
2	2021/11/0 8	Suggestion Box	Each	1
3	2021/11/0 8	Traceable Thermometers (Digital)	Each	35
4	2021/11/0 8	Cooler Boxes	12.5Litre s	10
5	2021/11/0 8	Eppendorf Research Plus Variable 100- 1000ul	Each	2
6	2021/11/0 8	<i>Hp LaserJet Pro MFP M428fdw Printer</i> <i>CNDRP3B7Z6</i>	Each	1
7	2021/11/0 8	Hp Colour LaserJet Pro MFP M283fdw Printer VNBRP4Q68V	Each	1
8	2021/11/0 8	Fujitsu SP Series SP1120 Scanner C92J001557	Each	1

2.2b	ZMA Calibra	ated Equipment in 2021	
SN	Date	Equipment	Quantity
1	Dec-21	TDRC Onsite ZMA Calibrated Equipment (Fridge, Freezer, Warmers, Balance, W/Bath,	89
2	2021/08/25	Thermometers sent to ZMA	60
3	2021/08/26	Pipettes Sent to ZMA	64
4	2021/11/26	Standard Weights Set sent to ZMA	1
5	2021/08/26	pH Meter	1
6.	April 2021	Tachometer	1
7.	May-June	In-house Calibration of Microscopes (20) and Centrifuges	40
	2021	(20)	

Table 2.2b shows the pieces of equipment that were calibrated in 2021.

4.4 Recruitment of Trained and Qualified Staff

TDRC management remains dedicated to upholding QMS by recruiting qualified and trained professionals. To bolster operations in specific laboratories, particularly amid COVID-19 testing, six staff members were contracted across Immunology, Microbiology/TB, Chemistry, and COVID-19 units. Furthermore, TDRC welcomed volunteer interns, not merely to assist with tasks, but to enrich their skills in a hands-on research environment. This initiative aims to empower these interns with practical experience, fostering their ability to contribute meaningfully to evidence generation in the future.

4.5 External Quality Assurance (EQA)

TDRC Management prioritizes External Quality Assessment (EQA) by ensuring the majority of tests participate in the program. EQA reinforces both staff and client confidence, affirming that laboratory tests yield accurate and dependable results. Laboratories spanning Haematology, Mycobacteriology, Parasitology, Immunology,

Chemistry, Molecular Biology, and Microbiology have all been enrolled in the NHLS EQA programme. All these facilities consistently received EQA panels and generally showcased commendable performance. Nonetheless, the Microbiology laboratory faced challenges in bacterial identification due to reagent shortages, negatively impacting their EQA results. Additionally, EQA feedback has been inconsistent, especially in Clinical Chemistry. To address this, a proposal was made to the MOH to integrate TDRC into the One World Accuracy PT Scheme, which is widely adopted by labs committed to QMS.

4.6 QMS Audits and Reviews by External Organizations

External reviews by independent organizations offer a rigorous, evidence-based evaluation of compliance with established standards, such as ISO 15189:2012 for medical labs. These external assessments are vital in healthcare, driving quality enhancement in provider institutions. To sustain its Quality Management System (QMS), TDRC remains open to evaluations by external entities. This approach allows the center to address non-conformities identified, ensuring sustained standard adherence. Records of these evaluations, along with recommended enhancements, are retained and acted upon, continuously elevating the laboratory's service quality.

In 2021, TDRC underwent two key external assessments:

- COVID-19 Laboratory Testing Certification Program (CoLTeP) by ASLM on 30th June 2021.
- ISO 15189 Accreditation Program through SADCAS on 24-25th August 2021.

4.6.1 Results of the CoLTep audit

The laboratory obtained 98% (5 star rating) with only 2 NCs identified as shown in the Table 3.1a.

Table 3.1a Non Conformity Summary Table for TDRC COLTep Audit

Non	Conformity Summery Table for TDRC COLTeP Audit			
No.	Recommendations/Comments	Checklist	ISO 15189	Major/ Minor
		Question	References	
SECT	ION 1.0 DOCUMENTS & RECORDS			
1	Maintain Inventory records of all Covid 19 testing reagents and consumables and ensure that entries are made clearly and appropriately.	2,12	ISO15189:2012 Clause 4.13; 5.3.2.7 & 5.3.2.4	Minor
2	Train all sample collectors and transporters in biosafety and biosecurity and ensure to maintain training records at the laboratory	5,5	ISO 15190:Clause 5.9.2 (e)	Minor

4.6.2 Results of the SADCAS assessment

TDRC was assessed by SADCAS on 24th-25th August 2021 for periodic evaluation and scope expansion. During this assessment, 35 nonconformities were identified, with 32 being major and 3 minor. Despite these findings, the SADCAS assessment report recommended the continuation of TDRC's laboratory accreditation to ISO 15189:2012 for previously accredited domains (Immunology, Parasitology, Clinical Chemistry, and Mycobacteriology) and extended the scope to include Microbiology, Molecular Biology, and Haematology. The assessors recommended the incorporation of electronic information system (DISA) into the Quality Management System and acquisition of service contracts for pieces of equipment.

Achievements: TDRC demonstrated a consistent commitment to upholding and enhancing a QMS aligned with ISO15189:2012. This commitment is evident in:

- 1. Maintaining the accreditation scope for four existing laboratories: Chemistry, Immunology, Parasitology, and Mycobacteriology.
- 2. Expanding the accreditation scope to include three additional laboratories: Haematology, Bacteriology, and Molecular Biology.
- 3. Achieving certification for COVID-19 testing through the ASLM COVID-19 Certification program.



First Aid training conducted for selected laboratory staff by the Ndola Fire Brigade. This is in keeping with the ISO 15190 safety standard for clinical laboratories.



In-house Quality Management Systems (QMS) workshop for TDRC laboratory staff



Clinical Chemistry staff with one of the SADCAS assessors after the successful pre accreditation audit.

4.7 Orientation on DISA Laboratory Information System

The DISA laboratory information system at TDRC was strengthened with the support of the Ministry of Health and other partners to enhance data management and efficient feedback to health facilities. A specialized training was facilitated by the Copperbelt Health Office to boost TDRC's ability to utilize the DISA data system within the TB laboratory. This training, held on-site, equipped five staff members with skills in report generation and provided ICT support for updating the DISA operating system and troubleshooting. However, a challenge arose as the DISA system was not fully optimized for specific functions, including the elevation of staff capabilities to a "super user" level.

In terms of staff development, Ms. Chansa Magdalene Silwizya participated in the Bios Acetylcholine training. Additionally, Mr. Westone Hamwata underwent a series of trainings facilitated by the CDC – Division of Laboratory Systems. These trainings covered Basic molecular biology – foundational science as well as Basic molecular biology – laboratory practices.

5 PUBLICATIONS

Publishing research results is essential for several reasons. For the public, it provides transparency and accessibility to scientific findings that can impact their lives. For government and decision-makers, published research offers evidence-based insights that can guide policy and intervention strategies. For researchers, sharing results in peer-reviewed scientific journals fosters collaboration, promotes academic discourse, and upholds the integrity and advancement of science. Recognizing these crucial benefits, TDRC actively encourages its staff to disseminate their work in renowned scientific journals. Listed below are the publications by TDRC scientists from the year 2021.

- Hachizovu S, Chaponda M, Makupe A, Manyando C, Mubikayi D, Mulenga M. Characteristics of people brought in dead at the Ndola Teaching Hospital in Zambia between 2012 and 2016. Medical Journal of Zambia 46 (3), 180-185
- Sié A, Hanefeld J, Chaponda M, Chico RM, LeDoare K, Mayaud P, Drexler JF, Jaenisch T. Congenital malformations in sub-Saharan Africa—warnings of a silent epidemic? Lancet Infect Dis 2021 Published Online March 25, 2021 https://doi.org/10.1016/ S1473-3099(21)00061-X
- Sikalima J , Schue JL, Hill SE, Mulenga M , Handema R , Daka V , Chileshe J , Kasongo W , Chaponda M , Kabuya JBB, Moss WJ, Ippolito MM, Southern and Central Africa International Centers of Excellence for Malaria Research. House Structure Is Associated with Malaria among Febrile Patients in a High-Transmission Region of Zambia. Am J Trop Med Hyg 2021 Apr 12; tpmd201378. doi: 10.4269/ajtmh.20-1378.
- Greenwood B, Cairns M, Chaponda M, R. Chico RM, Dicko A, Ouedraogo JB, Phiri KS, ter Kuile FO and Chandramohan D. Combining malaria vaccination with chemoprevention: a promising new approach to malaria control. Malar J. 2021 Sep 6;20(1):361. doi: 10.1186/s12936-021-03888-8
- 5. Hast MA, Stevenson JC, **Muleba M, Chaponda M, Kabuya JB,** Mulenga M, Shields T, Moss WJ, Norris DE, For The Southern And Central Africa International

Centers Of Excellence In Malaria Research. The Impact of Three Years of Targeted Indoor Residual Spraying with Pirimiphos-Methyl on Household Vector Abundance in a High Malaria Transmission Area of Northern Zambia. Am J Trop Med Hyg. 2020 Dec 21;. doi: 10.4269/ajtmh.20-0537. [Epub ahead of print] PubMed PMID: 33350376.

- Kabuya JB, Mataka A, Chongo A, Kamavu LC, Chola PN, Manyando C, Brouwere VD and Ippolito MM. Impact of maternal death reviews at a rural hospital in Zambia: a mixed methods study. International Journal for Equity in Health (2020) 19:119. https://doi.org/10.1186/s12939-020-01185-5
- Carcelen AC, Prosperi C, Mutembo S, Chongwe G, Mwansa FD, Ndubani P, Simulundu E, Chilumba I, Musukwa G, Thuma P, Kapungu K, Hamahuwa M, Mutale I, Winter A, Moss WJ, Truelove SA. COVID-19 vaccine hesitancy in Zambia: a glimpse at the possible challenges ahead for COVID-19 vaccination rollout in sub-Saharan Africa. *Hum Vaccin Immunother*. 2022 Dec 31;18(1):1-6. doi: 10.1080/21645515.2021.1948784. Epub 2021 Jul 6. PMID: 34227914; PMCID: PMC8920139.
- 8. Carcelen AC, Mutembo S, Matakala KH, Chilumba I, Mulundu G, Monze M, Mwansa FD, Moss WJ, Hayford K. Impact of a Measles and Rubella Vaccination Campaign on Seroprevalence in Southern Province, Zambia. *Am J Trop Med Hyg*. 2021 May 3;104(6):2229-2232. doi: 10.4269/ajtmh.20-1669. PMID: 33939639; PMCID: PMC8176503.
- Ngula Monde, Mildred Zulu, Mathias Tembo. Ray Handema. Musso Munyeme, Sydney Malama. 2021. Drug Resistant Tuberculosis in the Northern Region of Zambia: A Retrospective Study. *Front. Trop. Dis*, <u>[https://doi.org/10.3389/fitd.2021.735028</u>
- 10. Namaunga K Chisompola Elizabeth M Streicher Anzaan Dippenaar Michael G Whitfield Mathias Tembo, Sydney Mwanza Robin M Warren Samantha L Sampson. Drug resistant tuberculosis cases from the Copperbelt province and Northern regions of Zambia: Genetic diversity, demographic and clinical characteristics. Tuberculosis (Edinb) 2021 09 2; 130:102122. *Epub* 2021 Sep 2.

- 11. Zulu M, Monde N, Nkhoma P, Malama S and Munyeme M (2021)
 Nontuberculous Mycobacteria in Humans, Animals, and Water in Zambia: A
 Systematic Review. *Front. Trop. Dis* 2:679501. <u>doi: 10.3389/fitd.2021.679501</u>
- 12. Michael Melgar Ray W Shiraishi Clifford Tende Sydney Mwanza Joyce Mulenga Shepherd Khondowe David Mwakazanga Kelvin Kapungu Mathias Tembo Amos Nota Patrick Lungu Brittany Moore Laura J Podewils. Assessment of the tuberculosis case-finding and prevention cascade among people living with HIV in Zambia - 2018: a cross-sectional cluster survey. *BMC Public Health* 2021 05 4;21(1):859. Epub 2021 May 4.
- Acheampong, C.O., Barffour, M.A., Schulze, K.J., Chileshe, J., Kalungwana, N.A., Siamusantu, W., West Jr, K.P. and Palmer, A.C., 2021. Age-specific differences in the magnitude of malaria-related anemia during low and high malaria seasons in rural Zambian children. *EJHaem*, 2(3), pp.349-356.
- 14. Sikalima, J., Schue, J.L., Hill, S.E., Mulenga, M., Handema, R., Daka, V., Chileshe, J., Kasongo, W., Chaponda, M., Kabuya, J.B.B. and Moss, W.J., 2021. House Structure Is Associated with Malaria among Febrile Patients in a High-Transmission Region of Zambia. *The American Journal of Tropical Medicine and Hygiene*, 104(6), p.2131.
- 15. Kaliwile, C., Michelo, C., Sheftel, J., Davis, C.R., Grahn, M., Bwembya, P., Simpungwe, E., Mwanza, S., Chileshe, J. and Tanumihardjo, S.A., 2021. Breast milk–derived retinol is a potential surrogate for serum in the 13C-retinol isotope dilution test in Zambian lactating women with vitamin A deficient and adequate status. *The Journal of Nutrition*, 151(1), pp.255-263.
- 16. Sandoval-Ceballos, M.G., Kalungwana, N.A., Griffin, J.H.C., Martínez-Guerra, G., Ramírez-Ramírez, I., Maldonado-Peralta, R., Marshall, L., Bosch, C., Cruz-Huerta, N., Gonzalez-Santos, R. and León, P., 2021. The importance of conserving Mexico's tomato agrodiversity to research plant biochemistry under different climates. *Plants, People, Planet*, 3(6), pp.703-709.

Audited Financial Statements

58



FINANCIAL STATEMENTS FOR THE YEAR ENDED 31st DECEMBER 2021



Financial Statement for the Year Ended 31st December 2021

TABLE OF CONTENTS

Item	Page No
Statement of Directors' Responsibility	1
Report of the Auditor General	2 - 7
Consolidated Statement of Comprehensive Income	8
Statement of Financial Position	9
Statement of Cash Flow	10
Statement of Accumulated Funds	11
Significant Accounting Policies	12-14
Notes	15-25

Financial Statement for The Year Ended 31st December 2021

STATEMENT OF DIRECTORS' RESPONSIBILITIES

The Directors of Tropical Diseases Research Centre are responsible for the preparation of financial statements which give a true and fair view of the state of affairs of the Centre and of its excess/(deficit) of income over expenditure in accordance with the requirements of the Tropical Diseases Research Centre Act No.31 of 1982 of the laws of Zambia. In preparing the financial statements, the directors are required to:

- Select suitable accounting policies and apply them consistently;
- Make judgements and estimates that are reasonable and prudent; and

Prepare the financial statements on the going concern basis unless it is inappropriate to presume that the Centre will continue in operational existence.

The Directors are responsible for keeping proper accounting records, which disclose with reasonable accuracy at any time the financial position of the Centre and enables them to ensure that the financial statements comply with the Tropical Diseases Research Centre Act No.31 of 1982 of the laws of Zambia and International Financial Reporting Standards (IFRS's). They are also responsible for safe guarding the assets of the Centre and for taking reasonable steps for the prevention and detection of fraud and other irregularities.

In the opinion of the Directors and in accordance with the TDRC Act No. 31 of 1982 and IFRS, the statement of comprehensive income, the statement of financial position and the statement of cash flows have been drawn so as to give a true and fair view of:

- The deficit of income over expenditure for the financial year ended 31st a) December 2021 and
- The financial position as at 31st December 2021 b)

The Centre's Directors confirm that in their opinion, there are reasonable grounds to believe that the Centre will be able to pay its debts as and when they fall due.

Signed on behalf of Directors by:

Prof. Godfrev Biemba Board Chairman Tropical Diseases Research Centre

Dr. Gershom Chongwe Director Tropical Diseases Research Centre

06/06/23



INDEPENDENT AUDITOR'S REPORT

STAND No.7951 HAILE SELASSIE AVENUE, LONGACRES P.O BOX 50071 LUSAKA, ZAMBIA E-mail: auditorg@ago.gov.zm Website: www.ago.gov.zm Telephone: 260211252611/252771

Report on the Audit of the Financial Statements

To the Members Tropical Diseases and Research Centre

Unmodified Opinion

I have audited the financial statements of the Tropical Diseases and Research Centre, which comprise the Statement of Financial Position as at 31st December, 2021 and the Statement of Comprehensive Income, Statement of Cash-flow and Statement of Accumulated Funds for the year ended, and the notes to the financial statements, including a summary of significant accounting policies.

In my opinion, the accompanying financial statements of the Tropical Diseases and Research Centre (TDRC) present fairly the financial position of the Tropical Diseases and Research Centre (TRDC) as at 31st December 2021, and its financial performance and cashflows for the year then ended in accordance with International Financial Reporting Standards (IFRSs).



Basis for Opinion

I conducted my audit in accordance with International Standards of Supreme Audit Institutions (ISSAIs). My responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of my report. I am independent of the Tropical Diseases and Research Centre in accordance with the International Organisation of Supreme Audit Institutions (INTOSAI) Code of Ethics together with the ethical requirements that are relevant to my audit of the financial statements in Zambia, and I have fulfilled my other ethical responsibilities in accordance with these requirements and the INTOSAI Code. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.



Key Audit Matters

Key Audit Matters are those matters that, in my professional judgment, were of most significance in my audit of the financial statements. These matters were addressed in the context of my audit of the financial statements as a whole, and in forming my audit opinion thereon. I do not provide a separate opinion on these matters.

Non-Disclosure of Donated Assets					
Why the Matter was Determined to be KAM	How the Matter was Addressed in the Audit	Reference to the Related Disclosures in the Financial Statements (If applicable)			
TDRC is a research centre that relies on various equipment to carry out its mandate. Most of the equipment come as donated assets.	Management was requested through query No. 2 file reference OAG/103/238/2 to provide list of donated assets and proof of ownership.	Note 16			



Responsibilities of Management and those charged with Governance for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with International Financial Reporting Standards (IFRSs), and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error. In preparing the financial statements, management is responsible for assessing the Centre's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern

basis of accounting unless management either intends to liquidate the Centre or cease operations, or has no realistic alternative but to do so. Those charged with governance are responsible for overseeing the Centre's financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Statements

My objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance but is not a guarantee that an audit conducted in accordance with ISSAIs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with ISSAI's, I exercise professional judgment and maintain professional skepticism throughout the audit. I also:

• Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain



audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal controls.

- Obtain an understanding of internal controls relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Centre's internal controls.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Centre's ability to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify my opinion. My conclusions are based on the audit evidence obtained up to the date of my auditor's report. However, future events or conditions may cause the Centre to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

I communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal controls that I identify during my audit.



Report on Other Legal and Regulatory Requirements

In my opinion, the financial statements of the Tropical Diseases and Research Centre as at 31st December, 2021 have been properly maintained in accordance with the provisions of the Tropical Diseases Research Centre Act No.31 of 1982.

-*q*, amb

Dr. Ron Mwambwa FCMA, FZICA, CGMA, CFE ACTING AUDITOR GENERAL

DATE: 09/06/ 2023



STATEMENT OF COMPREHESIVE INCOME FOR THE YEAR ENDED 31st DECEMBER 2021

	NOTES	2021 K	2020 K
INCOME			
Government grants	1	21,181,890	15,886,419
Other income	2	53,754,266	49,201,114
Amortisation of capital Grants	13	565,340	565,340
		75,501,495	65,652,873
LESS: EXPENDITURE			
Center Administration Expenses	4	4,575,088	4,001,970
Employees Benefits	3	23,263,132	25,862,784
Fee Paying Clinic Expenses	5	6,054,601	684,143
Project Expenses	6	31,345,484	41,153,257
TAFS Expenses	7	197,536	848,340
TOTAL EXPENDITURE		65,435,841	72,550,494
(Deficit)/Surplus for the year		10,065,654	(6,897,621)

8

54



TROPICAL DISEASES 🔬 RESEARCH CENTRE

STATEMENT OF FINANCIAL POSITION FOR THE YEAR ENDED 31st DECEMBER,2021.

	Notes	2021 K	2020 K
ASSETS			
Non-current assets			
Tangible Fixed Assets	8	15,404,049	16,232,984
Current Assets			
Inventory	10	167,768	242,572
Accounts Receivables	11	2,525,632	374,930
Cash and Bank	9	12,159,823	11,925,527
		14,853,223	12,543,029
Total Assets		30,257,272	28,776,013
Accumulated Funds & Liabilities			
Canital Reserves	13	2 152 830	2 718 170
Revenue Reseves	14	(55,678,458)	(49.370.254)
Surplus/(Deficit) for the year		10.065.655	(6.897.621)
Total Accumulated Funds		(43,459,973)	(53,549,705)
Non Current Liabilities			
Provisions for leave Days and Contigent Liabilities	15	12,783,435	12,386,124
Total Non Current Liabilities		12,783,435	12,386,124
Current Liabilities			
Account Payables	12	60,933,810	69,939,594
Total Current Liabilities		60,933,810	69,939,594
Total Liabilities		73,717,245	82,325,718
Total Accumulated Funds and Liabilities		30,257,272	28,776,013
The Financial Statements set out on pages 8 to 25 have	e ben appro	wed by the board on 6 RA.23	and were
signed on their behalf by:			
5		han	
Prof.Godfrey Biemba	-	Dr. Gershom Chongwe	
Chairperson (TDRC)		Director (TDRC)	

(The notes on pages 15 to 25 form part of these financial statements)

34



STATEMENT OF CASH FLOWS FOR THE YEAR ENDED 31st DECEMBER, 2021.

	Notes	2021 K		2020 K
Cashflow from Operating Activities				
Surplus(Deficit) for the year		10,065,655		(6,897,620)
Adjusted for:-				
Depreciation		2,579,035		2,331,578
Assets in project expenses				348,749
Capital Reserves- Amortisation		(565,340)		(565,340)
Increase (Decrease) in Provisions for leave Days and Contig	ent Liabilities	397,311		671,631
Net cash flow before changes in working capital		12,476,661		(4,111,002)
(Increase)/decrease inventories		74,804		130,632
(Increase)/ decrease in accounts receivables		(2,150,702)		4,278,188
Increase/ (Decrease) in trade and other payables		(9,005,784)		(16,924,197)
ZRA debt relief and ZSIC pension				18,610,209
ZSIC claim				437,913
Exchange gain/loss		565,341		216,591
Cash generated from operating Activities		(10,516,341)		6,749,336
Cashflow from Investing Activities				
Purchase of Non Current Assets	8	(1,726,024)		(1,786,774)
Cash out flow from Investing activities		(1,726,024)	-	(1,786,774)
Decrease in cash and cash equivalents		234,296	-	851,560
Net cash and cash equivalent at beginning of year		11,925,527		11,073,967
Net cash and cash equivalent at end of year		12,159,823		11,925,527

*

NOTE

The Net cash and cash equivalent at end of the financial year ended 31st December 2020 was understated by K2000.



STATEMENT OF ACCUMULATED FUNDS AS AT 31st DECEMBER, 2021.

	Retained Earnings	Revenue Reserves	Capital Reserves	Totals
Opening balances as at 01/01/2021	(6,897,621)	(49,370,254)	2,718,170	(53,549,705)
Yearly transfers - 2020 earnings	6,897,621	(6,897,621)		-
Yearly transfers- amortisation		565,340	(565,340)	-
2021 Retained earnings	10,065,655			10,065,655
				~
Closing balances as at 31/12/2021	10,065,655	(55,702,535)	2,152,830	(43,484,050)

SIGNIFICANT ACCOUNTING POLICIES FOR THE YEAR ENDED 31ST DECEMBER, 2021

i. **Principal activities**

The Centre conducts research on diseases which are prevalent in Zambia, supports Zambia's disease control and primarily health care programs, strengthens Zambia's biomedical research capabilities and serves as a national as well as a regional research institution.

Ultimate Shareholder ii.

The Centre is wholly owned by the Government of the Republic of Zambia.

iii. **Accounting Policies**

a) Basis of financial statements preparation

The financial statements have been prepared under the historical cost. The accounting policies applied by the Centre are consistent with those of the previous year.

b) Statement of Compliance

The financial statements have been prepared in accordance with the International Financial Reporting Standards (IFRS) set by the International Accounting Standards Board (IASB) and comply with the provisions of the Tropical Diseases Research Centre Act No. 31 of 1982 of the laws of Zambia.

c) Going Concern

The financial statements have been prepared on a going concern basis i.e. on the assumption that the Centre shall continue in operational existence for the foreseeable future.

d) Revenue Recognition

The main source of income is GRZ funding for personnel emoluments and operation expenses. The other sources are project contributions and income from the clinic. GRZ and project contribution income is recognized when there is reasonable assurance that:

- The Centre will comply with the conditions attached to them; and
- The grants will be received

TROPICAL DISEASES

RESEARCH CENTRE

SIGNIFICANT ACCOUNTING POLICIES FOR THE YEAR ENDED 31ST DECEMBER, 2021

Revenue from the clinic is recognised when the service is provided to the patient and billed. Interest income is recognised on an accrual basis when the Centre becomes entitled to the interest.

e) Non-Current Assets - Property, Plant and Equipment

Items of property, plant and equipment are stated at historical cost. Expenditure on repairs or maintenance of property, plant and equipment made to restore or maintain future economic benefits expected from the asset is recognised as an expense when incurred.

f) Depreciation

Depreciation has been provided on a straight-line basis on all the tangible non-current assets so as to write off the cost of these assets over their expected useful lives.

The	rates	of	denre	ciation	are	as f	follows:
1 110	Iucob	UI.	acpic	ciacion	ure	us i	Uno no.

Land & Buildings	2%
Motor Vehicles	25%
Office Furniture & Equipment	10%
Laboratory equipment	10%
Plant & equipment	5%
Work in Progress	0%

g) Inventories

Inventories are valued at the lower of cost and net realisable value; cost includes expenditure incurred in acquiring the stock and bringing them to their existing condition and location. Net realisable value is the estimated selling price in the ordinary course of business, less the estimated cost necessary to make the sale.

TROPICAL DISEASES 🚮

RESEARCH CENTRE

SIGNIFICANT ACCOUNTING POLICIES FOR THE YEAR ENDED 31ST DECEMBER, 2021

h) Foreign Currencies

Assets and liabilities denominated in foreign currencies are converted at the mid Ex-change rates ruling at the balance sheet date. Gains or losses arising on translation are credited or charged to income statement in the year in which they arise.

In the year ended 31st December 2021 the Centre realised net exchange gain of K565,341 (2020 – K 216,591)

i) Provision for Retirement Benefits

Provision is made for retirement benefits for the employees in accordance with the prevailing conditions of service. Retirement benefits falling due twelve (12) months after the balance sheet date are treated as deferred liabilities. Retirement benefits falling due within twelve months from the balance sheet date are treated as current liabilities.

j) Grants

Revenue grants are credited to the income statement in the year of receipt.

Capital grants are credited to the capital grant account and amortized over the expected useful life of the capital asset concerned.

k) Surplus/ (Deficit) for the Year

This is stated after taking into account all expenditure

l) Taxation

Taxation has not been provided for as the Organisation is a non-profit making Organisation.

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31st DECEMBER, 2021

INCOME

		2021	2020
1	GOVERNMENT GRANTS	K	K
	January	1,765,158	
	February	· -	-
	March	-	1,765,158
	April	1,765,158	1,765,158
	May	1,765,158	-
	June	1,765,158	1,765,158
	July	1,765,158	1,765,157
	August		1,765,158
	September	8,825,788	1,765,158
	October	-	1,765,158
	November	3,530,314	1,765,158
	December		1,765,158
		21,181,890	15,886,419

2. OTHER INCOME

i	2021	2020
Other income	896,801	521,125
ZSIC Gratuity claims- other income	-	1,425,063
	896,801	1,946,188

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31st **DECEMBER, 2021 (CONTINUED)**

ii **INCOME FROM FEE PAYING CLINIC**

The Centre runs a fee paying clinic which is open to members of staff and the public.

	2021	2020
	K	Κ
INCOME		
Sales - staff debtors	110,364	37,642
Credit Sales-Trade Debtors	3,196,931	85,820
Cash Sales	13,752,170	3,441,834
Copperbelt Medical Associates Sales	38,108	37,840
Other Income	9,331	2,950
TOTAL INCOME	17,106,904	3,606,086

PROJECT FUNDS iii

The Centre receives funding from donors to carry out specific projects

	2021 K	2020 K
Project funds Add:-	31,237,367	35,724,415
Project		
Overhead Paid		
To The Centre	4,390,927	7,011,065
Gross Project Funds	35,628,294	42,735,480

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31st **DECEMBER, 2021 (CONTINUED)**

iv

TECHNICAL AND ADMINISTRATIVE FINANCING SCHEME (TAFS)

These are funds raised from research projects for the supplies the Centre stocks and hire of motor vehicles

	2021	2020
	K	K
Sales- Lab Items	4,649	727,289
Sales - Others	117,618	186,071
	122,267	913,360
Grand Total	53,754,266	49,201,114

3	EMPLOYEES BENEFITS	2021	2020
		K	K
	Acting Allowance	85,960	38,998
	Basic Pay	13,802,437	12,657,644
	Housing Allowance	2,628,194	2,442,435
	NAPSA Employer	737,754	721,085
	Pension Employer	1,999,697	1,749,043
	Responsibility Allowance	183,600	201,792
	Settling In Allowance	133,350	184,058
	Transport Allowance	1,951,873	1,755,200
	Vehicle maintenance allowance	348,612	329,400
	Leave Travel	270,000	151,500
	Skills development levy	97,412	83,677
	Gratuity accruals	178,574	1,008,817
	Increase in leave days provision	644,350	4,404,551
	Napsa penalty	-	-
	NHIMA employer	131,437	123,064
	Telephone Allowance	34,560	11,520
	Overtime	35,322	-
		23,263,132	25,862,784

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31st DECEMBER, 2021 (CONTINUED)

		2021 K	2020 K
4 CENTRAL ADMI	NISTRATION EX	PENSES	
Advertising		11,526	-
Accounting / Audit	Expenses	70,500	74,484
Advocacy		90,859	15,377
Bank Charges		22,093	22,558
Fuels and Lubricant	S	40,717	36,347
Maintenance - Equip	oment	2,950	75,468
- Bu	ildings	49,642	30,937
Motor Vehicle Repa	irs	133,455	117,075
Motor Vehicle Insur	ance & licenses	37,335	8,755
Rent and Rates		3,698	-
Electricity and wate	r	6,815	5,000
Telephone and Fax		25,534	18,765
Training		153,335	122,349
Staff Walfare		133,374	106,834
Board Expenses		115,700	142,873
Travel		144,232	188,764
Legal Expenses		70,857	61,428
Labour Day Expense	s	2,125	29,643
Lunch Allowance		36,000	-
Security Expenses		117,958	292,980
Printing and Statione	ry	202,620	129,354
General and Cleanin	g expenses	24,930	14,472
Workers Compensat	on	27,974	38,825
Depreciation		2,579,035	2,331,579
Subscriptions and De	onations	29,574	8,050
Postage and Courier		9,162	1,260
Management seminar	& meetings	411,088	119,123
Honaria		22,000	2,000
Laboratory supplies		-	7,670
		4,575,088	4,001,970

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31st **DECEMBER, 2021 (CONTINUED)**

5 FEE PAYING CLINIC EXPENSES

.

	2021 K	2020 K
Opening Stock	12,701	16,077
Add; Purchases	1,908,781	137,574
Less:Closing Stock (Note. 10)	(15,429)	(12,701)
Cost of Sales	1,906,053	140,950

LESS: EXPENDITURE

Total Expenses	6,054,601	684,143
Subtotal	4,148,548	543,193
relephone & fax	300	-
Sitting Allowances	2,400	-
Laboratory supplies	241,307	26,495
Honoraria	1,242,509	37,220
Office equipment repairs	328,771	2,020
Staff Welfare	2,540	3,745
Bad debts	-	165
Motor vehicle Fuel	10,000	-
Motor vehicle repairs	40,976	670
Printing & Stationery	142,014	34,650
General expenses	49,900	105,625
Postage & courier	9,143	-
Security	80,427	-
Cleaning expenses	15,084	2,949
Subscriptions- employee	27,320	
Subscriptions- employer	81,935	12,485
Lunch Allowance	919,250	291,750
Travel Expenses	882,983	22,704
Advertising and Promotions	23,841	-
Bank Charges	47,848	2,715

PROJECT EXPENSES 6

	2021	2020
	K	K
Honoraria	12,808,324	16,534,909
Consumables	-	601,246
Supplies	3,804,685	7,800,468
Equipment/Fixtures & Fittings	-	348,749
Travel/Transport	8,493,998	12,179,236
Office Expenses	1,130,826	-
Other Direct Costs	3,235,073	2,262,758
Training	248,802	1,288,352
Refunds	1,480,328	-
Bank Charges	143,448	137,539
Total	31,345,484	41,153,257

7 TECHNICAL ADMINISTRATIVE FINANCING SCHEME-EXPENSES

	2021	2020
	K	K
Opening Stock	229,871	898,126
Add; Purchases	116,349	146,750
Less:Closing Stock	(152,339)	(229,871)
Cost of Sales	193,881	815,005
LESS: EXPENDITURE		
Bank Charges	3,490	1,778
Bad debts	165	
Security	-	-
Staff welfare	-	4,000
Travel expenses	-	27,557
Lunch Allowance	-	-
Fuels and Lubricants	-	-
Subtotal	3,655	33,335
Total Expenses	197,536	848,340

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31st **DECEMBER, 2021 (CONTINUED)**

8 NON CURRENT ASSETS SCHEDULE

	Land & Buildings	Work in Progress	Plant and Machinery	Motor Vehicles	Furniture and Equipment	Laboratory Equipment	TOTAL
COST OR VALUATION At 1st January 2021 Additions Disposals	1,033,841	3,935,886	7,553	6,465,581 753,148	6,419,898 451,211	12,034,904 521,665	29,897,663 1,726,024
DEPRECIATION	1,033,841	3,935,886	7,553	7,218,729	6,871,109	12,556,569	31,623,687
At 1st January 2021 Charge for year Depreciation adjustment	408,098 18,824 - 24,076.00	-	7,553	3,300,109 1,209,539	4,230,224 348,827 -	5,718,695 1,001,845 -	13,664,679 2,579,035 (24,076)
At 31 December 2021 NET BOOK VALUE	402,846	-	7,553	4,509,648	4,579,051	6,720,540	16,219,638
At 31 December 2021	630,995	3,935,886	-	2,709,081	2,292,058	5,836,029	15,404,049
At 31 December 2020	625,743	3,935,886	-	3,165,472	2,189,674	6,316,209	16,232,984

Note: Accumulated depreciation has been adjusted by K24,076 which was wrongly charged on land from 2008 to 2020 at K1,852

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31st **DECEMBER, 2021 (CONTINUED)**

9 BANK BALANCES	2021	2020
	K	К
Fee Paying Account- Stanbic Bank	3,055,020	2,078,816
ITPT- Stanbic Bank	(487)	5,221
FIELDMAL (US\$ & Zmk) - Stanbic Bank	622,498	2,172,633
Operations Account - Stanbic Bank	132,836	51,527
Main Account - No. 1 - ZANACO	901,452	1,101,775
ITM Coartem(zamphia) - Stanbic Bank	922,883	505,658
CDC - Stanbic Bank	1,008,505	344,422
Global Funds - Stanbic Bank	1,030,086	482,511
ICEMR- Stanbic Bank	1,321,859	1,369,178
Amavac (VIT A.)	332,484	2,400,572
ASPIRE- Investrust	33,664	1,386,718
Car Loan - Investrust	64,122	12,971
HIV/AIDS- Professional Account	37,743	13,525
Smart- Investrust	474,172	-
Fixed deposit investrust	1,537,336	-
ICAP- Stanbic	685,650	
Total	12,159,823	11,925,527

58

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31st **DECEMBER, 2021 (CONTINUED)**

		2021	2020
		K	K
10	NVENTORY		
	Pharmacy	15,429	12,701
	Lab & Office Supplies-Tafs	152,339	229,871
		167,768	242,572
		2021	2020
		2021	2020
		K	K
11	ACCOUNTS RECEIVABLES	449,902	16.045
	Trade Receivables	448,893	16,045
		723,542	56,087
	Staff Debtors	271,564	243,195
	Prepayments to Contractors and Suppliers	1,081,033	59,003
		2,525,632	374,930
		2021	2020
		K	K
12	PAYABLES		
	Trade Payables	54,519	69,472
	Statutory Contributions	41,529,700	42,320,308
	Other Payables	306,776	1,117,987
	Retirement Benefit/Gratuity	3,744,524	11,087,095
	Accrued Rights	15,298,291	15,344,732
	Pension Contribution		
		60,933,810	69,939,594

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31st DECEMBER, 2021. (CONTINUED)

		2021	2020
		K	K
13	CAPITAL RESERVES		
	Balance as at 1 January 2021	2,718,170	3,283,510
	Add: capital grants received during the year	- III	_
	Less: Amortisation for the year	(565,340)	(565,340)
		2,152,830	2,718,170
		2021	2020
		K	K
14	REVENUE RESERVES		
	Balance as at 1 January	(49,370,254)	(53,146,147)
	Retained earning	(6,897,620)	(16,024,558)
	Transfer from capital reserves	565,340	565,340
	ZRA written off	-	18,610,209
	ZSIC gratuity claim for 2019	-	437,913
	Net adjustments to assets (note) 8	24,076	186,989
	Total Reserves	(55,678,458)	(49,370,254)
		2021	2020
		K	K
15	PROVISION FOR LEAVE DAYS		
	AND CONTIGENT LIABILITIES		
	Leave Days due	12,580,012	11,935,662
	Pension Contribution	203,423	450,462
	-		

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31st **DECEMBER, 2021 (CONTINUED)**

16. CAPITAL GRANTS SCHEDULE FROM 2002 TO 2021

DESCRIPTION	YEAR DONATED	AT COST	accumulated	
			amortisation	NBV - 2021
Furniture & Equipment (bal as a	t 01/01/2002)	16,727	16,727	-
Furniture & equipment	2002	1,250,000	1,250,000	-
Motor Vehicles	2004	505,020	505,020	-
Furniture & Equipment	2005	189,820	189,820	-
Lab Equipment	2005	358,489	358,489	-
Land & Building	2005	841,241	269,197	572,044
Motor Vehicle	2006	361,890	361,890	-
Lab Equipment	2006	251,935	251,935	· • •
Furniture & Equipment	2006	156,321	156,321	-
Furniture & Equipment	2007	113,996	113,996	-
Lab Equipment	2007	48,600	48,600	-
Land & Building	2008	92,600	24,076	68,524
Furniture & Equipment	2008	51,388	51,388	× -
Lab Equipment	2008	34,015	34,015	-
Lab Equipment	2009	1,075,281	1,075,281	-
Furniture & Equipment	2009	167,363	167,363	-
Laboratory Equipment	2011	222,000	222,000	-
Laboratory Equipment	2013	374,806	299,844	74,961
Furniture & Equipment	2013	107,323	85,858	21,465
Motor Vehicle - Nissan Navara	2013	173,000	129,750	43,250
			-	(43,250)
Office Equipment	2014	31,500	22,050	9,450
Laboratory Equipment	2014	1,935,922	1,355,145	580,777
Office Equipment	2015	33,239	19,943	13,296
Laboratory Equipment	2015	106,036	63,622	42,414
Laboratory Equipment	2016	33,000	16,500	16,500
Motor vehicle	2019	1,049,121	524,561	524,561
		0 580 631	7 613 301	1 923 990