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The immune divide: factors influencing immune variation and differences in vaccine responses

Pyuza, J.J.

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Curriculum vitae

Jeremia J. Pyuza (Shadrack) was born on March 31, 1990, at Haydom Lutheran Hospital, near his home village of Marera in what was Iramba District at that time, now Mkalama District of the Singida Region, Tanzania. His educational journey began in this rural setting, where he completed his secondary education in 2009 at Gumanga Secondary School. With a passion for the sciences, he proceeded to Bihawana High School for advanced-level studies, focusing on a science combination.

Driven by a strong interest in health sciences and public service, Jeremia pursued and completed a Bachelor of Science in Medical Laboratory Sciences at Kilimanjaro Christian Medical University College (KCMUCo), now KCMC University in 2015. During his undergraduate years, he became actively involved in public health outreach and discovered a passion for writing. He authored his first book, *Laboratory Medicine: The Cornerstone for Evidence-Based Medicine*, while still a student.

Determined to bridge laboratory science with clinical practice, Jeremia went on to pursue a Doctor of Medicine (MD) degree at the same university (KCMC University) in 2020. While in medical school, he worked part-time in the Department of Pathology and engaged in various research activities, publishing several scientific papers and authoring two additional books. During his third year of medical studies, he also began an online MBA to build his leadership and interdisciplinary learning. A pivotal moment in Jeremia's career came when he met Prof. Pancras Hogendoorn, then Dean of Leiden University Medical Center (LUMC), during a visit to the Department of Pathology at KCMC. Impressed by Jeremia's work and his books, Prof. Pancras encouraged him to develop a research topic and later introduced him to Prof. Maria Yazdanbakhsh, a leading immunologist at LUMC and in the Netherlands, renowned for her research on immune variation across populations in both high-income and low- and middle-income countries.

This collaboration led to a formative research experience on schistosomiasis in Mwanga District, Kilimanjaro, conducted under the supervision of Prof. Sia Msuya as part of his MD training. The promising results of that study paved the way for Jeremia to attend a Half Minor in Global Health at LUMC in the Netherlands, during his fifth year of medical school. Encouraged by Prof. Maria and with the support of the LUMC Global Fund, Jeremia

successfully applied to start a PhD in Leiden shortly after completing his medical degree. During his final year as a medical student, he was recognized as the best finalist in Surgery and received the prestigious Dr. Japhet Urasa Prize. Jeremia also has a Postgraduate Diploma in Family Medicine, which enables him to engage in public health education. He has authored or co-authored several Swahili-language public health books on topics including heart failure, pregnancy, hypertensive disorders, kidney disease, COVID-19, and hepatitis.

Jeremia is currently undergoing specialist training in Anatomic Pathology at KCMC University, where he aims to integrate his immunological expertise into the development of a molecular pathology laboratory. His interests include immune variation and vaccine response, immunopathology, immunohistochemistry, and immunotherapy, with a vision to improve vaccine effectiveness, particularly for infectious diseases, including those involved in cancer prevention and to advance cancer diagnosis and care in Tanzania. He has a coordinating role in the collaborative project between KCMC and LUMC, which includes student exchange programs, half-minor research placements, and PhD-related activities. Jeremia is married to Dr. Alice, and together they are proud parents of two children, Ray-Shadrack and Sarah.

Jeremia J. Pyuza PhD Portfolio:

Department: Leiden University Center for Infectious Diseases (LUCID)

PhD duration: 01/01/2021-15/05/2025

Training activities	Hours
Courses	
Introductory course in Epidemiology and Medical statistics London school of hygiene and Tropical Medicine(LSHTM) (2023)	42
Basic methods and reasoning in Biostatistics LUMC (2023)	42
International course in Clinical Epidemiology LUMC (2023)	40
Research regulations and practical implications in the LUMC(2025)	5
Meta analysis LUMC (2024)	30
PhD course in infection and Immunology (LUMC, 2024)	80
Foundations in Virology and Vaccinology Specialization(Coursera, 2025)	39
Certificate Good Clinical Practice(GCP) (2022)	08
Statistical Aspects of clinical trials LUMC (2024)	30
Planning your scientific journey(iBiology, 2022)	15
Let's Experiment : A Guide for Scientists Working at the Bench(iBiology, 2022)	15
Share Your Research: How to Give a Good Talk(iBiology, 2022)	15
Analysis of repeated measurements LUMC (2024)	42
Survival analysis(Advanced Biostatistics) LUMC (2024)	42
Clinical trial analysis, monitoring and presentation(2024)	40
Immunology: Adaptive immune system MOOC (2023)	40
Introduction to R data camp (2024)	04
Introduction to Tidyverse data camp (2024)	04
Intermediate R data camp (2024)	04
Data analysis with R programming MOOC (2024)	04
Introduction to regression data camp (2024)	04
Intermediate regression in R data camp (2024)	04
Building statistical model in R: Linear regression MOOC(2024)	04
Generalized Linear model in R data camp (2024)	04
Hierarchical and mixed effects model in R data camp (2024)	04
Introduction to data visualization with ggplot2 data camp (2024)	04
Data visualization using dplyr and ggplot2 in R MOOC (2024)	04
Introduction to machine learning data camp (2024)	04
Seminar	
Scientific conduct LUMC (2024)	05
Bi weekly department seminar LUMC (2021-2024)	40
Departmental presentation (2021-2024)	09
Conferences, and workshop	
ISBT conference south Africa 2023	28
Hypovax Global workshop Netherlands 2024	28
Innate immunity conference Netherlands 2024	28
FAIR Data conference and Training Leiden (2024)	28
Students supervision	
Half minor 2022	20
Half minor 2023	20
Half minor 2024	20
Field work activities	
Community engagement	40
Participants recruitment	40
Participants follow-up	40
Total hours:	915

List of publications

Publications included in this thesis

Pyuza JJ*, Meulah B*, Hoekstra PT, Mdende N, Mvilli E, van Lieshout L, Hilt ST, Corstjens PLAM, Yazdanbakhsh M, Msuya SE, van Dam GJ. Current status of schistosomiasis in school-aged children in Mwanza district, Tanzania: Impact of two decades of annual mass drug administration programme. *Parasitology*. 2024. DOI: 10.1017/S0031182024001045.

van Dorst MMAR*, **Pyuza JJ***, Nkurunungi G, Kullaya VI, Smits HH, Hogendoorn PCW, Wammes LJ, Everts B, Elliott AM, Jochems SP, Yazdanbakhsh M. Immunological factors linked to geographical variation in vaccine responses. *Nature Reviews Immunology*. 2024. DOI: 10.1038/s41577-023-00941-2.

Pyuza JJ*, van Dorst MAR*, Stam K, Wammes LJ, König M, Kullaya VI, Kruize Y, Huisman W, Andongolile N, Ngowi A, Shao ER, Mremi A, Hogendoorn PCW, Msuya SE, Jochems SP, de Steenhuijsen Pitsers WAA, Yazdanbakhsh M. Lifestyle score is associated with cellular immune profiles in healthy Tanzanian adults. *Brain, Behavior, and Immunity – Health*. 2024. DOI: 10.1016/j.bbih.2024.100863.

Pyuza JJ*, van Dorst MMAR, Barnett D, Stam K, Manurung M, Wammes LJ, König M, Kruize Y, Andongolile N, Ngowi A, Shao ER, Kullaya VI, Mremi A, Hogendoorn PCW, Msuya SE, Jochems SP, Penders J, Yazdanbakhsh M, de Steenhuijsen Pitsers WAA. Tanzanian gut microbiota profiles linked to high but rapidly waning yellow fever antibody titers. *NPJ Biofilms and Microbiomes*. 2025. DOI: 10.1038/s41522-025-00687-w.

***Authors contributed equally.**

Other publications not included in this thesis

Jahanpour O, **Pyuza JJ**, Ntiyakunze EO, Mremi A, Shao ER. ABO and Rhesus blood group distribution and frequency among blood donors at Kilimanjaro Christian Medical Center, Moshi, Tanzania. *BMC Research Notes*. 2017. DOI: 10.1186/s13104-017-3037-3.

Pyuza JJ, Andongolile AA, Issangya CE, Msuya D, Yahaya JJ, Shao ER, Mremi AR. Missed opportunity of deworming a Maasai boy from nomadic family leading to life-threatening intestinal obstruction. *Journal of Surgical Case Reports*. 2020. DOI: 10.1093/jscr/rjaa096.

Lema G, Mremi A, Amsi P, **Pyuza JJ**, Alloyce JP, Mchome B, et al. Placental pathology and maternal factors associated with stillbirth: An institutional-based case-control study in Northern Tanzania. *PLoS ONE*. 2020. DOI: 10.1371/journal.pone.0243455.

Pyuza JJ, Shao ER, Bosco K, Lodhia J, Mremi A. An incidental finding of duodenal GIST in a patient with penetrating abdominal trauma: A case report. *International Journal of Surgery Case Reports*. 2021. DOI: 10.1016/j.ijscr.2021.106263.

Suleman M, **Pyuza JJ**, Sadiq A, Lodhia J. Aortic aneurysm: An uncommon cause of dysphagia. *SAGE Open Medical Case Reports*. 2022. DOI: 10.1177/2050313X221135602.

Pallangyo A, **Pyuza JJ**, Nkya G, Amsi P, Andongolile A, Makata AM, Mremi A. Ventricular silent rupture leading to sudden death: Navigating diagnostic challenges in a resource-constrained setting. *Clinical Case Reports*. 2024. DOI: 10.1002/ccr3.8439.

Shirima FL, Keus A, Mmbaga BT, Hooper SB, Mchome B, **Pyuza JJ**, van den Akker T, Te Pas AB. Knee-to-chest flexion manoeuvre to reduce respiratory distress after planned caesarean birth: A feasibility study. *Archives of Disease in Childhood – Fetal and Neonatal Edition*. 2024. DOI: 10.1136/archdischild-2023-326640.

Shao ER, Mboya IB, Gunda DW, Ruhangisa FG, Temu EM, Nkwama ML, **Pyuza JJ**, Kilonzo KG, Lyamuya FS, Maro VP. Seroprevalence of hepatitis B virus infection and associated factors among healthcare workers in northern Tanzania. *BMC Infectious Diseases*. 2018. DOI: 10.1186/s12879-018-3376-2.