The evolution of hospital infrastructure and vector control in Zanzibar: past, present and future

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Aim

This study examines the co-evolution of hospital architecture and vector control in Zanzibar from the colonial era to 2050 to inform future hospital designs that can reduce MBD risk.

Introduction

Mosquito-borne diseases (MBDs) remain a significant burden in Zanzibar, where hospitals may act as hotspots for transmission. The 2023–24 malaria epidemic highlighted this ongoing risk, which coincides with the most extensive phase of hospital construction since the 1950s. Historical analysis of hospital design and vector control can inform the planning of future healthcare facilities.

Methods

Historical data were sourced from Zanzibar Ministry of Health reports, a literature review, and Zanzibar National Archives records. Present day hospital data came from semi-structured interviews with architects and engineers from the Health Care Engineering Unit (HCEU), along with construction drawings, satellite and drone imagery, and site visits (March 2023-January 2026). Future projections used government population estimates, universal healthcare modelling for sub-Saharan Africa, and vector suitability studies. Analysis was structured across four periods: the colonial era (1890s-1963), the post-revolution period (1963-2020), the post-COVID period (2020-present), and projected futures (to 2050).

Key findings

- Zanzibar's public hospitals include colonial-era manor style (n=1), Pavilion-style 'cottage' (n=4), tropical modernist (n=1), new district hospitals (n=9), and a regional hospital (n=1) built with IMF COVID-19 recovery funds (2022-2025).
- Colonial vector control combined drainage, biological control, and environmental measures, replaced in the 1950s with insecticide use. These approaches were top-down with limited user involvement.
- In the 1950s, hospital standardisation incorporated mosquito protection like screening. Colonial and post-revolution designs used bioclimatic strategies, including cross-ventilation, large windows, and shading.
- Newer buildings lack these, with inadequate ward areas and window-to-floor ratios, possibly reducing patient comfort and increasing mosquito exposure.
- The current construction pace targets universal healthcare (two beds per 1,000 people) by 2031, but population growth will require tripling capacity by 2050.

Conclusion

Cheap insecticides and air-conditioning have led to more generic solutions, weakening the link between hospital form, local climate, and vector ecology. The scale of future construction represents a critical opportunity to reintegrate context-responsive design that incorporates preventive measures into the design, informed by end-user knowledge and needs.

Results

Pre-1925



Early colonial hospital buildings

1884: Notre Dame des Anges mission hospital opens.

1887–94: Jubilee Hospital built (today's Old Dispensary).

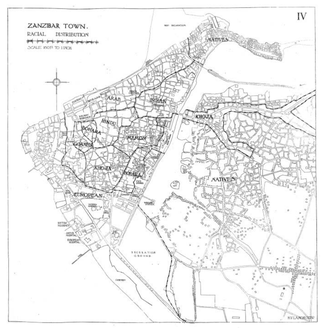
1894: Health, Sanitation and Public Works departments created.

1896: British Military Hospital opens at Mnazi Mmoja.

1900: Government Hospital for Natives and Subordinates opens (European wing added 1924).

(Left) The Old Dispensary from Zanzibar beach. 1900. Source: Archnet.

(Right) Map delineating proposed racial segregation in Zanzibar City by Lanchester (1923)



Environmental management

1896–1956: The Creek, separating Stone Town is reclaimed in stages, filled with refuse.

1907: Mosquito Brigade formed: house inspections, fines for breeding sites.

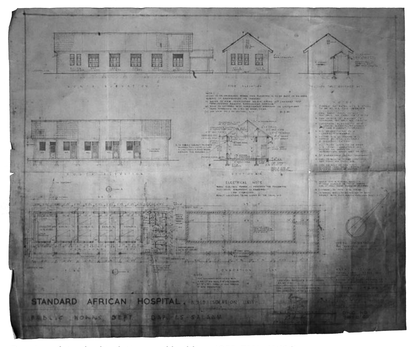
1908–09: New canals drain swamps in Stone Town.

1910s: Kerosene larviciding and automatic oilers used in ditches.

1913: Larvivorous fish (Haplochilus playfairii) released; thatched housing demolished.

1923: Lanchester masterplan zones the town by race, linked to MBD risk.

1925-1963



Drawing of standard isolation ward building, 1952, ZNA: AW6/1



New 214 bed Hassanali Karimjee Jivanjee Hospital (HKJ). Source: Riadh A. Al Busaidi

Colonial hospital expansion

1924: European wing added to the Government Hospital for 'Natives and Subordinates'.

1937: McCarthy proposes clearing vegetation behind Wete Hospital and laying drains to keep nearby swamps dry.

1941–42: Mosquito problems reported at Chake Chake Hospital; bed nets first proposed only for European and Asian patients, then provided for all patients.

1940s–50s: The ten-year plan funds new hospitals in Zanzibar Town, Chake Chake and Wete, plus rural hospitals, dispensaries, first aid posts and a smallpox hospital.

1940s–50s: Karimjee donation pays for a tuberculosis hospital at Dole, built by renovating existing buildings.

1950s: Sheikh Suleiman el-Kiyumi funds health units at Makunduchi and a maternity ward at Mkoani.

1952: Standard isolation ward drawings include window netting, well-fitting doors and chicken wire over the eaves.

Late 1950s: New outpatient clinic and laboratory built at Mnazi Mmoja (£47,477), lined up with HKJ so it would not block sea breezes.

1959: Wete redevelopment finished with fittings chosen for easy cleaning: washable emulsion paint, terrazzo floors and curved skirting.



Example of campaign raising awareness of mosquito breeding sites in private properties used in Zanzibar, 1941. Source: ZNA AJ1 57/167.

Continued environmental management

1930s: Larvivorous Gambusia affinis fish introduced.

1934: Malaria Research Officer (McCarthy) appointed and mosquito survey of the islands carried out.

1935: Anti-malaria gangs formed, Swahili awareness campaigns launched and bans on quarrying and grazing recommended.

1937: Screening and self-closing doors recommended; trees cleared and bamboo drains installed at Wete Hospital.

1938–39: Mkokotoni used as a "model hamlet", with 6,000 pit latrines, drainage and bush clearing.

1941: Malaria transmission inside Chake Chake Hospital reported; bed nets for all patients agreed a year later.

1941–42: Tibirizi swamp filled and planted with eucalyptus; anti-malaria engineer appointed.

1940s: First DDT spraying in towns and on dhows.

1949: Yellow fever controls introduced at ports and on ships.

1963-2020



Abdulla Mzee Hospital. Source: Otis Sloan Wood

Post-revolution hospitals

1964: East German designs for Chake Chake Hospital and standard district hospitals; Mnazi Mmoja renamed V. I. Lenin Hospital.

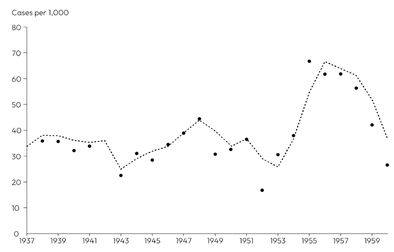
1967: China-built 76-bed pavilion-style hospital at Mkoani.

1980s–mid-2010s: Almost no new hospitals are built.

1990s: Health system reformed to include the private sector; 211 health facilities by 2010.

2016–17: Abdulla Mzee Hospital (China Aid) opens on the Mkoani site.

2019: Kivunge maternity ward opens (UNFPA).



Cases per 1,000 population. Population data for Zanzibar from colonial censuses.

Chemical control and rebound

1958–68: WHO eradication work (IRS plus drugs) brings malaria prevalence below 5%. However, malaria rebounds after the programme ends.

1984–89: USAID-funded control project (DDT) is held back by resistance; 35% of samples test positive in 1988.

Mid-1990s: Curtis's polystyrene-bead treatment of pit latrines in Makunduchi.

2000s: ACTs, LLINs, IRS and RDTs rolled out; malaria deaths fall 90% between 1999 and 2008.

2020-2025



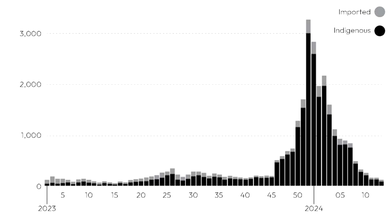
(Left) Drone photo of one of nine new district hospitals. Source: Otis Sloan Wood

COVID-19 hospitals

2022–25: IMF COVID-19 funds pay for 9 district hospitals and 1 regional hospital (Lumumba), the biggest build since the 1950s.

New designs: 5.1 m² of ward space per bed and openable windows at 6.1% of floor area, both below recommendations.

Demolition and renovation: Wete Hospital demolished; Mnazi Mmoja renovation temporarily removes about 500 beds.



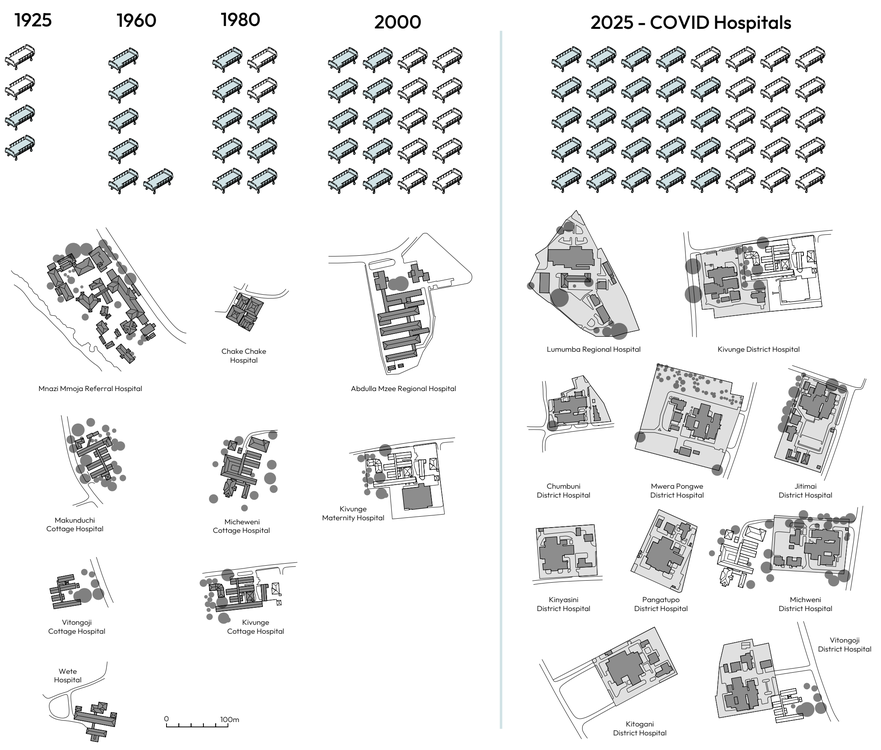
Epi-curve of confirmed malaria cases by week from Jan. 2023 to March 2024, comprising indigenous and imported cases. Source: The November-2023–March-2024 malaria epidemic in Zanzibar: a spatiotemporal epidemiological analysis, F. Kooiman et al, 2025.

Malaria resurgence & prevention

2022: MBD-Free Project starts, focused on prevention in hospitals.

2023-2024: Malaria epidemic, including imported cases.

Policy debate: keep malaria at low, stable levels rather than aim for elimination ($1.88 vs $2.87 per capita).



Rising demand for hospital beds and growing mosquito-borne disease risk

Hospital beds
The hospital bed icons above represent hospital bed infrastructure already built and beds needed to meet the universal healthcare target set by Falchetta, Hammad and Shayegh (2 beds per 1,000 people within a 2-hour drive), using World Bank population projections. If Zanzibar keeps building at its 2022–25 rate, it will reach this target by 2031. But population growth means about **three times today's bed capacity will be needed by 2050.**

Mosquito-borne disease risk
Climate models predict that coastal Zanzibar will remain suitable for malaria, with extreme weather adding to the risk. Ecological niche models show the same for Aedes aegypti mosquitoes. More urbanisation, tourism, trade and travel will also make imported outbreaks more likely.

MBD-Free Project

This research is part of the Danida funded MBD-Free Project. This inniative brings together researchers from the global north and south to explore the key role hospitals may play in the initiation and spread of mosquito-borne diseases (MBDs), and their prevention and monitoring through co-created control interventions and sentinel surveillance in Zanzibar district hospitals.

Collaborating entities

the University of Copenhagen, the State University of Zanzibar, the Royal Danish Academy, the Kilimanjaro Clinical Research Institute, KCMC University, the SACIDS Foundation for One Health, Instituto Nacional de Saúde, the Zanzibar Malaria Elimination Programme and the Zanzibar Ministry of Health.

Funding

Ministry of Foreign Affairs of Denmark
Danida (grant number 21-05-KU)

21ST INTERNATIONAL CONGRESS ON INFECTIOUS DISEASES (ICID) 2026
10-13 NOV, MADRID, SPAIN