

The Health of a Population is Epidemiological Transition (HOPIET): A Five-Year Longitudinal Investigation of Non-Communicable Disease Dynamics in a Population Advancing Towards Middle-Income Status in Sheema District, Western Uganda.

Abstract

This abstract outlines the foundational elements of a critical five-year longitudinal scientific project, titled **The Health of a Population is Epidemiological Transition in Uganda (HOPIET-UG)**, to be conducted in Sheema District, Western Uganda. The primary objective of this research is to meticulously document the incidence, prevalence, and associated biological, behavioural, and socio-economic risk factors of key Non-Communicable Diseases (NCDs), specifically Cardiovascular Disease, Chronic Obstructive Airways Disease, Diabetes, Hypertension, and Cancer, among the entire adult population residing in the district.

A central tenet of this study is to understand how these epidemiological patterns evolve in direct relation to the population's ongoing socio-economic transition from a low-income to a middle-income status. This transformation is occurring **by design**, as part of the Uganda Government's ambitious 'Vision 2040' initiative, which aims to elevate the nation's economic standing. Sheema District has been strategically chosen as the study site because national representative NCD risk factor surveys (STEPS 2014 and STEPS 2023) have demonstrated a consistent epidemiological profile across Uganda, with minor non-significant differences primarily attributed to population density and poverty levels. This makes Sheema District an effective cluster sample, ensuring the generalizability of the study's findings to the broader Ugandan context.

During the period of civil strife in Uganda from the 1970s to the 1990s, the nation's economy plummeted, leading to widespread food insecurity and severe undernutrition. This era provides a unique, yet tragic, opportunity to investigate the **intergenerational effects of maternal undernutrition on offspring health**, a phenomenon hypothesized to be a form of **"Type 5 Diabetes."** This proposed condition, which is characterized by a diminished insulin reserve due to reduced beta-cell mass, is a prime example of the **Barker Hypothesis**, linking intrauterine malnutrition to an increased risk of chronic diseases in adulthood. The **epigenetic changes** induced by maternal undernutrition during critical windows of fetal development may permanently alter gene expression, leading to a predisposition for metabolic disorders that can be passed down through generations. Therefore, a longitudinal study in Sheema District is crucial for establishing the causal link between this historical period of famine and the current prevalence of diabetes, thereby shedding light on the mechanisms of **developmental programming of disease** and its transgenerational implications.

The study will employ a robust mixed-methods approach. The quantitative component will utilize a prospective longitudinal cohort design to track the entire population, collecting comprehensive data on demographic characteristics, socio-economic indicators, behavioural risk factors (e.g., tobacco and alcohol use, diet, physical activity), physiological/biological risk factors (e.g., blood pressure, anthropometrics, glucose, cholesterol), and NCD outcomes (incidence, prevalence, disease progression, mortality). Concurrently, the qualitative component will delve into the lived experiences, perceptions of socio-economic changes, access to healthcare services, and community dynamics through in-depth interviews and focus group discussions, providing rich contextual understanding to complement the quantitative data.

Crucially, the study is designed with an integrated feedback loop: the early identification and deep understanding of NCD patterns and complications, derived from ongoing data collection and analysis, will directly inform and enable targeted interventions in diagnosis, disease management, and complication prevention. This iterative process of observation, analysis, and intervention aims to progressively reduce the overall burden of disease within the population.

Ultimately, the findings from HOPIET will provide actionable, evidence-based insights for public health policy and intervention strategies in Uganda. This research will contribute significantly to the global understanding of NCD epidemiology in transitioning low- and middle-income countries, ensuring that economic development, as envisioned by 'Vision 2040', translates into tangible improvements in population health outcomes.

Below is the conceptual framework of the project.

HOPIET-UG Project Conceptual Framework

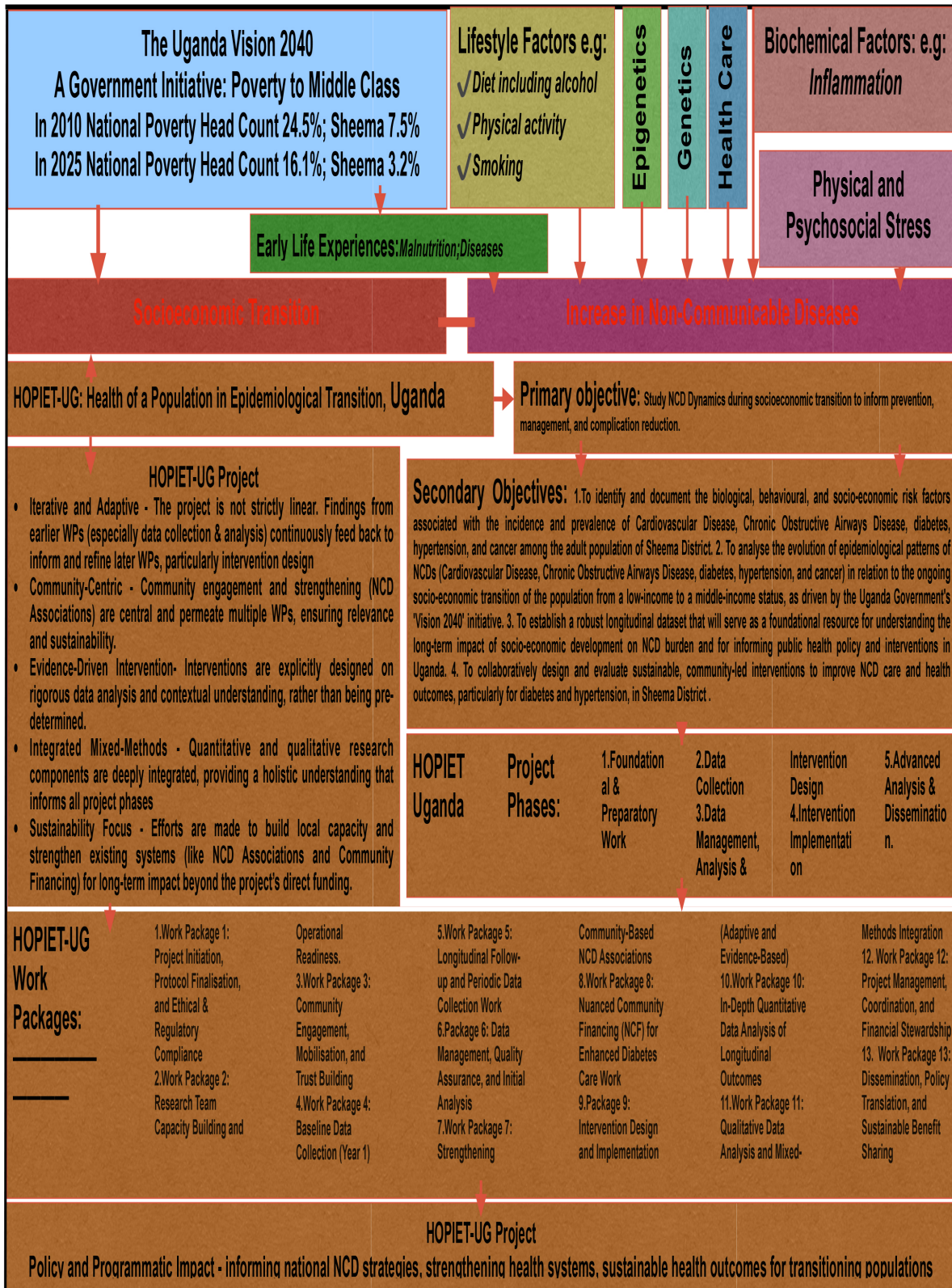


Figure 2 Schematic Representation of the Five-Year HOPIET-UG Conceptual Framework.

Box1 Conceptual Framework of HOPIET-UG

Uganda's commitment to socio-economic transformation is outlined in its Vision 2040, launched in 2010. This long-term development framework aims to transition Uganda from a low-income to an upper-middle-income country. A key indicator of this progress is the poverty index, which measures the percentage of the population living below the national poverty line. **The poverty line in Uganda is determined by the Uganda Bureau of Statistics (UBOS) and is based on the estimated cost of meeting basic caloric requirements, as well as other essential non-food expenditures for an individual. It essentially represents the minimum income or consumption expenditure needed to afford a basic standard of living.**

In 2010, when **Vision 2040** was launched, the national poverty headcount in Uganda was **24.5%**. For Sheema District, a region known for its relatively lower poverty levels, the estimated poverty rate stood at **7.5%** at that time.

Significant strides have been made towards the Vision 2040 goals. As of **2025**, Uganda's national poverty levels have remarkably decreased to **16.1%**. While specific 2025 district-level data for Sheema is not yet officially published, the broader Ankole sub-region, which includes Sheema, now reports a poverty rate of **3.2%**. This continued decline in poverty rates, particularly in regions like Sheema, underscores Uganda's demonstrable progress in improving livelihoods and signifies a tangible movement towards achieving middle-class status.

However, it is crucial to recognize that this economic transition is often associated with an increase in non-communicable diseases (NCDs) such as cardiovascular diseases, cancers, diabetes, and chronic respiratory diseases. As populations move towards higher income brackets, there are often shifts in lifestyle, including dietary changes (e.g., increased consumption of processed foods, unhealthy fats, and sugars), reduced physical activity, and increased exposure to risk factors like tobacco and harmful alcohol use. Therefore, it is imperative that public health strategies are proactively implemented to mitigate this rising burden of NCDs and ensure that health gains accompany economic progress. This is a critical consideration for maintaining overall population well-being and sustaining development.

Work packages have been developed and linkages are displayed in the figure below.

HOPIET-UG Project Work Packages: Schematic Diagram Overview

The HOPIET-UG project follows a logical, phased approach, with foundational work packages leading into data collection, intervention development, and ultimately, analysis and dissemination. Community engagement and capacity building are cross-cutting themes that support various stages.

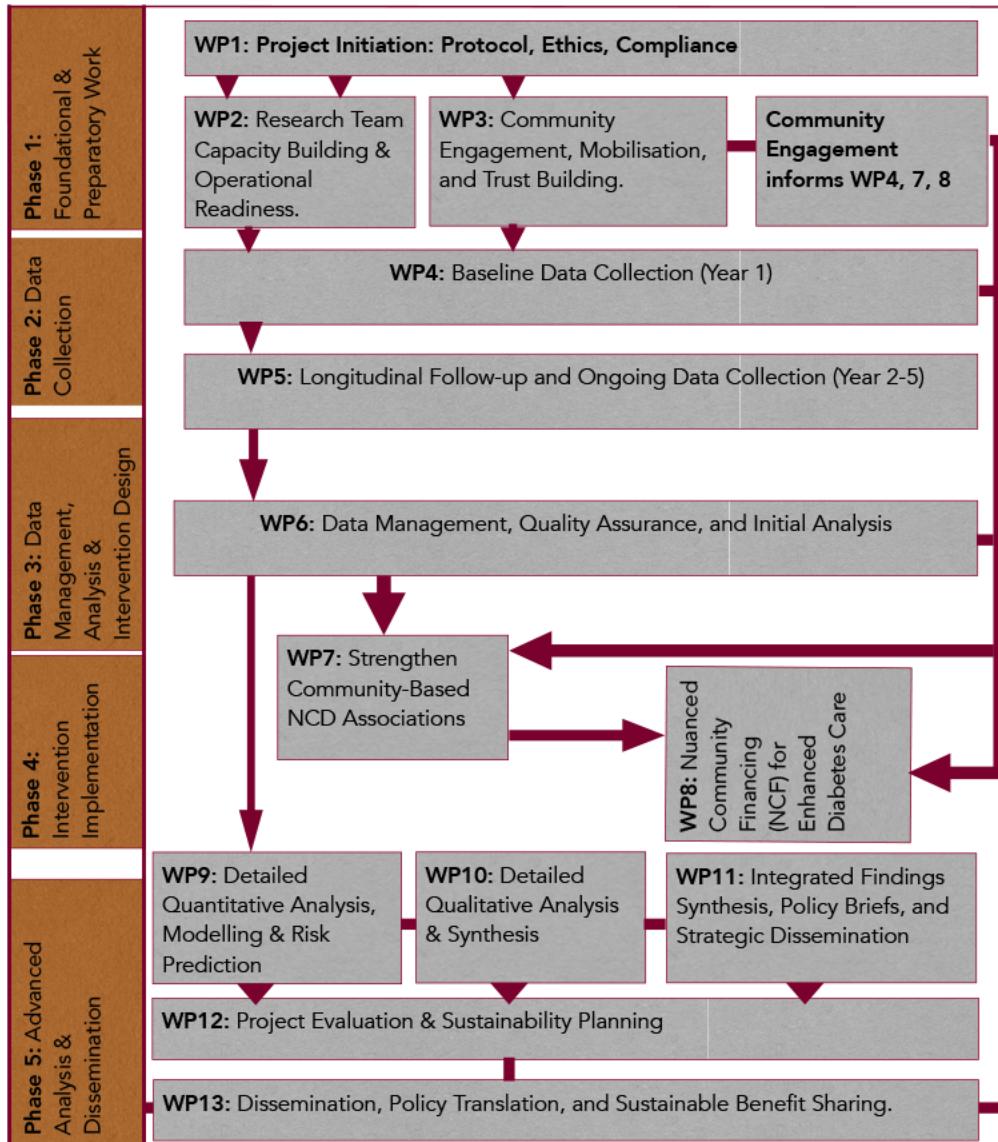


Figure 3 A schematic flow diagram displaying the work packages and interdependencies of HOPIET-UG project.