Modelling the future clinical and environmental burden of chronic kidney disease in Ghana and Uganda between 2025 and 2030

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Objectives

The objective of this study was to project the clinical and environmental burden of chronic kidney disease (CKD) between 2025 and 2030 in Ghana and Uganda.

Introduction

- CKD is a serious, progressive condition that affects an estimated 9.1% of the global population, and an estimated 15.8% of the African population [1,2].
- In sub-Saharan Africa, including Ghana and Uganda, the burden of CKD is increasing, driven largely by rising rates of diabetes, hypertension, and glomerulonephritis [2].
- Kidney replacement therapy (KRT) is both resource and environmentally intensive, with KRT resulting in up to 18 times more healthcare emissions than a general patient [3].
- Limited access to early detection and treatment, combined with constrained healthcare resources, poses challenges for disease management. Dialysis services remain scarce and costly, creating significant barriers for patients with advanced disease [4].
- Understanding the future clinical and environmental burden of CKD is therefore essential to inform policy, resource allocation, and health system preparedness in these settings.

Methods

- Using a microsimulation model, virtual populations for Ghana and Uganda were generated from 2025 to 2030 using country-specific demographic and epidemiological data, where available.
- Each year, modelled individuals progressed through CKD stages based on age-related eGFR decline rates and related comorbidities, to generate population-level projections of the clinical burden of CKD.
- Greenhouse gas (GHG) emissions associated with healthcare visits were estimated and scaled to per-patient healthcare resource utilisation estimates of CKD patients on KRT.
- These estimates, alongside the estimated GHG emissions associated with hospitalisations, were scaled to each respective population to produce population-level estimates in both countries.

Results

Table 1: Projected prevalence over time and percentage increase of CKD, KRT, and the projected environmental impacts of KRT between 2025 and 2030.

Output	Country	2025	2030	Percentage increase (%)
Prevalence of CKD	Ghana	4.3 million CKD cases	5.1 million CKD cases	17.2%
	Uganda	5.2 million CKD cases	6.1 million CKD cases	18.1%
Prevalence of KRT	Ghana	1,815 KRT cases	2,441 KRT cases	35.0%
	Uganda	1,001 KRT cases	1,166 KRT cases	16.4%
GHG emissions of KRT	Ghana	3,680 tonnes	4,930 tonnes	33.9%
	Uganda	2,350 tonnes	2,860 tonnes	21.7%

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Prevalence of CKD and KRT

- In Ghana, 4.3 million people (12.2%) were projected to have CKD in 2025, rising to 5.1 million (13.1%) by 2030. Only 3.1% of cases were diagnosed. KRT cases are projected to increase 35% to 2,441 by 2030, with haemodialysis accounting for almost all cases.
- In Uganda, 5.2 million people (10.1%) were projected to have CKD in 2025, rising to 6.1 million (10.4%) by 2030. Only 2.1% of cases were diagnosed. KRT cases are projected to increase by 16.4% to 1,166 by 2030, with haemodialysis (76%) and transplant (24%) patients accounting for most cases.

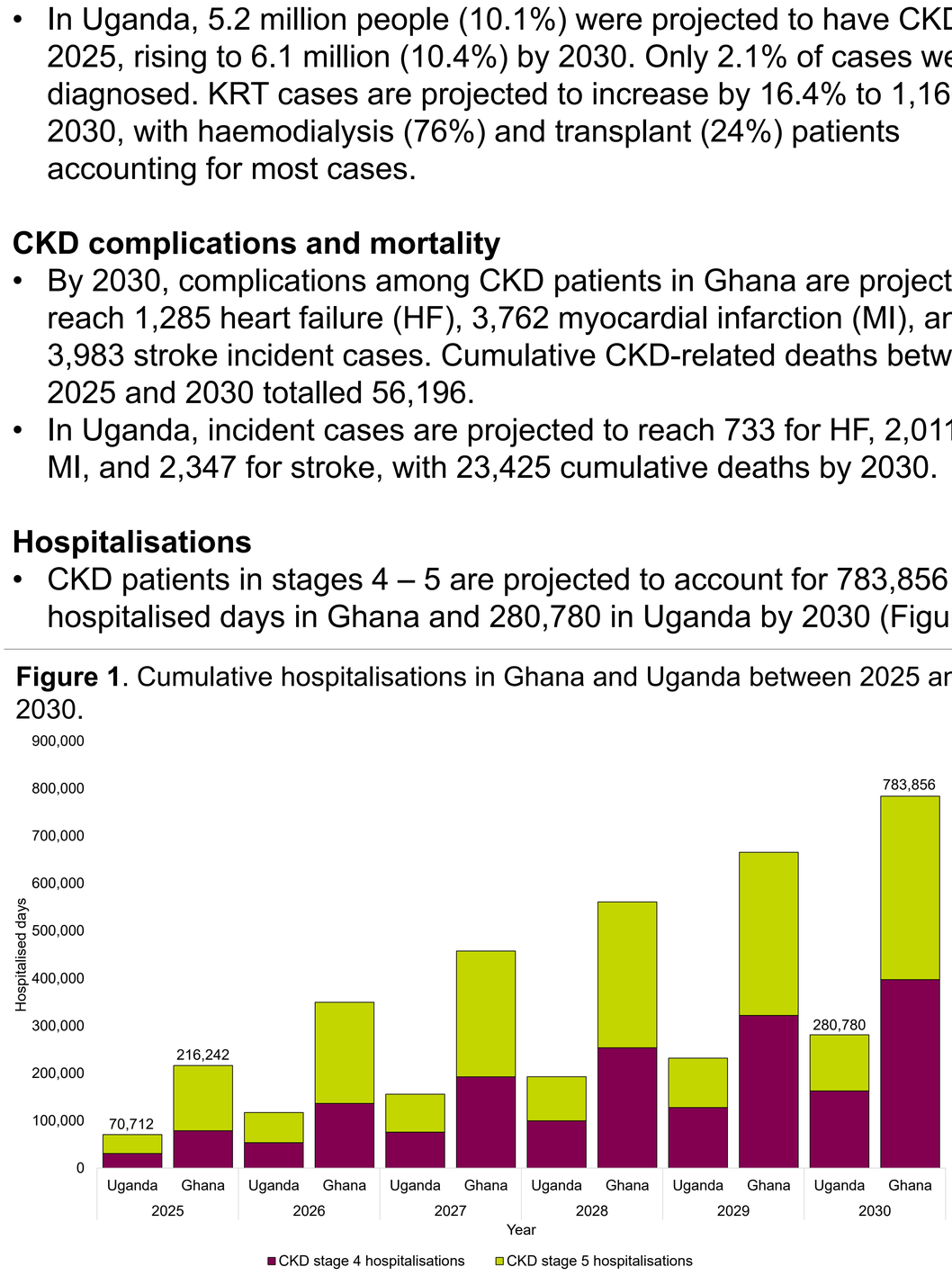
CKD complications and mortality

- By 2030, complications among CKD patients in Ghana are projected to reach 1,285 heart failure (HF), 3,762 myocardial infarction (MI), and 3,983 stroke incident cases. Cumulative CKD-related deaths between 2025 and 2030 totalled 56,196.
- In Uganda, incident cases are projected to reach 733 for HF, 2,011 for MI, and 2,347 for stroke, with 23,425 cumulative deaths by 2030.

Hospitalisations

- CKD patients in stages 4 – 5 are projected to account for 783,856 hospitalised days in Ghana and 280,780 in Uganda by 2030 (Figure 1).

Figure 1. Cumulative hospitalisations in Ghana and Uganda between 2025 and 2030.



Environmental burden of CKD

- The projected increase in hospitalisations and dialysis demand will substantially elevate the environmental footprint of CKD care in both countries.
- The projected rise in hospitalisations in Ghana and Uganda by 2030 corresponds to the emission of 18,400 and 7,210 tonnes of GHG, respectively – equivalent to a plane circling the globe 30.6 and 12.0 times [5].
- The rise in KRT in Ghana and Uganda corresponds to 4,930 and 2,860 tonnes of GHG emissions, respectively – equivalent to a plane circling the globe 8.2 and 4.8 times [5].

Conclusions

- Prevalence is projected to rise steadily in both countries, with only a small proportion of cases diagnosed, while costly, environmentally intensive kidney replacement therapies, and CKD-related complications are expected to increase significantly.
- Early CKD stages account for the majority of cases and costs, yet patients in advanced stages face the highest risk of mortality and resource use.
- The high prevalence of risk factors such as obesity, hypertension, and diabetes highlights the urgent need for upstream policy interventions to address the drivers of CKD.
- Expanding early detection and access to treatment, through initiatives such as hypertension and diabetes management programmes, will be critical to reducing the long-term clinical and environmental burden of CKD on patients, caregivers, and health systems in sub-Saharan Africa.

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