

Cancer Outcomes in Low- and Middle-income Countries: The Role of Clinical, Sociodemographics, and Public Funding as Drivers

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Research Article

Keywords: Mortality Incidence Ratios, Government Funding, Cancers, Low- and Middle-Income Countries

Posted Date: September 2nd, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-9837352/v1>

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Additional Declarations: No competing interests reported.

Abstract

Introduction

Cancer burden is rising in Uganda, as in many low- and middle-income countries (LMICs), with most patients presenting late due to limited access to diagnostic and treatment services. Sustained government investment, strengthened by the Uganda Cancer Institute Act of 2016, has enabled development of a comprehensive cancer care system, including palliative care and population-based cancer registration. This study examines trends in cancer outcomes at the Uganda Cancer Institute (UCI), highlighting the impact of public financing and the role of clinical and sociodemographic factors in shaping cancer care.

Methods

We reviewed patient records at UCI from January 2020 to December 2024. The study population included all adult patients with confirmed diagnoses of breast, prostate, Kaposi sarcoma (KS), cervix, and esophageal cancer. Descriptive statistics summarized sociodemographic and disease-related variables, while mortality-to-incidence ratios (MIRs) were calculated as a proxy for survival. MIRs were modelled over five years using beta regression with a logit link, adjusting for clinical and sociodemographic factors as well as public funding. Analyses were conducted in Stata (v19) and R (v4.5.0) using anonymized Electronic Medical Records data

Results

During the study period, 12,438 new cancer patients were registered. Cervix (29.4%), breast (24.5%), prostate (21.4%), esophagus (16.2%), and KS (8.5%) were the most common cancers. Prostate cancer had the lowest MIR (6.3%), followed by KS (11.5%), cervical (14%), breast (23%), and esophageal cancer (33%). Living outside metropolitan Kampala was associated with higher MIR ($\beta = 0.108$, $p < 0.001$), while HIV-positive status increased MIR ($\beta = 0.082$, $p = 0.012$). Diagnosis site type was strongly predictive, and higher government investment was consistently associated with reduced MIRs.

Conclusion

Sustained public investment in cancer care at UCI has led to improved outcomes, including increased survival and reduced mortality. These findings demonstrate that deliberate investment in cancer care is cost-effective in LMICs and can serve as a model for broader health system strengthening. Expansion through comprehensive cancer control programs integrating prevention, early detection, and referral mechanisms is essential

Introduction

Cancer burden is on the increase in Uganda as is the case in most countries in sub-Saharan Africa and other Low- and Middle-Income Countries (LMIC). Majority of cancer patients present for treatment with advanced stage disease due to limited access of cancer diagnostic services hence poor treatment outcome(1). In Sub Saharan Africa (SSA), public (government and donor funding) expenditure on health is low averaging US\$80 percapita, ranging from as low as US\$ 8 in Sudan to US\$538 in Seychelles. Required level of public spending for Low-income countries was estimated as US\$80-\$90 per person per year to cover basic health services and essential commodities. Noteworthy 39/49 SSA countries spend less than the estimated requirement(2). Relatedly, most developing countries have not been able to adequately invest in cancer care given competing demands from the high burden of communicable diseases and other non-communicable diseases (3, 4). Furthermore, this has been compounded by other factors associated with poor socio-economic circumstances such as education level and house hold income(4, 5).

The government of Uganda has over the years been deliberately drawn into cancer care due to historical circumstances. In the late 19th and early 20th centuries, biomedicine, popularly referred to as western medicine, was introduced in the country(6). Foremost in this aspect were works of missionaries such as sir Albert Cook who is credited for introducing western style medicine in Uganda(6). Several of the cases he observed, treated, and documented were suspected to have been cancers. This was inspirational and instructive in the development of cancer registration but most important, the seminal observation leading to the discovery of Burkitt's lymphoma in Uganda by Denis Burkitt(7, 8). This opened doors for research on cancer treatment and collaborative research which led to the establishment of the Uganda Cancer Institute (UCI) by the National Cancer Institute (NCI) in 1967(9–11). There has since been sustained acute awareness of cancer scourge in Uganda with many groundbreaking “firsts” in the world based on research from the institute(3, 10). The evolving research has led to the establishment of a comprehensive cancer care system with all service components of cancer control continuum in the country, including palliative care, despite resource constraints(12). Along side this, is the presence of a mature population-based cancer registry supporting evidence based national cancer control program(13, 14). The enactment of the Uganda Cancer Institute Act 2016 has created a conducive holistic legal and policy framework for national cancer control mandate

With this background, therefore, the government of Uganda has overtime gradually increased investment in cancer care through the UCI as the mandated government agency. The UCI is also the designated East African Centre of Excellence in Oncology(3, 15), thus, an extended role for technical support for cancer control in the East African community. With the growing awareness and demand for cancer control services in the country, the institute has established four regional cancer centres which are an extension of the institute to the population far from the capital city, Kampala(16, 17).

Public financing for cancer care has supported significant health infrastructure expansion, human resource capacity development and increased access to quality treatment. However, the documentation of the benefit and impact of these investments in cancer care overtime has not been systematically done to date.

Methodology

We conducted a comprehensive analysis of data from our institutional Electronic Medical Records (EMR) system (Clinic Master) reviewing all patients at the UCI from January 2020 to December 2024. The purpose of this analysis was to describe the trend in cancer outcome, relative to public investment in cancer services and impact of other social and disease associated factors.

The study population comprised all patients with a confirmed diagnosis of breast, prostate, Kaposi Sarcoma (KS), cervix, and esophageal cancer which were the five commonest cancers in the country captured in the Institutional EMR between 2020 and 2024. Included were patients with a documented cancer diagnosis and complete records with outcome status. Patients who had missing identifiers, incomplete diagnostic information, or duplicate entries were excluded. Key variables captured were demographic, social economic variables, diagnoses, disease stage, outcomes from the EMR and government funding over the five years was captured from the annual fundng allocation from the UCI Finance and Accounts Records .

Statistical Analysis

Descriptive statistics such as annual counts and proportions of new cases, deaths, disease stage and sociodemographics were summarized.

Mortality-to-Incidence Ratio (MIR) were calculated for each cancer type as a proxy for survival trends, this was mainly because the UCI has not developed proper capacity for adequate follow up of cancer patients to ascertain their most valid vital status and hence the mortality data in the institutional EMR is for only patients who die at the hospital (UCI). Details of patients who die in the community or who get lost to followup are not properly documented. In this study, MIR was defined as the ratio of mortality (number of cancer deaths) to incidence (number of new cancer cases) at the Uganda Cancer Institute over a period of five years. A MIR of approximately 1 or tending towards 1 meant poor survival outcomes from that specific cancer while a MIR tending towards 0 meant better survival outcomes. MIR trends were assessed across the five-year period.

Inferential statistics were modeled using beta regression with a logit link, adjusting for cancer stage, region (location), total government funding, age, sex and diagnosis. This approach accounts for the bounded nature of MIR (0–1) and provides robust estimates compared to linear regression(18).

We further modeled government funding over disease burden and outcome(MIR).

Analyses were performed using Stata (version 19) and R (version 4.5.0).

Results

Clinical social and demographic characteristics of patients 2020-2024

In the period 2020 to 2024, a total of 12,438 new cancer patients were registered at the UCI, of which the five common cancers were Cervix, 11.8%, Breast, 9.8%, Prostate, 8.6%, Esophagus, 6.5%, and Kaposi Sarcoma, 3.4%. Of these, 61% were female with a median age of 55 years ranging from 43 to 67 years. Majority (52%) of patients were from the central region, 53% were in formal employment , 45% were married , most were christians (75%), and with late stage disease (stage 3 and 4), 77%. Most of the patients were alive based on the database status at the time of this data analysis (83%) **(Table 1)**. A 60% increase in new cancer patients at the UCI for the five common cancers between 2020 and 2024 was observed, with an associated rise in mortality between 2021 and 2023 . **(Figure1) (Figure2)**. We further analyzed the proportional burden of the five cancers by stage at diagnosis. Breast cancer accounted for half (50%) of all early-stage cases, whereas esophageal cancer contributed the largest share (37%) of late-stage cases. **(Figure4)**

Mortality Incidence Ratio (MIR)

Lower MIR

Prostate cancer had the lowest MIR (0.063) indicating that 6.3% of the prostate cancer patients die relative to those newly diagnosed despite the increase in number of new cases over the years, hence approximately 93.7% of the prostate cancer patients survive. Kaposi Sarcoma (KS) also had low MIR of about 11.5%, implying that about 88.5 of KS patients survive. Hence Prostate cancer and KS had the best survival outcomes **(Table2)**

Intermediate MIR

Cancer of the Cervix depicted moderate MIR of 14% which was relatively stable with slight fluctuations. **(Table2)**

Higher MIR

Esophageal cancer had the highest MIR across the five years with about 33% of the esophageal cancer patients dying relative to the newly diagnosed cases hence Indicating very poor survival. Breast cancer also had relatively high MIR though not as high as cancer of the Esophagus that is about 23% lethality relative to incidence. Therefore breast and esophageal cancer had the most concerning survival outcomes. **(Table2)**

Mortality incidence ratios and associated factors.

Demographic Factors

Age

In the bivariate analysis, age was negatively associated with the outcome ($\beta = -0.0071$, $SE = 0.0004$, $p < 0.001$, 95% CI [-0.0079, -0.0063]), with each additional year of age, MIR decreased by 0.0071 times suggesting that older patients had lower MIRs. However, this effect was attenuated and non-significant after adjustment ($\beta = 0.001$, $SE = 0.001$, $p = 0.211$, 95% CI [-0.001, 0.004]). That is the effect of age on MIR was likely confounded by other factors (Table3).

Sex

Male sex was strongly associated with lower values in the unadjusted model ($\beta = -0.358$, $SE = 0.014$, $p < 0.001$, 95% CI [-0.384, -0.330]), that is males had a 0.36 lower MIR than females but the effect did not hold in the multivariable model ($\beta = -0.001$, $SE = 0.048$, $p = 0.978$, 95% CI [-0.095, 0.093]), indicating confounding by other factors (Table3).

Socio-Economic Factors

Location: Living Outside Kampala Metropolitan vs. Living in Metropolitan Kampala

Location outside Kampala Metropolitan was not a statistically significant predictor of MIR in the bivariate analysis ($\beta = 0.011$, $SE = 0.014$, $p = 0.453$, 95% CI [-0.017, 0.039]) but became positively associated after adjustment ($\beta = 0.108$, $SE = 0.031$, $p < 0.001$, 95% CI [0.047, 0.168]), that is living outside metropolitan Kampala was associated with higher MIR highlighting geographic disparities in outcomes (Table3).

Employment Status

Formal employment was negatively associated in the bivariate analysis ($\beta = -0.067$, $SE = 0.026$, $p = 0.011$, 95% CI [-0.118, -0.015]) that is formally employed patients had 6.7% lower MIR than those who were unemployed. However, in the multivariable model this effect diminished, indicating socioeconomic effects were confounded by other variables (Table3).

Clinical Factors

HIV Status

HIV-positive status was not significant in the bivariate analysis ($\beta = -0.002$, $SE = 0.021$, $p = 0.915$, 95% CI [-0.044, 0.039]) but emerged as a significant positive predictor after adjustment ($\beta = 0.082$, $SE = 0.033$, $p = 0.012$, 95% CI [0.018, 0.146]), being HIV positive was associated with a 0.082 times increase in the MIR underscoring the clinical importance of HIV comorbidity (Table3).

Cancer Stage

In the bivariate analysis, early-stage cancer showed a negative association with the outcome ($\beta = -0.146$, $SE = 0.057$, $p = 0.011$, 95% CI [-0.259, -0.034]) compared to unstaged cancer which was the reference category. Early-stage cancer patients show a significantly lower MIR than unstaged cases, meaning that relative to incidence, survival is higher in early-stage disease. However, after adjustment in the multivariable model, this association was not statistically significant: late-stage ($\beta = -0.040$, $SE = -0.8$, $p = 0.807$, 95% CI [-0.138, 0.058]) and Early stage ($\beta = -0.040$, $SE = -0.99$, $p = 0.321$, 95% CI [-0.119, 0.039]). Hence stage does not independently predict MIR once other variables are controlled (Table3).

Diagnosis (Cancer Type)

Diagnosis type was strongly predictive with Kaposi Sarcoma as the reference category, breast ($\beta = 0.854$, $SE = 0.077$, $p < 0.001$, 95% CI [0.703, 1.104]), cervix ($\beta = 0.265$, $SE = 0.077$, $p < 0.001$, 95% CI [0.114, 0.416]), and esophagus ($\beta = 1.165$, $SE = 0.071$, $p < 0.001$, 95% CI [1.026, 1.304]) cancers had significantly higher values, while prostate cancer had lower values ($\beta = -0.569$, $SE = 0.112$, $p < 0.001$, 95% CI [-0.787, -0.350]). These findings highlight substantial variation in outcomes by cancer type, with esophageal cancer showing poor relative outcome. Cancer type strongly influences MIR with esophageal and breast cancers being associated with worse outcomes, while prostate and KS showed better outcome (Table3).

Mortality Incidence Ratios and Public Funding

Public funding for cancer in Uganda has been increasing from 34.994 billion Uganda Shillings in 2020 which is an equivalent of about 9.3 million United States Dollars to 72.884 billion Uganda Shillings in 2024 which is approximately 19.3 million United States Dollars. Correlation of budget increase and MIR by cancer type is depicted in **Figure 3**. Overall as funding increases there is improvement in outcome as shown by better MIR for all cancer overtime. Best outcomes were noted for prostate cancer and Kaposi sarcoma. Relatively poor outcomes were noted for Esophageal cancer and Breast cancer. Cervical cancer showed intermediate outcome. (Table 3)

Public Funding was consistently negatively associated with the outcome in both models (bivariate: $\beta = -0.0218$, $SE = 0.0004$, $p < 0.001$, 95% CI [-0.023, -0.021]; and the multivariable: $\beta = -0.018$, $SE = 0.001$, $p < 0.001$, 95% CI [-0.019, -0.016]), The narrow confidence intervals show this is a precise and robust association suggesting that higher expenditures were linked to reduced MIRs, potentially reflecting resource allocation efficiency.

Discussion

The findings of this study corroborate with the hypothesis that nationally organized, publicly funded cancer services led to objectively verifiable improvement in cancer outcome for common cancers in Uganda. This is in line with the fact that public funding improves health outcomes(19). We noted trend of improved survival, reduced mortality among patients accessing services as the numbers of patients accessing services surged. This is on the backdrop of

improvement in infrastructure development, equipment and capacity for service delivery. Overtime there has been incremental investment for development of cancer services in Uganda. Moreover, we noted strong indicator of value for money in the investment.

A well aligned public cancer management system as shown in this case is a prerequisite for improved utilization of investment and is an area of emphasis in the implementation of a comprehensive national cancer control plan. This has the potential of addressing national cancer burden at a population level(12). The UCI has experienced a significant increase in patient volume, directly correlated to enhanced service availability, indicating that public services are reaching more people. Also, the trend of reduced mortality is supported by the strengthening of pathology services and the ability to offer comprehensive treatment pathways (radiotherapy, chemotherapy, surgery) that were previously very limited, particularly in resource-limited settings(3, 20).

New cancer cases increased progressively during the study period an indicator of increase service utilization. Overall improvement in survival and decreased mortality overtime for the most difficult to treat cancers such as oesophageal carcinoma has been noted.

The trend of oesophagus can be explained by disease presentation at late stage increase number of patients occasioned by availability of services.

Overall, all cancers have moved to a fairer MIR lately (less than 0.2) by 2024.

This can be explained by improved access to services, occasioned by persistent investment. The strategy of bringing cancer care closer to the community—specifically through regional centers in Gulu, Mbarara, Arua, and Mbale—aligns with the plans to reduce patient load due to increasing numbers at the central facility in Kampala and providing more timely care. More so, the deployment of high-precision equipment, such as the Linear Accelerator (LINAC) and new imaging technologies (SPECT CT), will improve the standard of care, allowing for better outcome probabilities for common cancers in the long run.

This means streamlined public cancer management system is a prerequisite for improved utilization of investment in cancer care given the benefit of improved outcome for patients attending such services. Nonetheless this benefit needs to be extended to the entire community through an effective comprehensive cancer control program. The model of expansion of services in Uganda has already been initiated through establishment of regional cancer centre, improving community awareness and having an effective referral mechanism.

While the findings support a positive trend, the study also acknowledges significant bottlenecks. Despite the rise in funding, the sheer volume of cases (35,000 + new cases yearly) continues to strain resources. Therefore, further expansion of regional cancer centres is urgently needed, as many patients still face delays in treatment initiation due to geographic and financial barriers. This is especially true for radiotherapy services, which remain largely centralized at the Uganda Cancer Institute in Kampala. Strengthening regional cancer care capacity would reduce congestion at UCI, improve access to timely treatment, and enhance the quality of cancer care nationwide.

Strength of the study is derived from the clinical data base with confirmed histological diagnosis and proper standardised treatment with guidelines and protocol. This minimises bias in observation, documentations and outcome ascertainment. This study is therefore likely to be reproducible in a prospective model.

Short coming of MIR as a proxy for cancer outcome has been highlighted especially using population-based cancer registry data but not in a data derived from clinical data base with complete information like in our case(21). Secondly even at population level some studies have shown good correlation with outcome such as the case in a study of 34 Organization for Economic Cooperation and Development (OECD) countries(22). The question of robustness of economic analysis of impact of investment on outcome has also been raised. This can best be addressed in a purposefully designed prospective study or clinical trial.

Validity of our assumption is that for an equitable cancer service the investment must come from the government hence public funding. This is in line with the principles of universal health coverage (UHC)(23). We therefore didn't include in our model contribution of private sector, civil society and philanthropy. This is because most development partners invest in communicable diseases or areas like maternal and child health but not cancer or non-communicable diseases.

Could bias and confounding account for the findings? There is a possibility of selective bias because only those who have social support can come to Kampala hence excluding the poor from the country side from attending the service in Kampala. Mainly solid tumors were including using the criteria of most common cancers per our population-based registries thus haematological malignancies were hardly represented. Our data were drawn from routine medical records hence not designed for purpose and retrospective in nature.

Conclusion

Sustained public investment in cancer services result in improved outcome such as survival, reduced mortality for patients accessing services as public investment in cancer services improves. Therefore, improved access to modern cancer services in developing countries has the potential of improving cancer outcome despite increasing burden of cancer in this setting. The linkage of improved care services to an effective prevention and control system is therefore an area for public investment focused on cancer services in developing countries. Uganda has created a cancer care model, based on public investment showing that this study is a validation of this model. Deliberate investment in cancer care in developing countries is cost effective. The next step is expansion of this model to the population with emphasis on primary prevention and early detection through an effective comprehensive national cancer control program and swift operationalization of regional cancer centers to improve access to care, thus a fair balance of the demand and supply sides of cancer control.

Abbreviations

EMR
Electronic Medical Records
IRB
Institutional Review Board
KS
Kaposi Sarcoma
LMICs
Low- and middle-income countries
LINAC
Linear Accelerator
MIR
Mortality Incidence Ratio
NCI
National Cancer Institute
OECD
Organization for Economic Cooperation and Development countries
REC
Research and Ethics Committee
SSA
Sub Saharan Africa
UCI
Uganda Cancer Institute
UHC
Universal Health Coverage

Declarations

Ethical Considerations This study utilized routinely collected, de-identified data from the institutional EMR covering the period 2020–2024. No direct patient contact occurred, and no identifiable information was included in the analysis. Institutional Review Board (IRB) approval was waived off by UCI Research and Ethics Committee (REC) because the study involved secondary analysis of anonymized data and also because this was a minimal risk study.

Consent for publication

I give consent to publish this work both in print and online since this is my original work and all co-authors are aware of the contents of this manuscript

Availability of data and materials

The data analysed for this paper is available from the corresponding author on reasonable request.

Conflicts of interest

The Author(s) declare that there is no conflict of interest

Funding

No external funding was obtained for this study. Analyses were performed on data already collected within the Uganda Cancer Institute's electronic medical record system.

Authors' contributions

JO conceptualized and drafted the manuscript. BSA designed the study, performed the statistical analyses and interpreted the data. NN assisted with methodological refinement. EA, DB, BN, JN and AJ critically reviewed the manuscript for intellectual content and provided proofreading support. All authors approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Acknowledgements

We acknowledge the contributions of the Uganda Cancer Institute data team including the data entry clerks as well as biostatisticians and records staff, whose diligent work in maintaining the electronic medical record system made this analysis possible.

References

1. Bray F, Parkin DM, African Cancer Registry N. Cancer in sub-Saharan Africa in 2020: a review of current estimates of the national burden, data gaps, and future needs. *Lancet Oncol.* 2022;23(6):719–28.

2. Ssozi J, Amlani S. The Effectiveness of Health Expenditure on the Proximate and Ultimate Goals of Healthcare in Sub-Saharan Africa. *World Development*. 2015;76:165–79.
3. Orem J. Building Modern Cancer Care Services in Sub-Saharan Africa Based on a Clinical-Research Care Model. *Am Soc Clin Oncol Educ Book*. 2022;42:1–6.
4. Stefan DC. Cancer Care in Africa: An Overview of Resources. *J Glob Oncol*. 2015;1(1):30–6.
5. Wojcicki JM. Socioeconomic status as a risk factor for HIV infection in women in East, Central and Southern Africa: a systematic review. *J Biosoc Sci*. 2005;37(1):1–36.
6. SIR Albert Cook, C.M.G., O.B.E. M.D. *Br Med J*. 1951;1(4713):1021–2.
7. Burkitt D, Wright DH. A Lymphoma Syndrome in Tropical Africa with a Note on Histology, Cytology, and Histochemistry. *Int Rev Exp Pathol*. 1963;2:67–138.
8. Burkitt D, O'Connor GT. Malignant lymphoma in African children. I. A clinical syndrome. *Cancer*. 1961;14:258–69.
9. Olweny CL. The Uganda Cancer Institute. *Oncology*. 1980;37(5):367–70.
10. Savage L. Former African cancer research powerhouse makes plans for a return to greatness. *J Natl Cancer Inst*. 2007;99(15):1144–5, 51.
11. Varmus H. Medical research centers in Mali and Uganda: overcoming obstacles to building scientific capacity and promoting global health. *Science and Diplomacy*. 2014;3(1).
12. Orem J, Wabinga H. The roles of national cancer research institutions in evolving a comprehensive cancer control program in a developing country: experience from Uganda. *Oncology*. 2009;77(5):272–80.
13. Wabinga HR, Nambooz S, Amulen PM, Okello C, Mbus L, Parkin DM. Trends in the incidence of cancer in Kampala, Uganda 1991-2010. *Int J Cancer*. 2014;135(2):432–9.
14. Wabinga H, Subramanian S, Nambooz S, Amulen PM, Edwards P, Joseph R, et al. Uganda experience-Using cost assessment of an established registry to project resources required to expand cancer registration. *Cancer Epidemiol*. 2016;45 Suppl 1(Suppl 1):S30–S6.
15. Okello CD, Niyonzima N, Ferrareso M, Kadumbula S, Ddunga H, Tarlock K, et al. Haematological malignancies in sub-Saharan Africa: east Africa as an example for improving care. *Lancet Haematol*. 2021;8(10):e756–e69.
16. Okongo F, Amuge C, Jatho A, Niyonzima N, Ogwang DM, Orem J. The regional cancer spectrum in Uganda: a population-based cancer survey by sub-regions (2017-2020). *Ecancermedicalscience*. 2024;18:1782.
17. Bogere N, Angucia BS, Nangobi EK, Kayaga J, Nyeko MO, Nanteza Okello M, et al. Mapping the Distribution and Challenges of Long-Distance Travel for Patients With Breast Cancer at the Uganda Cancer Institute. *JCO Glob Oncol*. 2025;11:e2400533.
18. Ferrari S, Cribari-Neto F. Beta Regression for Modelling Rates and Proportions. *Journal of Applied Statistics*. 2004;31(7):799–815.
19. Musah A, Aawaar G, Musah G, Abdul-Mumuni A. Financial development, public health financing, and health outcomes in Sub-Saharan Africa. *BMC Public Health*. 2025;25(1):2943.
20. Kavuma A, Kibudde S, Kanyike D, Kigula-Mugambe J, Zhao T, Gay H, et al. Evolution and Recent Radiation Therapy Advancement in Uganda: A Precedent on How to Increase Access to Quality Radiotherapy Services in Low- and Middle-Income Countries. *JCO Glob Oncol*. 2025;11:e2400339.
21. Ellis L, Belot A, Rachet B, Coleman MP. The Mortality-to-Incidence Ratio Is Not a Valid Proxy for Cancer Survival. *J Glob Oncol*. 2019;5:1–9.
22. Choi E, Lee S, Nhung BC, Suh M, Park B, Jun JK, et al. Cancer mortality-to-incidence ratio as an indicator of cancer management outcomes in Organization for Economic Cooperation and Development countries. *Epidemiol Health*. 2017;39:e2017006.
23. Voorhoeve A, Tan-Torres Edejer T, Kipiriri L, Norheim OF, Snowden J, Basenya O, et al. Making Fair Choices on the Path to Universal Health Coverage: Applying Principles to Difficult Cases. *Health Syst Reform*. 2017;3(4):301–12.

Tables

Table 1: Clinical sociodemographic description of patient characteristics at UCI 2020 to 2024

Variable (n=12,438)		Frequency	Percentage
Sex	Female	7,578	60.93
	Male	4,860	39.07
Age	Median	55	
	IQR	43 to 67	
Region	Central	6,451	51.87
	Western	2,287	18.39
	Eastern	2,174	17.48
	Northern	1,248	10.03
	Non-Ugandans	278	2.24
Year	2020	2,193	17.63
	2021	2,010	16.16
	2022	2,269	18.24
	2023	2,826	22.72
	2024	3,140	25.25
Location	Metropolitan Kampala	4,138	33.27
	Outside Kampala Metropolitan	8,300	66.73
Employment status	Formal employment	6,552	52.68
	Informal employment	4,484	36.05
	Unemployed	1,180	9.49
	No data	222	1.78
Marital Status	Married	5,565	44.74
	Widowed	1165	9.36
	Single	484	3.89
	Divorced	903	7.26
	No data	4,321	34.74
Religion	Christian	9,356	75.22
	Moslem	1,428	11.48
	Other	1,654	13.3
Diagnosis	cervix	3,662	29.44
	breast	3,043	24.47
	prostate	2,664	21.42
	esophagus	2,012	16.18
	KS	1,057	8.5
HIV Status	positive	1,893	15.22
	negative	3,160	25.41
	unknown	1,978	15.9
	No data	5,407	43.47
Other Comorbidity	Yes	2,568	20.65
	No	9,870	79.35
Cancer Stage	late_stage	1,935	77.37
	early_stage	332	13.27
	unstaged	234	9.36
Vital Status	Alive	10,265	82.53

Table 2: Mortality-Incidence Ratios of Cancer Patients at UCI 2020 to 2024

Cancer type	Cases	Deaths	Mortality-Incidence ratio
Esophagus	2,012	659	0.328
Breast	3,043	697	0.229
Cervix	3,662	511	0.140
KS	1,057	122	0.115
Prostate	2,665	169	0.063

Table 3: Factors Associated with the Mortality Incidence Ratios at UCI among the Five common adult cancers

Variable		Bivariate Regression				Multivariable Regression	
		Regression Coefficient (β)	Std Error	pvalue	95% CI	Regression Coefficient (β)	Std Error
Age		-0.0071	0.0004	<0.001	(-0.0079 to -0.0063)	-0.0001	0.0001
Sex	Female	Ref				Ref	
	Male	-0.358	0.014	<0.001	(-0.384 to -0.330)	-0.0011	0.0001
Location	Kampala Metropolitan	Ref				Ref	
	Outside Kampala Metropolitan	0.011	0.014	0.453	(-0.017 to 0.039)	0.056	0.0001
Religion	Christian	Ref				Ref	
	Muslim	-0.050	0.022	0.021	(-0.093 to -0.007)	0.007	0.0001
	Other	0.198	0.020	<0.001	(0.160 to 0.236)	0.091	0.0001
Total Public Funding		-0.0218	0.0004	<0.001	(-0.023 to -0.021)	-0.020	0.0001
Diagnosis	KS	Ref				Ref	
	Breast	0.646	0.023	<0.001	(0.601 to 0.691)	0.864	0.0001
	Cervix	0.147	0.023	<0.001	(0.102 to 0.192)	0.217	0.0001
	Esophagus	1.127	0.023	<0.001	(1.081 to 1.173)	1.244	0.0001
	Prostate	-0.468	0.025	<0.001	(-0.517 to -0.419)	-0.571	0.0001
Cancer Stage	unstaged	Ref				Ref	
	Late Stage	-0.073	0.040	0.071	(-0.006 to 0.152)	-0.040	-0.0001
	Early_stage	-0.146	0.057	0.011	(-0.259 to -0.034)	-0.040	-0.0001

Figures

Five Common Adult Cancers at UCI 2020 to 2024, (n=12,438)

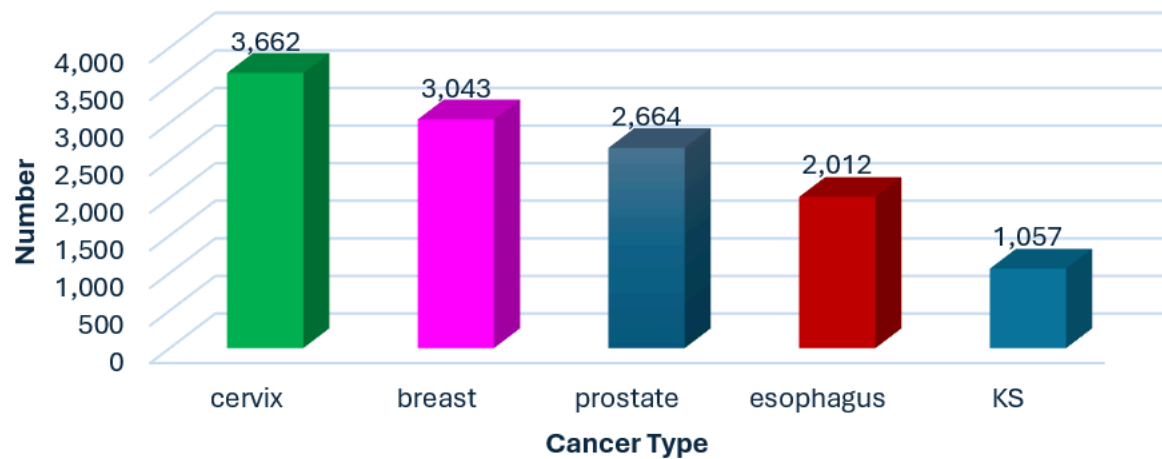


Figure 1

Distribution of the five common adult cancers at UCI 2020 to 2024

Cancer Burden Trend for Top Five Cancers at UCI from 2020 to 2024

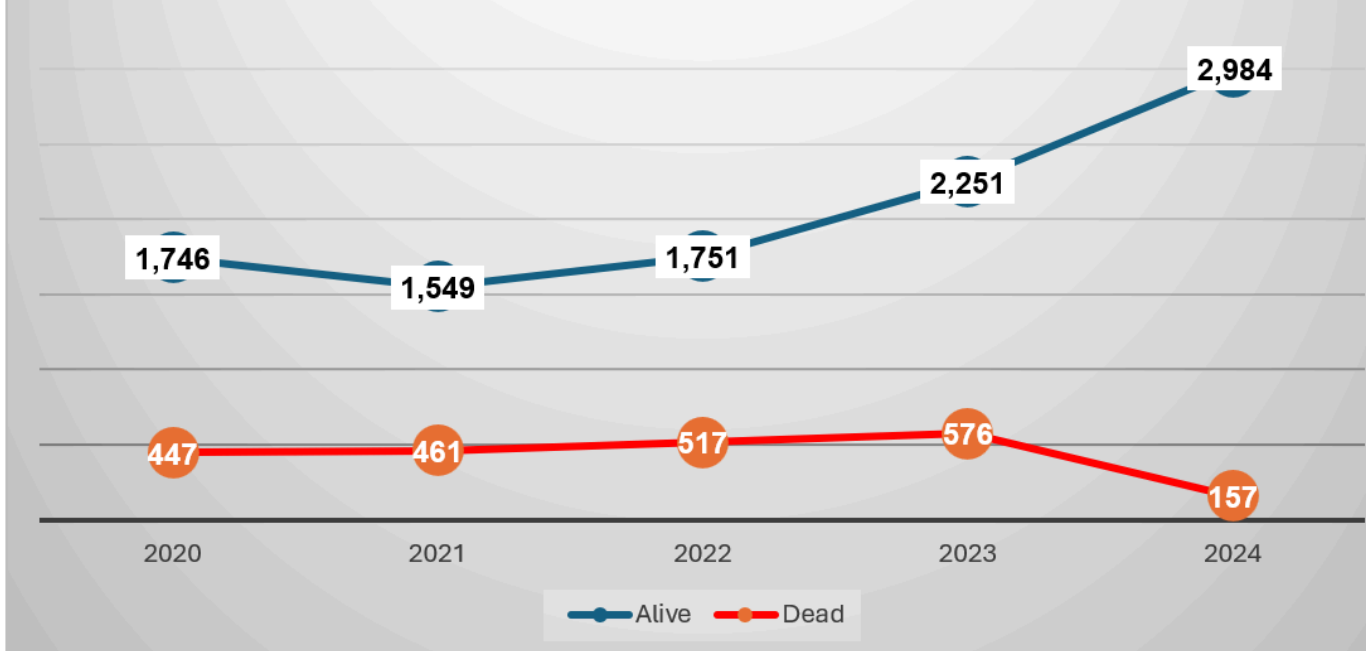


Figure 2

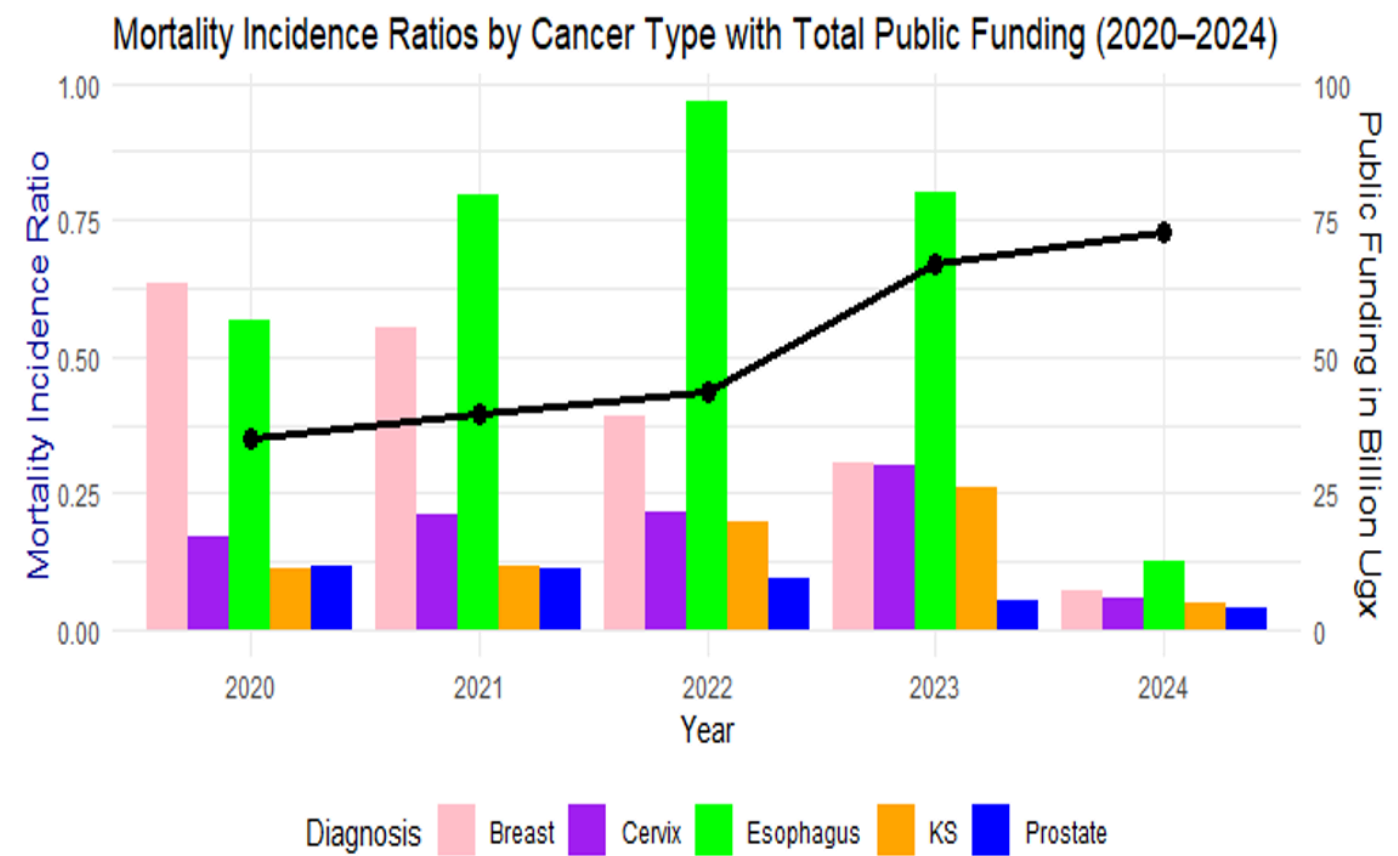


Figure 3
Mortality Incidence Ratios of the five Common Adult Cancers at UCI Vs Total Public Funding

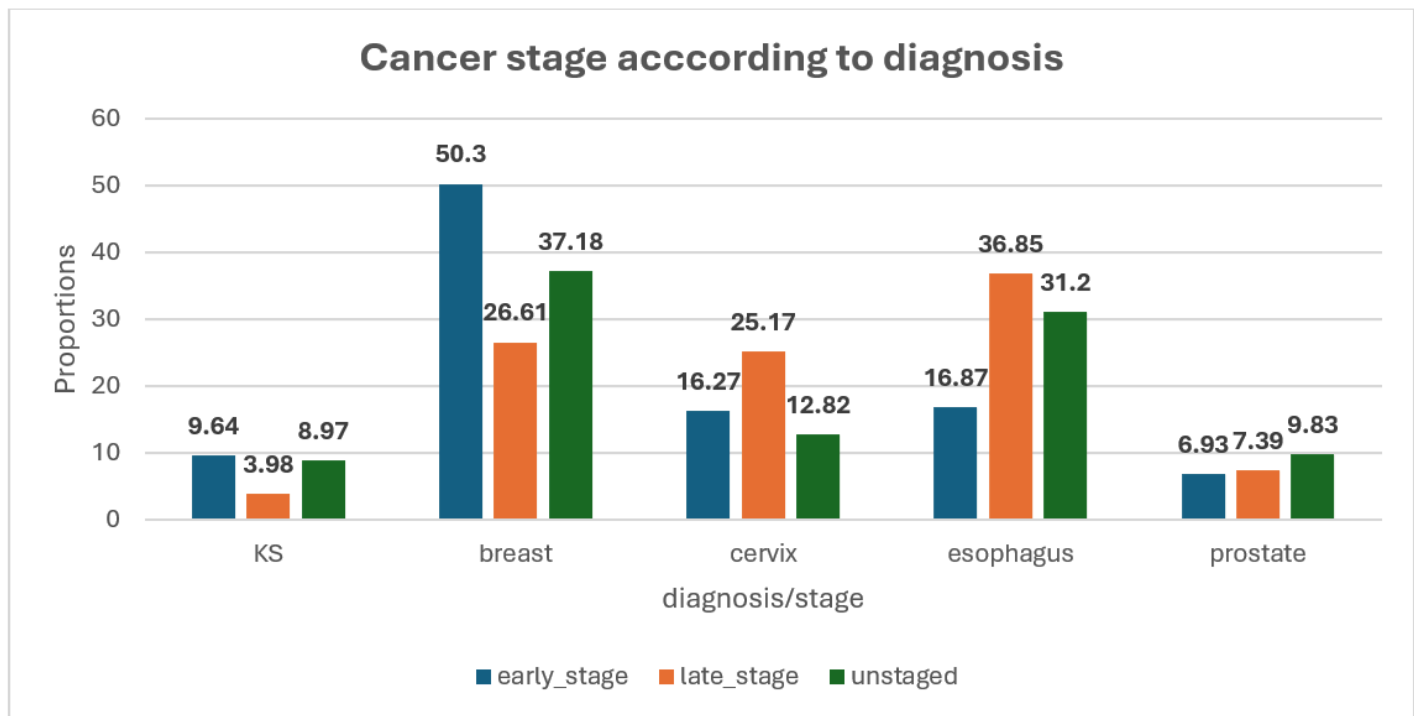


Figure 4

Proportions of cancer Stage according to diagnosis