

Program Planning to Develop Infrastructure for Cancer Care in Liberia

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abstract

Liberia's health infrastructure was completely devastated after 14 years of back-to-back civil war. Postconflict rebuilding of the country's health workforce and infrastructure has become a priority. Initially, the focus was on the diagnosis and treatment of communicable diseases that caused multigenerational family losses. With the increasing burden of noncommunicable diseases, however, the country has turned its attention to addressing diabetes, cancer, and cardiovascular and respiratory diseases, with the development of the noncommunicable disease unit under the Ministry of Health. Recovering from another setback caused by the Ebola virus outbreak in 2014, the country assembled a diverse group of stakeholders to form Liberia's first National Cancer Committee. To structure a program that would address the increasing burden of cervical and breast cancers, the major cause of mortality among reproductive-aged women in Liberia, input from the International Atomic Energy Agency was critical. This article describes the preplanning activities for developing infrastructure to support cancer care in Liberia that occurred between 2013 and 2020 and is still ongoing. This case study is intended to serve as a planning guide for countries with limited resources as they work toward the goal of eliminating cervical cancer and developing infrastructure to address their country's burden of all cancers.

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INTRODUCTION

The World Health Assembly Resolution of 2017 called for an integrated approach to address cancer as a public health priority, ensuring optimal cancer care, addressing inequities in treatment, and reducing the burden of disease and death globally.¹ In developed countries, cancer programs typically address the spectrum of prevention, screening, diagnosis, treatment, and palliation, with research as the underpinning to guide cancer policies. Low-income countries with limited resources are often unable to prioritize treatment and palliation, creating a binary choice between prevention and treatment reminiscent of the approach taken in the early HIV era that focused on prevention over treatment, resulting in considerable loss of lives.² For cervical cancer, which kills more than 311,000 women annually,³ the focus in low- and middle-income countries (LMICs) has been on screening, often overlooking well-known and documented prevention strategies. Because most new cervical cancer cases occur in LMICs where patients present with advanced disease, program planning should simultaneously explore low-cost treatment options that would address both the rapid rise in cervical

cancer and the pain and suffering associated with this disease.^{4,5}

Liberia, one of the poorest countries in the world, has spent the past two decades rebuilding its health infrastructure after 14-year back-to-back civil wars and the recent Ebola crisis.⁶ With a long-term emphasis on communicable diseases, the country has now focused on noncommunicable diseases (NCDs), which account for 37.9% of disability-adjusted life years and 43% of all deaths in Liberia.⁷ Of the four major NCDs—diabetes, cardiovascular disease, cancer, and respiratory disease, cancer has emerged as the second most common and has taken a significant toll on the lives of women in Liberia.

In Liberia, breast and cervical cancers are historically the most common cancers and most women present with advanced-stage diseases where death is inevitable.⁸ In 2009, an awareness program for cervical cancer resulted in the largest teaching hospital in Monrovia, the capital of Liberia, developing a short-lived outpatient chemotherapy unit that mostly offered palliative treatment. In 2013, the first cervical cancer screening program was launched in Monrovia, and since then, the country has been trying to develop a comprehensive cancer

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CONTEXT

Key Objective

The objective of this article is to serve as a planning guide for countries with limited resources to develop a foundation and infrastructure to address their country's burden of cancer.

Knowledge Generated

For a country with limited resources and infrastructure to implement cancer care programs, buy-in from government and a diverse group of stakeholders was necessary. Establishing a National Cancer Committee to determine goals and targets and develop a cancer policy was an important component of the process. Engaging the International Atomic Energy Agency to conduct a country-wide assessment to identify needs and gaps in services and infrastructure allowed prioritization of goals.

Relevance

For a sustainable program, the time-frame to achieve goals could span several years.

program to raise awareness and encourage earlier diagnosis where surgery may be beneficial.⁹ This article describes the planning activities to develop infrastructure to support cancer care in Liberia between 2013 and 2020. Specifically, it outlines activities to assess the resources needed to address the burden of cancer and the framework and timeline for building and strengthening cancer control systems in Liberia.

METHODS

The first steps in addressing the state of cancer care in Liberia were formulated in a meeting spearheaded by the Ministry of Health, which included a handful of stakeholders from the private and public sectors, nongovernmental agencies, and academic partners. A plan was formed to address current capacity; the initial question posed to the group was where are we now? To answer that question, the group undertook a rough assessment of cancer-related activities in Liberia as a baseline for existing infrastructure. To obtain a more comprehensive assessment and gap analysis, an invitation was extended to the International Atomic Energy Agency (IAEA) to conduct an in-depth, country-wide assessment using their integrated mission of the Programme of Action for Cancer Therapy assessment tool.

In preparation for the IAEA visit, the planning group expanded into a formalized National Comprehensive Cancer Committee that included in-country representatives from the WHO, Centers for Disease Control and Prevention, United Nations Population Fund, and local educational and clinical professionals. The first meeting of the Liberian National Cancer Control Committee was held in early 2016, and long-term projections and timelines were proposed during subsequent meetings. For the IAEA visit, subcommittees were formed to prepare presentations on the country's capacity for prevention and control, diagnostics, therapeutics, and palliation.

In August 2016, Liberia hosted the IAEA for site visits. The IAEA team visited major public hospitals in Montserrado County including all the facilities in the capital city of Monrovia.

The team also visited selected public primary and secondary health centers and private facilities providing cancer care in the region. Subcommittee members presented their findings on the country's capacity to the IAEA team, who, in turn, provided an assessment document at the conclusion of their visit.

RESULTS 2013-2015

Awareness Assessment

Before 2013, the Liberian Cancer Society (LCS) was the only organization that addressed cancer awareness on a national scale. LCS was formed in 1980, but was dormant during the war until it was reactivated in 2010. Awareness of cervical cancer was also achieved through the introduction of the first chemotherapy unit in the country at JFK Hospital in Monrovia, which brought together women experiencing the same symptoms and diagnosis to share their stories with each other, their families, and other women in their villages.

Awareness programs were found to be concentrated in the urban regions of Liberia, predominantly Montserrado County, and more targeted in the capital city of Monrovia. Between 2013 and 2015, several new nongovernmental organizations involved in cancer awareness were initiated, but overall diagnostic and therapeutic programs failed to keep pace with the increasing awareness activities.

Primary and Secondary Breast and Cervical Cancer Prevention Assessment

The most effective tool for the primary prevention of cervical cancer is the human papillomavirus (HPV) vaccine. In 2013, an application for assistance in delivering HPV vaccinations was applied for and approved. Two rural communities were selected with the hope of vaccinating 10,000 girls age 8-11 years from each county, but implementation of the vaccine program, scheduled to begin in 2014, was delayed until 2016 because of the Ebola virus outbreak.

Several organizations, including the LCS, promoted breast cancer awareness and conducted pilot educational and screening programs for self-breast examinations. Trained

nursing staff conducted clinical breast examinations with referrals to general surgery as indicated.

Gap analysis highlighted a lack of organized prevention and screening programs for both breast and cervical cancers. Given the delay in the pilot HPV vaccination program, an effective messaging campaign to support the program was needed and a mechanism was instituted to determine uptake and/or barriers to the uptake of the vaccine. Breast and cervical screening programs were found to be uncoordinated and not standardized. For both primary prevention and screening programs, there were limited staff to perform education and training sessions, and the training of community health workers was recommended to increase coverage for both programs.

Assessment of Diagnostic Capacity

Overall, there was limited capacity for radiology, pathology, and laboratory medicine services. A computed tomography (CT) scanner was present at a rural hospital, but there was only one radiologist in the country who was trained in CT scan interpretation. The single CT scan was nonfunctional at the time of evaluation because of mechanical failure. At the largest teaching hospital in

the city of Monrovia, JFK Hospital had imaging capacity that was limited to x-rays and ultrasounds only. A tele-radiology service with India was functional for several years at JFK Hospital, but did not function at the time of the assessment. Pathology and laboratory medicine services were similarly limited and fragmented. A reference laboratory was established at JFK Hospital, but services were hindered by a lack of equipment, reagents, and trained staff, all of which were highlighted during the Ebola virus outbreak in 2014. There were individual laboratories at private and public hospitals throughout the country, but most of the laboratories faced similar challenges and without equipment contracts or personnel trained in maintenance or repair, broken equipment was common. No anatomical pathology services were available. One rural hospital had fine-needle aspiration (FNA) capacity, but its remote location and dependency on a visiting cytopathologist made it unsustainable.

The proposed activities recommended were geared toward improving national laboratory services and developing radiology capacity including training of technicians and technologists in both disciplines and the development of a policy

FIG 1. A prewar Cobalt-60 machine at JFK Hospital illustrates the need for modern radiation therapy technology in Liberia's hospitals.



for maintenance and troubleshooting to prevent and decrease the downtime of hospital equipment needing repair.

Assessment of Therapeutic Capacity

With few specialists and no oncology-trained subspecialists practicing in the country and without pathologic confirmation of cancer, treatment was neither standardized nor evidence-based. The surgical theaters at JFK Hospital were in disrepair, and no postoperative or intensive care units were established. There were no support personnel such as critical care faculty, anesthesiologists, and medical oncologists or gynecologic oncologists in the country. Radiation and chemotherapy were also unavailable, resulting in patients traveling to either Ghana or India for basic cancer care. Without a national supply chain for chemotherapy drugs, patients either received drugs sent by relatives from outside the country or purchased them from neighboring Ghana. To address the deficits in cancer care, the recommendations called for an investment to train providers at all levels of care and improve the national supply chain to include the essential chemotherapeutic agents for the most common cancers in the country. To establish radiation therapy services, a framework for health workforce training abroad and the development of a unit to address radiation protection and safety to meet the 5-year goal of establishing radiation therapy services in Liberia was necessary. A nonfunctional prewar cobalt unit was contained at JFK Hospital, an artifact of a by-gone era when JFK Hospital was a premier hospital providing services throughout West Africa (Fig 1).

Assessment of Palliative Care Capacity

Although most patients presented with advanced cancers at the first encounter, palliative care services were unavailable. There was one HIV-focused inpatient facility operating at the time of the assessment, but the constant need for funding threatened its sustainability. We identified a group of volunteer nurses who were providing home care to patients and support to their caregivers; none of them were specifically trained in palliative care. Lack of trained personnel, inability to secure morphine, and lack of national financing for palliative and hospice care were some of the challenges identified as barriers to provision of this service for patients with terminal cancer. We recommended formalizing a palliative care registry that would allow a multidisciplinary team of providers and community health workers to provide physical, social, and spiritual support for a home-based program and track patient outcomes, as well as the challenges of drug access and administration.

Assessment of Cancer Registry Activities

The Liberian National Cancer Registry was reactivated after the war by a trained volunteer registrar. The initial registry was held at JFK Hospital where anatomic pathology was present, but it was destroyed during the war. Liberian National Cancer Registry faced several challenges while

rebuilding their service because of unpaid and nominal staff and a lack of in-country pathology. By 2015, an office was secured at JFK Hospital to house the cancer registry, and office equipment and furniture were donated by the WHO. The establishment of a pathology/FNA laboratory was proposed to overcome gross under-reporting of cancer cases country-wide.

IMPLEMENTATION: 2016-2020

Under an expanded National Cancer Control Committee, now part of the Ministry's NCD division, Liberia's National Cancer Policy was developed (Table 1). The process was iterative. An initial draft of the policy was distributed to committee members, and from 2016 to 2018, it was edited to meet the changing health landscape. Ultimately, the National Cancer Policy outlined a 4-year plan for increasing cancer awareness among health workers, disseminating information about cancer to the lay public, establishing evidence-based policies, and setting up services for cancer prevention, screening, treatment, and terminal care. Given the magnitude of resources needed to address all cancers in Liberia and the important role that women have played as peacemakers, income producers, and directors of their family's health, the Committee opted to target breast and cervical cancers while assessing all other cancers that add to the burden of disease in Liberia.

After a successful HPV vaccine pilot, a national HPV vaccination program was initiated in 2019 and is currently ongoing for girls age 8-11 years. Although no national strategy for cervical or breast cancer screening has been established, clinical breast examination outreach with referral for biopsy and see-and-treat pilots using visual inspection with acetic acid and thermocoagulation are being conducted. A database is being proposed to determine if there are county gaps in screening, whereas plans for transitioning to primary HPV screening are underway.

In a move to bolster the cancer registry and obtain a pathologic diagnosis, an FNA laboratory was established in 2018 and a full pathology laboratory was completed in 2019. In preparation for opening the pathology laboratory, four clinical laboratory technicians completed task-shifting training over 6 months, conducted by volunteers from the American Society of Clinical Pathology. At the same time the pathology laboratory opened at JFK Hospital, the NIH donated a CT scan, four operating theaters were renovated by United States Agency for International Development-supported organizations, and a mammogram unit was donated to Redemption Hospital.

An additional donor-funded palliative care program using the trainer model was established in Monrovia but is now dependent on fundraising to continue its services, as the donor funding cycle is completed. Several Liberian health workers were sent abroad by the Ministry of Health for short courses in oncology-related care with the intent of launching a treatment program in the future. In October 2020, a scholarship was

TABLE 1. Cancer Care Activities Implemented in Liberia From 2016 to 2020

Year	Activity	Implementation	Gaps/Needs
2016	Cancer prevention Cancer screening Cancer policy	Pilot HPV vaccination in two counties > 10,000 girls vaccinated Pilot, targeted cervical cancer screening with VIA CBE and SBE screening for breast cancer National Cancer Committee: National Cancer Policy draft started	Need for National HPV vaccination Program Messaging to promote uptake of HPV vaccine Fragmented screening programs; need for more organized national screening for both breast and cervical cancers Increase multidisciplinary stakeholders from across the country
2017	Cancer Registry	Two nurses hired by MOH to assist in country-wide data collection	Lack of pathology required for recording cancer by type Transportation for the CR team to gather data country-wide Lack of financial support for lead Cancer Registrar
2018	Health policy Diagnostic services	National Cancer Policy validated Pathology: FNA laboratory started	Policy needs to be ratified by Senate for budget allotment Designated space for procedures/slide review 10% FNAs unsatisfactory or suspicious: need for anatomic pathology
2019	Prevention Diagnostic services	National Vaccine Program implemented country-wide Anatomic Pathology Laboratory implemented at JFK Hospital Four chemistry laboratory technicians trained as pathology technicians (task sharing) Two Pathologists trained in Ghana for 3 years return to Liberia to lead path services Radiology: JFK Hospital CT scan donated by NIH Radiology: Redemption Hospital Mammogram donated to Redemption Hospital	Vaccine hesitancy: need to promote messaging and assess barriers/facilitators IHC not available Financial barriers to accessing pathology services Budget for consumables for laboratory sustainability Assess barriers and referrals for use No mammographic services at JFK Hospital MRI donation from NIH pending Unable to find/purchase films for use with the mammogram unit
2020	Therapeutic services	Health workforce training: > 20 providers sent abroad for cancer-related training Surgical training: ObGyn resident undergoing fellowship in gyn oncology at the Uganda Cancer Institute	Lack of cohesive teams for cancer care implementation Lack of infrastructure for cancer care delivery Program to be completed in December 2022 Need to develop infrastructure to support cancer treatment Need national strategy for chemotherapy supply chain Need health workforce preparation to meet 5-year radiation therapy plan

Abbreviations: CBE, clinical breast examination; CR, cancer registry; CT, computed tomography; FNA, fine-needle aspiration; HPV, human papillomavirus; IHC, immunohistochemistry; MOH, Ministry of Health; MRI, magnetic resonance imaging; NIH, National Institute of Health; SBE, self-breast examination; VIA, visual inspection with acetic acid.

awarded to a recently graduated resident from the obstetrics and gynecology residency program at JFK Hospital for a 2-year gynecologic oncology fellowship at the Uganda Cancer Institute. Upon completion of the fellowship in 2022, he will be the first trained Liberian gynecologic oncologist.

DISCUSSION

As Liberia lays down the framework for providing cancer care, it must wrestle with the fact that for most citizens, cancer care will come with a price that might not be affordable. Despite strong global support and momentum for achieving universal health coverage by 2030,¹⁰ many LMICs lack the political, financial, and infrastructural framework to achieve this goal. Currently, health expenditure in Liberia has remained under 10% of gross domestic product since 2015, resulting in most Liberians covering up to 20% of their health care with out-of-pocket expenditures.^{11,12} As the prevalence of NCDs

increases in Liberia, many Liberians will be forced to forgo health care or face financial hardship.

Globally, approximately 20% of all NCD-related mortality is due to cancer, and the number of new cases, projected to reach 29.5 million by 2040, will disproportionately affect regions of the world like Liberia, with the fewest resources.¹³ Because Liberia has not yet provided universal health coverage, it is estimated that patients with cancer will spend approximately 42% of their annual income on their cancer-related care.¹⁴ Development and implementation of cancer programs to address this increase in NCD burden is a complex undertaking that is further complicated by the financial debt that can push the poorest of patients with cancer to financial bankruptcy.

The 2017-2021 National Non-Communicable Diseases Policy and Strategic Plan of Liberia issued in 2016 included cancer as one of the 10 most common NCDs. The policy and strategic

plan focused on the impact of NCDs on personal and national economy, health access, and disability life years and had as its goal to strengthen the overall health system, and improve health access, and the supply chain of all essential medicines.¹⁵ The Liberia's National Cancer Policy, written after the NCD Policy was issued, was therefore presented as a free-standing policy that prioritized developing the necessary infrastructure to support diagnostics and screening, improving human workforce capacity in the field of oncology, and introducing community awareness.¹⁶ The current cancer policy will be updated and incorporated into the revised NCD Policy in 2022.

With more than 75% of cancer-related mortality estimated to occur in LMICs, careful planning and incorporation of evidence-based guidelines are important to develop sustainable programs and national policies including health finance reform. Public health surveillance and cancer control coalitions have been posited as two key public health levers necessary to reduce cancer inequities in LMICs.¹⁷ Public health surveillance relies on strong laboratory health services. The Ebola outbreak in 2014 exposed Liberia's fragmented surveillance system and galvanized the country's investments in diagnostics and surveillance. This led to organizing laboratory services under a coordinated National Reference Laboratory (NRL), which broke ground in 2017.¹⁸ The NRL, a unit of the National Public Health Institute of Liberia, was initiated as a collaboration between the US Government of Defense, Defense Threat Reduction Agency, and the Government of Liberia. Investment in the NRL, which has already had an important impact on the recent COVID-19 response, increasing its testing capacity and demonstrating 100% concordance with the WHO Afro External Quality Assurance assessment for COVID-19 testing, is expected to play a major role in biomarker identification and cancer surveillance.¹⁹

Although the Government of Liberia has invested in external training of cadres of health workers for professional advancement, including a chemopharmacist, training has not resulted in assembling a coordinated team to deliver cancer-specific treatment. Liberia currently has just more than 250 practicing physicians and one medical school that graduates approximately 40 students each year. Specialty training in Liberia was only started in 2013 in four core specialties: pediatrics, obstetrics and gynecology, surgery, and internal medicine, but has since expanded to include three additional specialties. The program is on track to train 178 specialists by 2025, but no fellowship programs to train subspecialists currently exist.²⁰

There is an overall shortage of nursing staff in Liberia. Before 2013, there were 12 accredited nursing schools, almost half of

which were in the capital city of Monrovia. Between 2014 and 2019, six additional nursing schools were added including a Nursing Center of Excellence created by Partners in Health at Harper in Maryland County. Partners in Health has also invested in oncology training for Liberian nursing and pharmacy staff at their cancer center in Butaro, Rwanda, to meet the needs of the growing number of childhood cancers seen at JJ Dossen Hospital in Maryland County.²¹

Using the IAEA to provide in-depth country assessment and recommendations helped the Liberian Cancer Committee prioritize surveillance by investing in and strengthening the country's population-based cancer registry and its laboratory capacity.^{22,23} The importance of population-based cancer registry in cervical cancer elimination and ensuring surveillance and monitoring of all cancers by region cannot be overstated.²⁴ Given the country's lack of resources, Liberia's programs will lean heavily on awareness and prevention as it builds screening, diagnostic, and treatment capacities.

Major challenges have impeded both national prevention and screening programs for cervical cancer, the most lethal cancer in Liberian women. Only 14% of first-dose HPV vaccine coverage was achieved using a multicohort age strategy in the initial rollout of the national vaccination program (although this has increased steadily since then), and screening for cervical cancer, considered a low hanging fruit in most developed countries, has been difficult to expand beyond pilot see-and-treat projects.^{25,26}

Liberia still lacks comprehensive programs in cancer treatment (surgery, chemotherapy, and radiation) and palliative care for patients with advanced untreatable diseases. These deficits exacerbate inequities in care between Liberia and high-income countries and between those Liberians with and without the financial means of seeking treatment outside the country. The process, however, is ongoing to develop affordable, accessible, and quality care for all Liberians.

In conclusion, planning for cancer care in under-resourced settings is a collaborative effort that requires the involvement of multiple stakeholders. Buy-ins from governmental agencies are crucial, and assessment by the IAEA's team is essential. This report is intended to serve as a guide for initiating the first steps in cancer program planning in a low-resource environment. The Liberia National Cancer Committee continues to improve its strategic planning to provide evidence-based cancer care to its citizens.

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