

Review

A Historical Review of Liberia's Public Health Evolution—Past, Present & Future

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Abstract: Over the past two centuries since its independence in 1847, Liberia has made significant progress in building an integrated public health system designed to serve its population. Despite a prolonged period of civil conflict (1990–2003) and the emergence of the 2014–2016 Ebola Virus Disease (EVD) that crippled its already weakened health system, Liberia was able to re-emerge, making significant strides and gains in rebuilding and strengthening its health infrastructure and systems. Lessons learnt from the EVD epidemic have led to developments such as the newly established National Public Health Institute of Liberia (NPHIL) and several tertiary public health institutions to meet the growing demands of a skilled workforce equipped to combat existing and emerging health problems and/crisis, including informing the more recent COVID-19 response. This article delineated and documented the historical efforts made towards establishing public health interventions such as infrastructures and systems of the past, and how these structures and systems became the foundation and pillars of the current resilient health system. This paper highlighted some of the key crises and interventions deployed, and some of the historical public health champions, laws, and policies that aided in strengthening the public health systems then and now. It is expected that in addition this paper can be used as a guide for further or future research.

Keywords: Liberia; public health; Ebola virus disease; low-income country



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1. Introduction

1.1. The Changing Face of Public Health

In recent years the world has had to combat emerging and re-emerging diseases of epidemic and pandemic proportions. The 2014–2016, West Africa Ebola Virus Disease (EVD) epidemic, COVID-19 pandemic and the recent Monkeypox outbreaks has underscored the need for strengthened and resilient public health systems, institutions, and workforces [1–6]. Although historically considered rare compared to those infectious and chronic diseases that cause much of the disease burden; accelerating climate change, and increasingly mobile/migrant populations have led to more frequent disease outbreaks of public health significance in the past decade [6–8].

These public health emergencies cause disruptions in health service delivery, amplifies community mistrust, and creates long lasting socioeconomic effects that are of particular importance to low and middle-income countries (LMIC) [9–12]. Strengthening of public health institutions could save far more lives at a lower cost, especially in resource constrained countries. Over the past decade, many countries have strengthened, or created national public health institutes (NPHI), often following an event such as the EVD epidemic in west Africa [13–15].

Liberia has been no exception to the changing tides of public health emergencies and health system strengthening. However, Liberia has made significant gains despite the many existing challenges to strengthen its health systems and better serve its population. To fully understand the progress made thus far, one must regress to the historical events

and evolution of the public health structures, primordial institutions, and the founding of Liberia's health system.

1.2. Challenges for Liberia in the Past Three Decades

Liberia is a tropical country in West Africa with a spectacular coastline covering an area of 111,369 km² (43,000 sq mi), it is populated by 4.5 million inhabitants and historically gained its independence in 1847 with assistance from the then American Colonization Society, an established body tasked by America to resettle free slaves back to Africa [16–19]. Liberia is also one of Africa's oldest independent countries [19,20].

Liberia experienced a 14-year civil war from 1990–2003, that left near total destruction of the country's infrastructure. The post-war recovery period was further interrupted by the 2014–2016 EVD epidemic that left over 10,000 persons dead and disrupted health services across the country. More recently, the country has been battling the COVID pandemic and other infectious outbreaks [21,22].

Currently, Liberia is ranked 175 out of 189 countries on the Human Development Index [23]. In Liberia, 43.4% of the population is under the age of 15 and 33.3% is between 15–35 years of age [24]. The maternal mortality rate is high at 1072 deaths for every 100,000 thousand live births, with 40% of women giving birth at home [25,26]. The under-five mortality rate is high with more than a third of all deaths under the age of 5 happening in the neonatal period, despite Liberia having met the Millennium Development Goals by 2015 [25,26]. According to the 2011 WHO report on noncommunicable diseases in Liberia, 30.7% of participants aged 24–64 years were hypertensive with 88.2% not on medication at the time of the survey; with over 90% having never measured their glucose level [27].

Liberia has been striving to achieve the Sustainable Development Goals (SDG) through the United Nations Sustainable Development Cooperation Framework 2020–2024 which is aligned with the Pro-Poor Agenda for Prosperity and Development (PAPD) [24,28]. While the United Nations acknowledged that significant gains towards achieving the SDGs have been made, they faced a huge challenge in terms of tracking implementation [24]. However, out of 44 child related SDG indicators, Liberia was on track to meet only three and over twenty requiring accelerations in 2021 [29]. The COVID-19 pandemic that started in 2020 has derailed progress in some sectors while also testing gains made since the Ebola epidemic. Since 2020, there have been 7988 confirmed cases of COVID-19 and one confirmed case of Monkeypox [30].

1.3. Specific Aims

While much headway has been made since the first freed slaves settled on the land that was to be Liberia, on the west African coast, little has been done to systematically document the public health achievements that the country has made. To date, there remains a paucity of information and scientific literature from Liberia. Therefore, it is important to delineate the advances made in the field of public health thus far and lessons learned. The aim of this paper was to review the progress made in the last hundred years and provide some considerations for the future direction of public health in Liberia.

2. Origins of Public Health in Liberia

2.1. Individuals That Pioneered Public Health

From its founding in 1847 till the early 1900s, Liberia's health system consisted to a large extent of disjointed health facilities run by various Christian missionary led organizations and settlers from the United States. The early to mid-1900's saw much advancement and progress being made in the fields of health system building and public health in Liberia [20]. In 1946, Dr. Joseph Nagbe Togba, M.D., returned home from the United States after completing his formal training and internship at Meharry Medical College. He was the first Liberian born physician to practice medicine in Liberia, where others prior to him were either white Americans or freed slaves who had settled in Liberia (Figure 1). Dr. Togba began his services in 1946 at the Liberian Government Hospital in Monrovia,

as the only Liberian doctor and one of twelve physicians in the country. Upon arrival he wrote about his observations of public health in Liberia, “*public health as practiced in Liberia simply applied to Monrovia and its environs. The work of public health was a matter of going along the streets to the homes of prominent officials in the cabinet, legislature, and judiciary. The grass and dirt around their homes were to be cleared. Garbage and dirt were not to be seen in certain places in Monrovia or else the Public Health team was to be taken to task*” [20]. Towards the end of 1946, Dr. Togba was appointed Acting Director of Public Health and Sanitation by the government of Liberia. In 1949, Dr. Togba, received his master’s degree in Public Health from Harvard University, becoming the first Liberian doctor with a formal training in Public Health.

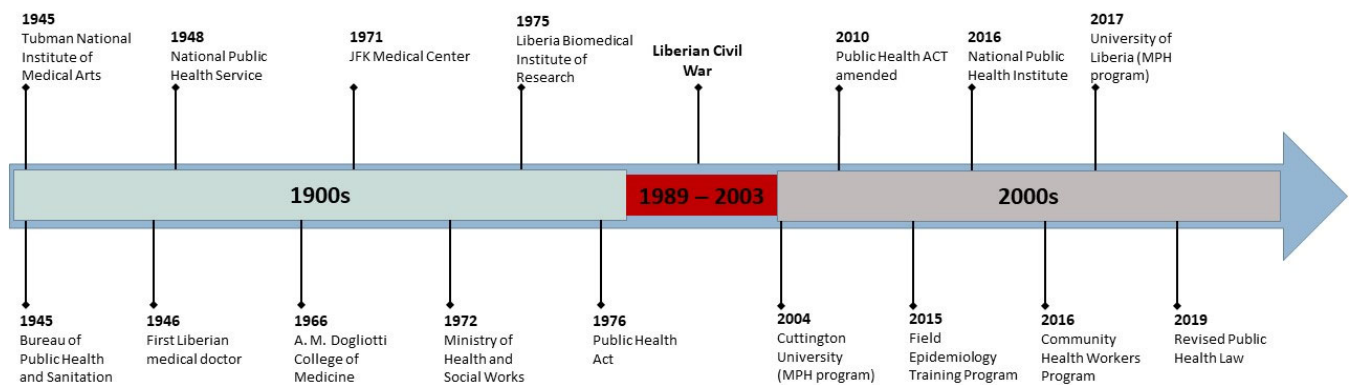


Figure 1. Timeline of key public health events in Liberia.

Another figure of historical note in the field of public health in Liberia was Mrs. Rachel Pearce-Marshall. Mrs. Pearce-Marshall was the first Liberian nurse to obtain a college degree in public health nursing in 1954 (Figure 1) [20]. Following her studies in the United States, she was appointed to organize the public health nursing program in Liberia. Two years later she was made the director of Public Health Nursing in Liberia [20,31]. She was the first Liberian to be elected as president of the West African College of Nurses for the period of 1989–1991.

2.2. Early Public Health Institutions

In the early 1940s, President Tubman requested for American assistance to tackle the many health problems that the country confronted. In response, the U.S. State Department, in November 1944, directed the United States Public Health Service (USPHS) to send a small team of African American health workers to Liberia [20,32]. In 1945, the bureau of Public Health and Sanitation (Figure 1) was established in Monrovia, Liberia. The first policies on disease control and on health interventions for the fledgling country would emanate from this office [20]. This is considered by many as the cornerstone of public health and the national health system in Liberia. In 1946, shortly after Dr. Togba’s return home, the legislature passed the first ACT meant to impact the health of the public, which stipulated the following: there was to be an annual examination of all school children; there was to be premarital serology and medical examination with free treatment for those found positive; there was to be free treatment to all students and indigents in government clinics and hospitals.

One of the earliest descriptions of the health system at the time was provided by Dr. John B. West who led the USPHS team. Dr. John B. West, wrote of his initial impression in the Public Health Reports, “*we found that to the best of our knowledge there were six physicians, two dentists and an indeterminate number of nurses practicing in Liberia, which has a population estimated at two million*” [32]. To prioritize public health and sanitation in and around the Monrovia, on 2 May 1945, President Tubman issued a proclamation that notified the residents to permit representatives of the USPHS mission to enter homes and spray or otherwise apply dichlorodiphenyltrichloroethane (DDT) to walls and ceilings for the

purpose of killing mosquitos [20]. This could be considered one of the first large scale public health campaigns to be initiated in Liberia.

In 1948, the Bureau of Public Health and Sanitation was dissolved and in its place was established the National Public Health Service (NPHS), led by Dr. Togba as the first Director General [20]. The NPHS would become the precursor to the present-day Ministry of Health and Social Welfare (MOH&SW). Dr. Togba went on to lead the Liberian delegation to the United Nations International Health Conference in New York in 1948 that culminated in the formation of the World Health Organization [20]. In 1950, Liberia's appropriation for Public Health and Sanitation was 12% (10% in 2014) of its total revenues, which was one of the highest health appropriations in the world at the time [33].

2.3. Key Institutions Involved in Workforce Development and Services

The mid 1900s saw the establishment of several key institutions meant to produce an essential healthcare workforce such as nurses, physician assistants, and medical doctors. By the late 1980s the Liberian health system was largely staffed by those trained in Liberian health institutions.

The Tubman National Institute of Medical Arts (TNIMA) was established in 1945 through the effort and cooperation of the Liberian National Public Health services (now Ministry of Health and Social Welfare) and the United States Mission (Figure 1) [34,35]. In 1952, a training course of auxiliary health education was established at TNIMA through the effort of the Liberian American Joint Commission for Economic Development. Later that year, the Liberian requested WHO to establish a school of sanitation after realizing that most of the population's common diseases were a result of poor sanitation and hygiene. The school was then established on a one-year training basis until 1961, when it was raised to two (2) years and renamed the School of Environmental Health. In 1964, the government of Liberia in collaboration with WHO and UNICEF established the Physician Assistant Program, and training started in March 1965 as a two (2) year program and increased to three (3) years in 1976.

The Monrovia Torino Medical College was established in 1966 with the assistance of the Italian government, the Vatican, and the A. M. Dogliotti Foundation (Figure 1) [20,36]. The Catholic Church, under Pope Pius XII collaborated with the Italian government to build the physical structure of the medical college campus, which at the time included the academic building, a dormitory, an administrative office building and a teaching hospital, the St. Joseph Catholic Hospital. In 1970, the College was merged with the University of Liberia as the seventh academic program and the second professional school. It was then renamed The Achille Mario Dogliotti College of Medicine (A.M.D. College of Medicine) after the late Italian philanthropist and founder of the Dogliotti Foundation in Italy [20]. The A. M. Dogliotti College of Medicine was established to provide Liberia with medical doctors who were trained within the country and would help provide preventive and curative services across the health system. The first curriculum of the college laid a high emphasis on understanding core public health principles, which was seen to be essential for preparing young doctors who were expected to work in rural parts of Liberia. In 1968, with the publication of the Ten-Year Health Plan (1967–1976), there was a shift of emphasis from curative services to preventive medicine. The A.M.D College of Medicine played a critical role in providing trained physicians skilled in the principles of public health for a decentralized healthcare system.

The Liberian Institute for Biomedical Research (LIBR) was established in the 1970s as a premier research facility to develop scientific breakthroughs for a variety of viral infections, including hepatitis B vaccines, and a safe blood sterilization process for blood transfusions (Figure 1) [30]. Currently, LIBR serves as the country's reference laboratory and an integral component of the NPHIL, and the public health infrastructure in the country.

The John F. Kennedy Medical Center (JFKMC) was established and opened on 18 June 1971 (Figure 1) [20,34,37]. This was a collaboration between the governments of Liberia and the United States of America [20,37]. The purpose of this institution was to

improve medical education and extend preventive practices to the rural areas of Liberia as the center for training of doctors, nurses, midwives, laboratory technicians, and sanitarians. As such the west wing of the JFKMC was occupied by the Tubman National Institute of Medical Arts (TNIMA) classrooms, administrative offices, and library. By the late 1970s, the role of JFKMC as an integral part of the national health system was cemented as it became the national referral and teaching hospital. Today the JFKMC serves as the national teaching and referral hospital hosting both medical students and residents of the newly established Liberian College of Physicians and Surgeons.

3. Key Events Impacting the Public Health System

3.1. *The Liberian Civil War and Its Impact on the Health System*

Before 1990, Liberia had focused primarily on curative and tertiary health care that had an urban bias. However, just before the war, there were signs that the MOH&SW had begun dealing with the twin issues of decentralization and provision of primary health care (PHC) services. It had acknowledged that it needed to move from the curative to the preventive and that it needed to empower its county health teams.

A decade of civil war (1989–2003) devastated the health system and halted much progress made in the late 1900s [38–43]. At the war's conclusion nearly 250,000 were dead, millions displaced; under-five mortality and maternal mortality were amongst the worst globally [44,45]. Of 293 public health facilities, 242 were destroyed, health educational/training institutions shut down, and only 10% of the population was estimated to have access to basic healthcare by the conflict's end [42,43]. Some health facilities were not even staffed, and many lacked the reliable power supply, water, drugs, and equipment the most basic clinic should have. Achieving adequate staffing levels was particularly difficult—most skilled health workers had left during the war years and those left behind missed out on even a basic education, making it hard to find suitable candidates for fast-track training courses. By 1998, the total number of personnel working in the public sector had fallen from 3526 to 1396 [39,42,43,46].

In 2005, with donor support the government of Liberia embarked on a massive effort to rebuild the health system, prioritizing access to primary care, particularly in rural areas of the country. The emphasis on rural healthcare was a departure from the previously urban-centric focus of Liberia's health sector. Additionally, postwar assessments of the health system identified an urgent need for national policy and service delivery guidelines to lead the revitalization of primary health care services. Prior to the war, Liberia had national policies that addressed only STDs/HIV/AIDS, EPI, control of diarrheal diseases, and malaria [39,42,43]. There were no official policies for family planning, non-communicable diseases, safe motherhood, acute respiratory infections, and drugs. Many of the country's current health policies and guidelines were drafted in the period immediately following the end of the civil conflict. To address these varied challenges, Liberia's post-war government chose to organize their reconstructive efforts around a Basic Package of Health Services (BPHS) [39,42]. The BPHS is a defined set of evidence-based, cost-effective interventions that are considered essential to improve the health of the population [47–50]. The BPHS included plans to rebuild and staff health facilities and established a minimum set of primary care interventions to be provided free of charge in all government clinics. These services focused particularly on maternal and child health, communicable disease, and mental health. Recognizing that a certain portion of the population would be unable to access facility-based services due to distance from available clinics, the BPHS also included a plan for the recruitment and training of community health volunteers (CHVs) to further expand certain services in rural and hard to reach regions of the country

According to the country's first national clinic accreditation process, 80% of government clinics were estimated to meet the minimum standards for delivery of the BPHS by 2010 [41,42]. The government therefore upgraded the BPHS to the Essential Package of Health Services (EPHS) in 2011, an expanded initiative that introduced a more comprehensive program for indicators (such as child health) that required increased attention [41,42].

3.2. *The Ebola Epidemic's Influence on Public Health*

Between 2014–2016, Liberia saw 10,678 cases and 4810 deaths from the Ebola Virus Disease (EVD), further disrupting service delivery across an already weak health system [2,51–55]. The Ebola epidemic revealed that health system strengthening requires a greater investment in all aspects of the health system (healthcare worker training, surveillance, reporting, analysis, policy, financing) and that post-conflict investments had focused primarily on primary health care and curative services at the cost of prevention [2,38,56–58]. As the outbreak wound to an end much attention was focused on how best to strengthen the public health and healthcare systems. Additionally, the outbreak highlighted several gaps in existing health policies.

The 2014–2016 Ebola epidemic spurred much progress in the field of public health in Liberia that warrants mentioning. Key programs such as the “Health Workforce Program Strategy 2015–2021” and the “Investment Plan for Building a Resilient Health System” have done much to improve the situation in recent years [46,59–61]. The focus of public health leaders during this period was not only centered on strengthening communicable disease response systems, but also extended to the growing burden of non-communicable diseases (NCDs), culminating in the “National Policy and Strategic Plan on NCDs”. The establishment of the National Public Health Institute (NPHIL) and revised public health law are also key positive outcomes of the otherwise devastating EVD epidemic.

3.3. *Responding to the COVID-19 Pandemic*

On 16 March 2020, the first case of COVID 19 was confirmed in Liberia [22]. This is significant given that the World Health Organization had only just declared COVID-19 a pandemic on the 11th of March, an indication of the country's capacity and level of preparedness to identify cases and respond to this new health crisis [62]. In Liberia, to date (23 November 2022) there have been 8014 confirmed cases and 294 deaths; given its resources and capacity only a few years prior, the low number of fatalities is a formidable feat [63]. Liberia has used the many lessons learned from the 2014–2016 EVD epidemic when responding to the COVID-19 pandemic [22,46]. While healthcare service delivery, such as outpatients and noncommunicable disease clinics, were temporarily shut down, essential services, and healthcare worker training programs quickly adapted to meet the need for social distancing [22,64]. The strengthened public health system and the healthcare workers whose capacity had been built during and after the Ebola epidemic were able to respond to the new crisis in a timely and efficient manner [22,64–66]. Additionally, since the start of the COVID-19 pandemic, Dr. Mosoka Fallah, one of Liberia's leading public health specialists has been a vocal advocate to ensure that inequities in responding to the pandemic does not lead to increased loss of lives on the African continent [67–71]. His advocacy includes leveraging lessons learned from the Liberian Ebola experience to strategies for dealing with COVID vaccine hesitancy and inequity, to continued investments in public health infrastructure [67,68].

4. **Public Health as a Growing Field**

4.1. *Post Graduate Public Health Education*

The period following the civil war and the 2016 EVD epidemic saw significant investments being made in the field of public health training. By 1998, the total public health personnel had fallen from 3526 to 1396, with the number of physicians declining to fewer than 30 [43,46]. According to a WHO 2021 report, there were 234 doctors, 9415 nurses/midwives, 1071 laboratory technicians, 3391 community health workers, and 4758 other health workers in Liberia [72,73]. Specialist physician and nurses were in critical need [10]. Several institutions of higher learning, including the NPHIL has prioritized training skilled public health practitioners to help meet the many health challenges that face the Liberian people today [38,46,59,66,74].

Cuttington University is the oldest private institution of higher learning in Liberia. In 1887, it was initially founded as the Hoffman Institute for the training of ‘men in skill

and virtue' by the episcopalian church [75]. It later had a divinity school, and it assumed the name, Cuttington Collegiate and Divinity School on 22 February 1889. During the civil war, for a short period (1990–1997) the university was shut down, reopening its doors in 1998. An Act establishing the University College as Cuttington University was signed into law on 20 July 2005. To meet the growing demands and challenges of the nation's development process a graduate school was added to Cuttington University in 2005. Among the professional degrees and programs provided was the country's first public health degree program (Table 1). Since 2004, Cuttington University has provided comprehensive, professional graduate public health programs in the fields of: epidemiology, healthcare policy & management, maternal child health, community health, and public health nutrition.

Table 1. Institutions in Liberia offering public health training and areas of concentration.

Training Type	Cuttington University (2004)	National Public Health Institute (2015)	University of Liberia (2017)
2-year master's degree	Epidemiology Environmental Health Healthcare policy & Management		Applied Epidemiology Environmental Health Health Systems Policy and Management Public Health Lab
	Maternal Child Health Community Health Public Health Nutrition	Liberian Field Epidemiology Training Program (LFETP)	
Post graduate diploma	Monitoring & evaluation	<ul style="list-style-type: none"> • FETP-Frontline • FETP-Intermediate • Executive FETP 	Certificate in Health Systems Leadership and Management
	Public finance Epidemiology		

The Liberian Field Epidemiology Training Program (LFETP) began in August 2015 (Table 1). The program is funded by the U.S. Centers for Disease Control and Prevention (CDC) and implemented by the African Field Epidemiology Network (AFENET) [30,76–79]. The LFETP resides in the National Public Health Institute of Liberia (NPHIL) and is linked closely to the Division of Infectious Disease Epidemiology (DIDE) and Division of Training and Capacity-Building. As of October 2021, the LFETP has graduated 270 persons in 12 cohorts at the frontline level and 62 persons in four cohorts at the intermediate level. There are 18 participants in the current Intermediate Cohort 5 (scheduled to graduate in December 2021) [77,79]. Fourteen Medical Directors of major health facilities graduated as the first cohort of the Executive FETP [77,79].

The University of Liberia was founded in 1862 as Liberia College and became a full University in 1951 (Table 1) [36,46,59]. It is a public institution funded mainly by the Government of Liberia. In 2017, the University of Liberia master's in public health Program (two-year program) within the College of Health Sciences, was established. It is designed to meet a critical workforce gap in the Liberian public health sector and is a direct result of the "Health Workforce Program Strategy 2015–2021". Consequently, the curriculum emphasizes the acquisition of workforce-ready skills, research and technical competencies and offers learners the option of focusing on one of four tracks: Applied Epidemiology, Environmental Health, Health Systems Management, and Public Health Lab.

4.2. Community Health Worker Program

In 2016, Liberia established a robust community health worker (CHW) program. A 2008 study found that only 15% of rural Liberians could access basic health services for childhood diseases such as diarrhea, malaria, measles, and malnutrition [40,42,80]. The Liberian government and partners agreed that the best way to address this gap in services

was to use a cadre of community health workers (CHWs). Between 2016–2019, Liberia recruited, trained, and fielded 3177 CHW [80]. CHWs currently provide primary care in 14 of the country's 15 countries, for an estimated 715,000 rural people. This means that CHWs reach 70% of rural populations living more than five km from the nearest health facility. So far, this workforce has identified over 4000 potential epidemic events, and each year carries out about one million home visits [80,81].

4.3. Key Public Health Interventions, Policy, and Laws

The 2014–2016 Ebola epidemic served as a catalyst for the MOHSW. The need for universal access to safe and quality services through; a robust Health Emergency Risk Management System; and an enabling environment that restored trust in the health authorities' ability to provide services through community engagement in service delivery and utilization, improved leadership, governance, and accountability at all levels was seen as crucial [2,40,52,55,57,59,82]. In response to the need for a resilient and responsive health system, several key policies, plans and legislation (Table 2) was passed in the years following the Ebola epidemic. One key document was the "The Investment Plan for Building a Resilient Health System (2016–2021)" which was developed to facilitate the health system recovery and set it on the path to development [61]. The Investment Plan was not meant to replace or substitute the NHPP, but rather to complement it. The Investment Plan was followed by several key policy documents, guidelines, and laws.

4.3.1. National Public Health Institute

After the devastating EVD epidemic, Liberia began to rebuild its health system. The need to strengthen Liberian expertise in infectious disease preparedness and response and in a host of other areas became obvious to policy and Ministry of Health leaders. The National Public Health Institute of Liberia was established by the Liberian government in December 2016 [30,76,84]. The Institute collaborates with and advises the Ministry of Health on infectious disease control, environmental health, occupational health and safety, and other issues. NPHIL is mandated to improve the public health status of the Liberian population in collaboration with relevant agencies and government institutions, in alignment with IHR core capacities (prevention, detection, and response to public health threats and events). It shall provide real-time surveillance and expert advice on public health morbidity and mortality to the Government of Liberia, key stakeholders, and the public. Public health workforce training and capacity building is an integral component of the Institute.

The Emmet Dennis National Scientific Conference was established by the National Public Health Institute of Liberia in a quest to provide a platform to share scientific knowledge [30,74,84]. This initiative was embraced by all stakeholders supporting health in Liberia. The conference was named in honor of Dr. Emmet Dennis, who served as the first Director of the Liberian Institute for Biomedical Research, which he founded.

4.3.2. Private Public Health Institutions

There are several non-governmental organizations both local and international that support public health interventions in Liberia [85]. One such local organization is the Public Health Initiative Liberia (PHIL) which was conceived in 2011 by Liberian health professionals to contribute towards the effectiveness of the health care delivery system of Liberia through leadership, partnership, innovation, advocacy, and empowerment. PHIL is a non-governmental organization registered in Liberia with a mission to promote and enhance Liberia's quality of health care delivery through leadership, partnership, innovation, and capacity building [86]. Since its start, PHIL has been involved in various public health initiatives such as: cervical cancer screening, menstrual hygiene, breast cancer awareness, and community engagement during the Ebola epidemic and the current COVID-19 pandemic.

Table 2. Key Public Health Laws, Policy, Plans, and Guidelines.

Policy, Plans, and Laws	Date	Summary
Health Workforce Program Strategy	2015–2021	<p>The core objectives of the Health Workforce Program Strategy [77] are to:</p> <ul style="list-style-type: none"> • Improve the quality, quantity, and skill diversity of the national health workforce
Investment Plan for Building a Resilient Health System in Liberia	2015–2021	<p>The specific objectives of the Investment Plan for Building a Resilient Health System [61] in Liberia are to:</p> <ul style="list-style-type: none"> • Universal access to safe and quality services through improved capacity of the health network for provision of safe, quality Essential Packages of Health Services. • A robust Health Emergency Risk Management System through building public health capacity for prevention, preparedness, alert and response for disease outbreaks and other health threats. • An enabling environment that restores trust in the health authorities’ ability to provide services through community engagement in service delivery and utilization, improved leadership, governance and accountability at all levels.
Revised Community Health Worker Policy	2016–2021	<p>The core objectives of the National Community Health Services Policy [78] are to:</p> <ul style="list-style-type: none"> • Strengthen community engagement and build the capacity of households to contribute to the reduction of maternal, newborn and child morbidity and mortality and to address issues of public health concern; • Increase access to and utilization of an improved quality of a standardized package of essential interventions and services including, Infection Prevention and Control (IPC) interventions; • Strengthen support and governance systems for implementation of community health services; • Build human resource capacity for community health services via pre-service and in-service training, including IPC; and • Develop robust Health Monitoring, Evaluation and Research (HMER) systems, including community-based surveillance and information systems.
National Non-Communicable Diseases Policy and Strategic Plan	2016–2021	<p>The NCD Policy [79] is expected to form an integral part of the National Health Plan (2011–2021) and the National Health Investment Plan (2015–2021). The overarching goal of the NCDs policy is the reduction of NCD morbidity, mortality and disability in Liberia through NCDs preventive and control services that are of high quality, effective and affordable.</p> <ul style="list-style-type: none"> • To strengthen service delivery systems for the prevention, control and management of NCDs. • To build the capacity of service providers at all levels of care (primary, secondary, tertiary) on NCDs prevention, control and management. • To increase access to essential drugs, medical & Diagnostic Supplies for NCDs that will be of quality, efficient, & affordable for the demand side. • To strengthen the data management of all NCDs to inform policy makers for decision making. • To create an environment that strengthens coordination, collaboration, and partnership among stakeholders. • To mobilize adequate funding for the implementation of NCD activities at all levels of the health system.

Table 2. Cont.

Policy, Plans, and Laws	Date	Summary
National Policy and Strategic Plan on Health Promotion	2016–2021	<p>The Primary objectives of the National Policy and Strategic Plan on Health Promotion 2016–2021 [80] are to:</p> <ul style="list-style-type: none"> • To provide a legal framework to strengthen leadership for the development and implementation of health promotion in Liberia • To establish a mechanism for planning, monitoring and evaluating health promotion interventions on both processes and outcomes. • To empower individuals, families, communities and civil society' for their active involvement and participation in health promotion interventions • To promote evidence-based research as a prerequisite for the development of health promotion interventions • To promote multi-sectorial and multi-disciplinary approaches to health promotion development and implementation
Mental Health Policy and Strategic Plan for Liberia	2016–2021	<p>The core objectives of the Mental Health Policy and Strategic Plan for Liberia [81] are to:</p> <ul style="list-style-type: none"> • To modernize existing services, create new and additional services, recruit and train more skilled staff, and link to both other government and non-government sectors
National Public Health Institute Strategic Plan, 2017–2022	2018	<p>The primary objectives of the Nation Public Health Institute [30,76] are to:</p> <ul style="list-style-type: none"> • Contribute to development and sustainability of the public health workforce • Develop, enhance, and expand the surveillance platform • Establish a comprehensive, integrated, and sustainable public health diagnostic system • Establish multi-sectoral epidemic preparedness and response capacities and capabilities • Develop, enhance, and expand processes and structures to protect environmental and occupational health • Expand, conduct, and coordinate public health and medical research to inform Liberian public health policies • Strengthen the relationship between NPHIL and national and international public health partners • Ensure sustainable financing and operations of the NPHIL
Infection Prevention Control Guidelines	2018	<p>The overall objective of the national infection prevention control program [82] is to establish and maintain a “culture of IPC” so to improve quality of care provided:</p> <ul style="list-style-type: none"> • Developing IPC best practices and guidance for preventing the spread of health care-associated infections (HAI) and Antimicrobial Resistance (AMR); • Contributing to the prevention and containment of endemic and epidemic diseases.

Table 2. Cont.

Policy, Plans, and Laws	Date	Summary
National Technical Guidelines for Integrated Disease Surveillance & Response	2018	<p>The broad objective of integrated disease surveillance and response [83] in Liberia is to contribute to the reduction of mortality, morbidity and disability from diseases through accurate, complete and timely reporting and analysis of data for public health action. Specific objectives are to:</p> <ul style="list-style-type: none"> • Strengthen the capacity to conduct effective surveillance activities: train personnel at all levels; develop and carry out plans of action; and advocate and mobilize resources. • Integrate multiple surveillance systems so that resources can be used more efficiently. • Improve the use of information: to enable rapid detection, for analysis and response to suspected epidemics and outbreaks; to monitor the impact of interventions; and to facilitate evidence-informed public health policy, planning and action. • Improve the flow of surveillance information across levels of the health system. • Strengthen laboratory capacity for pathogen detection and monitoring of drug resistance. • Increase involvement of clinicians in the surveillance system. • Emphasize community participation in detection and response to public health problems.
The New Public Health Law as Revised	2019	<p>The New Public Health Law [84] address new and emerging public health challenges such as emergency treatment, discrimination, mental health, nutrition, regulation of marketing of products for infants and young children, zoonotic diseases, non-communicable diseases, antimicrobial resistance, clinical trials, and complementary and alternative medicine</p>

4.3.3. Public Health Law

Liberia adopted its first public health law on 16 July 1976, and which stayed in effect for over forty years [84]. The 1976, law did not address new and emerging public health challenges such as emergency treatment, discrimination, mental health, regulation of marketing of products for infants and young children, zoonotic disease, non-communicable diseases, antimicrobial resistance, clinical trials, and alternative medicine [84]. In 2019, the 1976 public health law was revised to address these concerns and more. The Act to Establish the National Public Health Institute of Liberia that was approved on 27 December 2016 and states the NPHIL's objective is to improve the health of the Liberian population in collaboration with relevant agencies and institutions of government.

5. Discussion

Over the past century and despite a decade-long hiatus due to the civil war and the devastating EVD epidemic, Liberia has made significant progress in strengthening its public health workforce, policies, and infrastructure [39,40,46,59,87]. However, for Liberia to continue on this trajectory and to retain a responsive and resilient public health system certain considerations should be made while continued investments in key areas should be prioritized. Furthermore, it is important to formally document and record the progress and significant investments made in key sectors of the public health system, as part of the historical record, literature, and evidence of public health evolution in Liberia.

5.1. Investments in a Public Health Workforce

Key investments have been made in creating training programs for an effective public health workforce; with government supported training programs such as the LFETP and University of Liberia public health master's program [22,38,46,59,74,77,79]. In its strategy

document, the NPHIL accounts for the healthcare workforce in detail and states that the number of public health specialists is unknown. Given the multiple public health programs in the country including Cuttington University (functioning since 2004) efforts should be made to document the exact numbers and contributions of those trained and working in the field of public health [75]. Without proper accounting and coordination of public health training programs, both private and government, efficient use of resources and provision of a skilled workforce that meets the needs of the country, would be difficult. Effective public health responses often require skilled multidisciplinary teams, including communicable disease and non-communicable disease skills; not to mention an intersectional approach with other key institutions in a country.

5.2. Coordination and Intersectional Collaboration

The importance of intersectoral collaboration and coordination was highlighted by the EVD epidemic [40,55,88–95]. Without coordination between faith communities, community engagement, health sector, and private sector, the epidemic would have lasted much longer [93]. The NPHIL is mandated to improve the public health status of the Liberian population in collaboration with relevant agencies and government institutions in alignment with IHR core capacities (prevention, detection, and response to public health threats and events). However, it is unclear how the institution is collaborating with other government sectors and the private sector. If the institute is to live up to its potential, it needs to take on a clear role as a coordinating body and ensure that all sectors are actively engaged, and that resources are leveraged in a cost-efficient manner while avoiding duplication of efforts. Coordination and linkage between institutions training public health professionals and practitioners, and the institutions that are intended to absorb and use their skills need to be strengthened. The ability to identify and confirm infectious diseases at the earlier stages of an epidemic or outbreak cannot be overstated, however, this is dependent on strong relationships with vulnerable communities and those entities that serve them. Continued and prioritized investments in strengthening laboratory and diagnostic capabilities in the country requires a decentralized approach if real time identification of emerging diseases is to occur. Additionally, collaboration with local public health institutions and organizations should be considered and encouraged as an opportunity to build capacity.

5.3. Investments in Institutions, Policies, and Guidelines

Public health may be a relatively small component of a health system, compared to the rest of the health system that provides curative services. However, the contribution of public health towards the overall health system is central to that system functioning well [8,78,94,95]. Especially, in low resource countries such as Liberia, the most cost-effective use of health appropriations is to invest in the preventive health interventions that are found in public health [22,40,95]. While the newly established “Emmet Dennis National Scientific Conference” has been a great start for the dissemination of scientific information, more avenues for the dissemination of scientific information should be explored. NPHIL should work closely with the MOH and other key stakeholders to increase their ability to manage, and translate their data into knowledge, knowledge into informed policy and guidelines, and guidelines into evidence-based interventions. Graduate students from the various institutions of higher education often conduct quality research which can be used to help identify and inform gaps in the health system. Additionally, public health leaders and public health practitioners should ensure active and continuous community engagement and devise forums and identify ways in which to communicate public health messaging in plain language to the populations they serve.

6. Conclusions

Over the past several decades Liberia has made significant progress, from rebuilding its healthcare system after a devastating civil war to strengthening its public health system post EVD epidemic, to being able to respond to the demands of new pandemics such

as COVID-19. However, such progress can only be maintained at the present trajectory if serious considerations are given to continued prioritization by the government and sustained investments by the international community in the public health sector.

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