

**FACTORS INFLUENCING THE ADHERENCE TO INFECTION PREVENTION AND CONTROL PRACTICES  
AMONG HEALTH WORKERS IN LIBERIA: A LITERATURE REVIEW**

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FACTORS INFLUENCING THE ADHERENCE TO INFECTION PREVENTION AND CONTROL PRACTICES AMONG  
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A thesis submitted in partial fulfilment of the requirement for the degree of Master of Science in Public Health

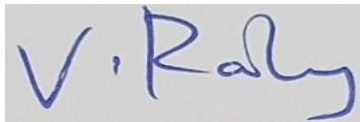
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## **ABSTRACT**

**Background:** Healthcare-associated-infections are a major and common problem in healthcare worldwide with significant burden in many low-middle-income-countries, including Liberia. Studies show that Infection-Prevention-Control practices (IPC) are effective in the prevention and control of healthcare-associated-infections, however, IPC practices among health-workers in Liberia is inadequate and has led to the transmission of infections between patients and health-workers thus imparting health-service delivery.

**Objective:** The objective of this study was to explore the factors that are influencing the adherence of health-workers to IPC practices in health-facilities in Liberia, to formulate evidence-based recommendations that can be used by the ministry of health and partners to improve adherence and reduce the spread of infections in healthcare settings.

**Methodology:** This work is a literature review of grey literatures and peer review studies done on Liberia and other sub-Saharan African countries. The Dejoy “theoretical model explaining self-protective behavior at work” framework was used to analyze the literatures included.

**Findings:** Individual factors such as Knowledge of IPC, positive attitude and good risk perception were found to be facilitators of adherence while environment factors such as lack of supplies, equipment and infrastructures were found to be barriers to adherence. The support of management in providing a safe work climate and guidelines positively influences IPC practices. Several interventions implemented in bundles were found to improve health-workers’ adherence to IPC practices.

**Conclusion:** The result of this study shows that several levels of factors influence the intention and ability of health-workers to adhere to IPC practices and are interconnected. To improve health-workers adherence to IPC, the government of Liberia through the Ministry-of-Health and Partners need take a holistic approach in implementing Interventions.

**Keywords:** “healthcare-associated-infections”, “infection-prevention-and-control”, “health-workers”, “adherence”, and “Liberia”.

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<b>ABBREVIATIONS</b>	
AMR	Anti-microbial Resistance
EVD	Ebola Virus Disease
HAIs	Healthcare Associated Infections
HHFA	Harmonized Health facility Assessment
HWs	Health Workers
HFs	Health Facilities
HWs	Health Workers
IPC	Infection Prevention and Control
LICs	Low Income Countries
LMICs	Low- Middle Income Countries
MOH	Ministry Of Health
PPEs	Personal Protective Equipment
SARA	Service Availability and Readiness Assessment
SSA	Sub-Sahara Africa
WASH	Water Sanitation Hygiene
WHO	World Health Organizations

## KEY WORDS DEFINITION

1. **Adherence/compliance** as used in this work refers to the continuous, consistent, and accurate used of measures, protocols, guidelines, and recommended practices intended to stop or manage the spread of infectious illnesses(1). Throughout this work adherence and compliance are used interchangeably with similar meaning.
2. **Healthcare Associated Infections** refers to infections that are transmitted and acquired in healthcare settings by patients and healthcare workers while receiving or providing care.
3. **Health facility** refers to the physical place or establishment where health services are provided to people who need medical care and treatment(2). Health facilities in this work include but are not limited to clinics, health centers and hospitals.
4. **Health workers** are people whose work action's primary objective involved improving the health of patients. In this work health workers are used instead of healthcare workers to refer to both clinical workers and non-clinical workers in healthcare settings(3).
5. **Infection Prevention and Control** is a set of practical measures that are based on scientific evidence, aimed at preventing and managing the spread of infectious diseases within healthcare settings and other environments where infections can be transmitted; in order to reduce the risk of infections and protect patients and health workers from being harm by these infections(4).
6. **Infection prevention and control practices** refers to sets of precautions or measures used by health workers in healthcare settings to prevent the transmission and spread of infections between patients and health workers.
7. **Standard precautions** are a complete set of Infection Prevention and Control measures and practices designed to be always used when providing healthcare in all settings regardless of the infectious status of a patient as it is meant to lessen or avoid the transmission of diseases that are related to providing healthcare. Infection prevention and control standard precautions practices includes: Hand hygiene, respiratory hygiene, the use of personal protective equipment and clothing, safe injection practices, safe waste management, screening and isolation, environmental cleaning and decontamination(5)

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## 1.0 INTRODUCTION

Infection Prevention and Control (IPC) is an important component in the provision of safe and quality health care services because it affects care providers, patients, and caregivers. Adequate and effective IPC practices in Healthcare Facilities (HFs) protect patients, Health Workers (HWs) and communities from the risk of contracting infectious diseases. Three main purposes of IPC are to prevent patients from developing Healthcare Associated Infections (HAIs) when receiving care, minimize occupational health risk to HWs and control the spread of diseases during outbreaks. Poor adherence to standard IPC practices is the major contributor to the high burden of HAIs and can lead to the transmission of infectious pathogens between patients and HWs, thus increasing the risk of infection among HWs.

HWs are key in the delivery of quality health services, therefore, it is essential to prioritize their wellbeing and safety to ensure the safety of patients and the continuation of routine health services to the population. During disease outbreaks, HWs are at the frontline and are more prone to infections than the general population. So, to reduce the risk of infections among HWs and the patients they care for, it is important that HWs always adhere to IPC practices.

As the principal investigator, I am a physician assistant who has worked both in clinical and public health settings in Liberia. For six years of my career, I was involved in direct patient care at facility level and in disease outbreak response. I have firsthand experience on the challenges involved in IPC when providing healthcare in a resource-limited setting like Liberia. I've also witnessed colleagues lose their lives to infections contracted while providing care to patients. I therefore wear a lens of a witness when collecting and synthesizing evidence in this review.

Before my educational journey at KIT, I worked as IPC focal person in the Grand Cape Mount County health team, Liberia. In this specific position, I observed that adherence to IPC practice depends largely on several interconnected factors. Serving during two major outbreaks in history, the West Africa Ebola virus Disease (EVD) epidemic and the Coronavirus disease (COVID-19) pandemic, and seeing how poor IPC practices increased disease spread, affected HWs and disrupted health service delivery, I became interested to document the variables that influence IPC practices among HWs in my country.

In this thesis, I try to understand the various factors that play a role in determining the adherence of HWs to IPC practices by reviewing, analyzing available evidence in combination with my personal experience in the field and identify which interventions and strategies could work better in Liberia.

## Chapter one - Background on Liberia

### 1.1. BACKGROUND

#### 1.1.1. Country profile

##### Geography

Liberia is a country located on the western coast of Africa bordered by Sierra Leone to the northwest, Guinea to the north, Cote d'Ivoire to the east, and the Atlantic Ocean to the southwest. Liberia covers 43,000 square miles and is divided into 5 regions and 15 counties of which the capital city is Monrovia (see fig.1)(6). Liberia terrain is characterized by low rolling coastal plains that rise to a mountainous interior and has a tropical climate with two seasons(rainy and dry) (7).



Figure 1:map of Liberia

##### Demography

Liberia has a population of approximately 5.5 million people, with an annual growth rate of about 2.71% per year. The population is relatively young, with about 60% under the age of 25 (see table 1). The country is also one of the most urbanized in West Africa with over 50% of the population living in urban areas (8).

Table 1: Liberia demographic profile

Demographic characteristic	value	year	Data source
Total population	5,506,280	2023	World Factbook
Population density	53 /km <sup>2</sup>	2023	world meter
Urban population	53.6%		World Factbook
Annual population Growth Rate	2.71 %	2023	World Factbook
Population lees than 25 years	60%	2020	World Factbook
Population more than 65 years	2.8%	2023	World Factbook
Birth Rate	36.26 births/1000 pop	2023	World Factbook
Death Rate	6.46 deaths/1000 pop	2023	World Factbook

Total fertility Rate	4.73 children/woman	2023	World Factbook
Life expectancy at birth	65.8 years	2023	World Factbook
Median Age	18 years	2020	World Factbook
Literacy rate	57.5%	2023	Country Reports

**Socio-economic situation**

Liberia is a low-income country (LIC) that has a gross domestic product per capital of around \$675.7 according to 2021 data(9). The country faces numerous economic and social challenges including a high poverty rate which is 52% as per world bank 2021 estimate (9). 64% of the population in Liberia live below the poverty line (surviving on less than \$2 per day) with approximately 1.3 million Liberians that live in extreme poverty and cannot afford their daily needs(10). Employment rate in Liberia is highest among men(81%) compare to women (61%) and the highest percentage of Liberians are employed in the informal agriculture sector (38% women, 41% men) follow by small businesses (52% women, 17% men)(11). Literacy rate in Liberia is disproportional between women(52%) and men(75%)(11). The country’s economy is largely based on agriculture, with about 60% engaged in subsistence farming. There is also large scale exportation of agriculture products(rubber, palm), forestry and mining (12). In 2022, the Liberian economy expanded by 4.8%, however, extreme poverty has been increasing since 2014 and passed 50% in 2020 (13).

Liberia has made some progress in recent years towards economic recovery and development with an average growth rate of around 3% between 2018 and 2020. However COVID-19 pandemic and other economic shocks have slowed this progress (14). In term of social indicators, Liberia has a high infant mortality rate(63 deaths per 1000 live births), low life expectancy(65.8 years), and low literacy rate (11). Access to basic services such as clean water and sanitation is limited with 16 % of households lacking access to improve water source while only 47% has access to improve toilet facilities(11), lesser particularly in rural areas. The country has struggled with conflict and instability in recent decades, which has further hindered its development (14).

**1.1.2. Health Sector overview**

**Governance and service delivery**

The 14 years of civil conflict (1989-2003) greatly devastated the health system in Liberia. With the destruction of health infrastructure and shortage of health workers, the health system was practically dysfunctional(15).

From 2005 up to present, the country has made a strong effort in rebuilding its health system. First by introducing the Basic Package of Health Services (BPHS) under the National Health and social warfare Policy and Plan 2007-2011, (16,17). Under the BPHS, Liberia introduced the free primary healthcare policy with the goal of ensuring that the population has access to basic health services(16). Due to the limited government budget toward health and decrease in donor funding, the free healthcare became impacted by high out of pocket spending (16). Additionally HWs did not fully understand the content of the BPHS and associated it with low salaries, poor work conditions and limited support from those in authority(18). The BPHS was followed by the development of an Essential Package of Health services (17). This health package has defined the type of health services to be delivered at various levels of care and was introduced to ensure the provision of quality and equitable preventive and curable services at all levels of the health system (15).

Liberia has a decentralized health system with the Ministry of Health (MOH) overseeing policy and coordination at national level. The health system is organized into three tiers: primary, secondary, and tertiary level (see figure 2) (16). The primary level consists of community based and facility-based services and offers preventive, promotive, and curative services. The community health workers are the pillar of community-based services, and they are community health assistants (CHAs), community health Volunteers (CHVs) and trained traditional midwives (TTMs)

LEVEL OF	HEALTH FACILITIES	SYSTEM CARE ORGANIZATION			
<b>PRIMARY</b>	CHV, CHAs TTM Non-permanent SDP Clinic	COMMUNITY			
<b>SECONDARY</b>	Health Center District Hospital		DISTRICT		NATIONAL
	County Hospital			COUNTY	
<b>TERTIARY</b>	Regional Hospital National Referral Hospital				

Figure 2: Relation between facilities, levels of care and health system organization, Liberia (15)

Facility based services are primary health clinics that are headed by physician assistants and Nurses that serves a catchment population of about 1000-3500 population (level one clinics) or 3500-1200 population (level two clinics mainly found in urban areas) (16). The secondary level consists of health centers that offer 24 hours services with inpatient capacities (up to 40 beds), offer limited laboratory services, and serves a population of 25,000 to 40,000 while county Hospitals serve a catchment of 200,000 people. County hospitals offer laboratory and radiology services, general surgeries, and emergency obstetric services. The secondary level facilities are headed by Medical doctors (16). The tertiary level is mainly for referrals and has no catchment population. There is one regional referral Hospital (Jackson F. Doe hospital) located in Nimba county and one national referral Hospital (JFK medical center) in Monrovia that offer specialize services (16). The Liberian health system is primarily divided into two sectors: the public sector which represent 55% of HFs and the private sector representing 45% of total HFs in the country (2).

The EVD outbreak of 2014-2016 exposed preexisting vulnerabilities within the health system that was yet ill-equipped to handle the crisis, and this resulted in the breakdown and disruption of health services and the loss of human resources (15). Recovering from EVD, the Government of Liberia decided to prioritize its effort to build a resilient Health system based on lesson learnt from EVD. The investment plan for rebuilding a resilient health system was developed by MOH to reduce the risk due to epidemics and improve the health status of the population. This plan has nine investment areas, which includes a **fit-for-purpose healthy workforce**, health infrastructure and technology, Epidemic preparedness and response, medical supplies and Diagnostic, quality service delivery, sustainable health financing, leadership and governance, community engagement and comprehensive information research and communication management. It complements the national health policy and identify key health system actions to prioritize (17). Since the EVD outbreak, there has been improvement made in Liberia in responding to public health emergency as evident in COVID-19 early detection and response(15).

The health system continues to face numerous challenges in providing health services and improving the health status of the population. Presently, Liberia still has one of the highest maternal mortality ratios (MMR) in the world (772/100,000 live births) despite the improvements over the past years. Neonatal deaths have increased from 26 deaths/1000 live births in 2013 to 37 deaths in 2019/2020 (11,19). Sepsis, a preventable public health problem, remains the second leading cause of maternal and neonatal death in Liberia (15). The health system has also been impacted by the high prevalence of communicable diseases such as HIV, TB, Malaria, diarrhea, and respiratory diseases. Communicable, maternal, and neonatal diseases are the main causes of death in Liberia with Communicable diseases responsible for 57% of total deaths in Liberia (15,20).



Non communicable diseases have also been increasing in recent years. According to 2019 Global burden of disease, cardiovascular diseases were the second highest cause of death in all ages in Liberia. It is also rank highest for years lost to disability in Liberia(21).

### Health Workforce

Human Resource is one of the key building blocks of the health system and critical for service delivery. It is also one of the nine investment areas for building a resilient health system in Liberia(17). There are various cadres of health workforce in the Liberian health sector and four are considered core. These are medical doctors, physician assistants, nurses, and midwives. The present health workforce density (2021) in Liberia is 11 of the core workforces per 10,000 population as compared to 11.4 in 2016 which is still below half of the international WHO recommended benchmark of 23 per 10,000 population as seen in figure 3 (2,22). Adding to the shortage in the workforce are those that lost their lives while providing care during outbreaks: about 8 % of the workforce was lost due to EVD(23) and about 2% of HWs infected with COVID-19 also died between March 16, 2023, and June 16, 2023(24).

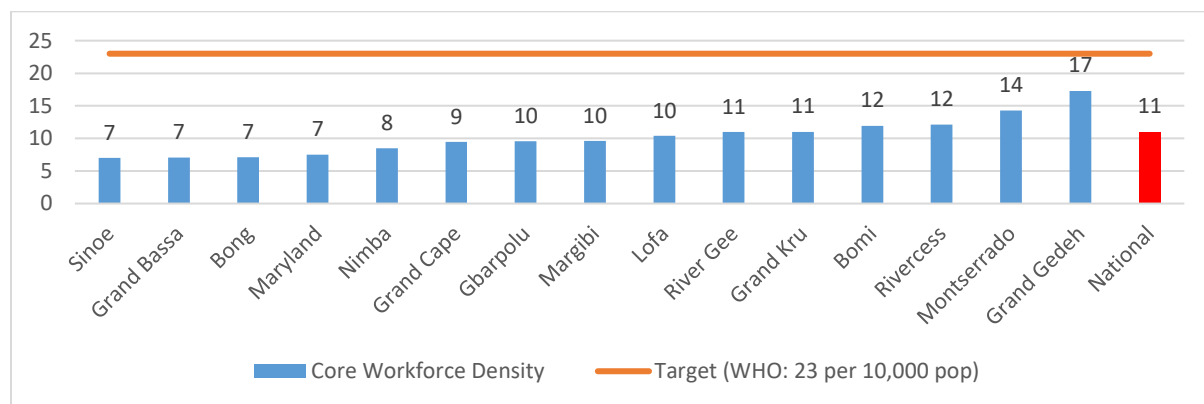


Figure 3:Core Health Workers Density per 10,000 population per county, HHFA 2021(2)

The government of Liberia is the largest employer of health workforce in the country; however, almost half of the workforce is based in Monrovia, the capital city. Because of the “one-size-fit-all” approach that has been used in the distribution of the health workforce, most of the HFs are either understaffed or overstaffed resulting in gross imbalances and favoring facilities in the urban areas (25). Deployment of HWs to rural areas

is difficult because of the low salary structure and inadequate incentives to motivate workers to be retained in rural facilities (16). There is still a substantial need for improvement in the production, deployment, and retention of HWs (16).

## Health infrastructure

Liberia has a current HF density of 2.1 per 10,000 population as compared to 1.9 in 2021 thus reaching WHO recommended 2 per 10,000 population(2,26). In 2021, there were 866 HFs reporting to the LDHIS-2 from all fifteen counties in Liberia, which has far improved from the total 831 functional facilities that was providing services to the population in 2018 and 550 in 2010(2,16,22). Of the 866 HFs, hospitals make up 4.2%, health centers – 7%, and clinics - 88% (see table 2) (2).

Table 2: Health Facilities Distribution by Facility Type and by County, HHFA -2021(2)

County	Clinic		Health Centers		Hospitals		Grand Total
	Private	Public	Private	Public	Private	Public	
Bomi	3	23				1	27
Bong	14	38		1	1	2	56
Gbarpolu	1	14				1	16
Grand Bassa	6	25	1		2	1	35
Grand Cape Mount	1	28	1	3		1	34
Grand Gedeh	2	19		2		1	24
Grand Kru	2	15		4		1	22
Lofa	5	50		3	2	2	62
Margibi	22	20	8	6	1	1	58
Maryland	3	21		2		1	27
Montserrado	266	44	10	12	4	6	342
Nimba	29	46	1	4	3	3	86
Rivercess	2	16		1		1	20
River Gee	2	15		2		1	20
Sinoe	2	34				1	37
<b>Grand Total</b>	<b>360</b>	<b>408</b>	<b>21</b>	<b>40</b>	<b>13</b>	<b>24</b>	<b>866</b>

Although the number of facilities has strongly increased, the quality of these HF's remains a challenge with only 52% of HF's having the basic amenities to provide health services in Liberia as compared to 79% in 2018 according to the Harmonized Health Facilities Assessment (HHFA) report 2021. (See figure 4). About 77% of HF's in Liberia has improved water source and 80% has sanitation facilities. There has also been a decline in the number of HF's having standard precautions (SP) for IPC from 68% in 2018 to 61% in 2022(2,22).

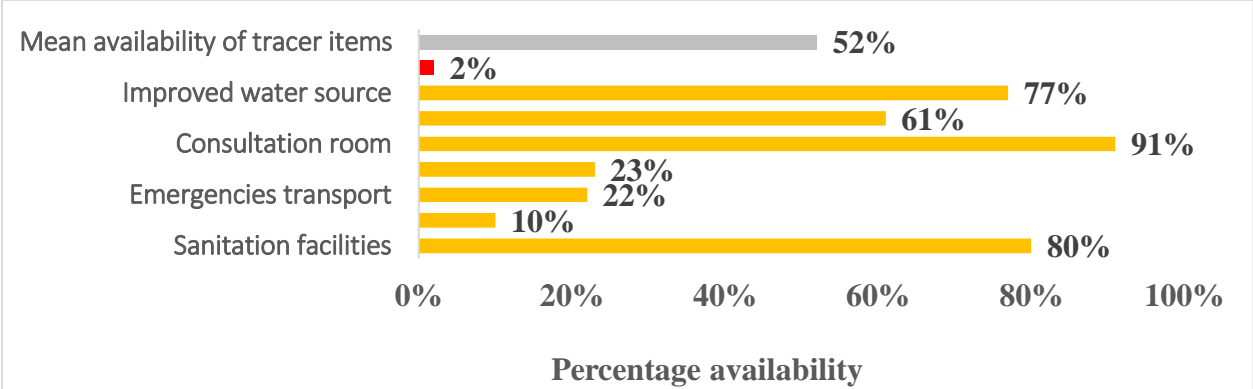


Figure 4:Percentage of health facilities with basic amenities in Liberia (HHFA), 2021 (2)

**1.1.3. Overview of HAIs and IPC**

**The importance of IPC in addressing HAIs**

HAIs form a major and one of the most common problems in health care and patient safety worldwide. These are infections that originates within healthcare settings and can affect both patients and healthcare providers (27). Respiratory infections and bloodstream infections are the most common types of HAIs that spread during healthcare(28). Anyone receiving and providing healthcare is potentially at risk of acquiring HAIs. The World Health Organization (WHO) estimate that 24% of patients that acquired HAIs dies every year, including 52.3% of those admitted to Intensive care units ICU(29). The burden of HAIs is significantly high in low-middle-income countries (LMICs) (15.5/100 patients) as compared to high-income countries (HICs) (4.4-7.1/100patients). The highest mortality due to HAIs is 29.3% in Africa (30,31).

The WHO estimates that 70% of HAIs can be prevented with effective IPC practices. Effective IPC is a crucial component of health care and public health as it helps in preventing the spread of infectious diseases, protect

HWs from being harmed by avoidable infections including those caused by antimicrobial resistant (AMR) pathogens, and acquired during the provision of healthcare service. IPC also promote the safety of patients, reduce health care cost, and prevent the emergence and spread of AMR. (4). It is also critical in preventing and reducing the transmission of infections during disease outbreaks (32). Poor adherence to standard IPC practices is the major contributor to the high burden of HAIs. Failure to follow standard IPC practices such as hand hygiene, Personal Protective Equipment (PPEs) usage, proper waste management, and proper disinfection and sterilization of equipment can lead to the transmissions of pathogens between patients and HWs (33). IPC should be applied to every patient and healthcare professional at every point in time to prevent the spread of infectious agents in the healthcare environment(4).

WHO recognizes eight core components of IPC that work together to improve IPC practice and reduce HAIs (see figure 5). These core components are the responsibility of a functional national IPC program. The core components of IPC are interrelated and contribute to improve adherence to infective IPC practices and reduce the overall burden of HAIs and AMR(30).



Figure 5: WHO eight core component to improve IPC (33).

Effective IPC practices in health facilities require a functional IPC program at national level and within acute HFs (30,33). A functional IPC programs ensures the availability of technical IPC guidelines that support good IPC practices, provide IPC trainings for IPC professionals and healthcare providers, and have in place a surveillance system to evaluate the burden of HAIs and AMR within acute HFs. It also designs interventions

that translate guidelines into practices and carry-on regular monitoring and audits of IPC practices. WHO also recommends an enabling environment that support IPC practices as part of its core components(33)

In 2022, WHO launched the first ever global report on IPC. According to the report, 11% of the countries reporting did not have a national IPC program and 54% had national IPC programs that were not being implemented. Also, only 3.8% of all the countries reporting met the minimum requirement for implementing IPC(34). This minimum requirement has been defined by WHO as “IPC standards that should be in place at the national and facility level to provide minimum protection and safety to patients, HWs and visitors, based on WHO core components of IPC program”(32). The report further states that the implementation of IPC programs at national and HF level is a big challenge in many Low-Middle-Income Countries(LMICs) (34). None of the participating countries and HFs in LMICs that participated in the 2019 global IPC survey met the minimum requirement for IPC. In addition, LMICs often lack the infrastructure and resources to fully implement effective IPC programs and practices. National level IPC programs in LMICs lack the resource to allocate specific budget and dedicated staff for IPC implementation at HFs (29,35). The global strategy on IPC has prioritized it as crucial in tackling the burden of HAIs and as central in responding to infectious health emergencies(36).

### **IPC in Liberia**

Prior to the EVD outbreak, IPC in Liberia was basic as there were no national IPC programs or guidelines, or dedicated IPC staff at HFs (37). The importance of IPC was first recognized during the EVD outbreak as Liberia was severely affected due to the widespread transmission of the disease in the population and among HWs. After the EVD outbreak, IPC became a national priority(38). Aligned with this priority and to strengthen IPC in Liberia, a national IPC program was established under the health care Quality management unit (HQMU) at the MOH. This management unit is responsible for the coordination of IPC activities across the country at all levels of healthcare with the support of health partners, such as local and international organizations. In 2018, the first national IPC guideline was developed in Liberia from a previously fragmented modules of IPC training; along with various IPC Standard Operating Procedures (SOPs) and checklists that have been integrated into the national supervision and monitoring tool. In addition, there has been an effort for nationwide IPC training for HWs. Also, efforts were put into establishing IPC programs at sub national level to oversee IPC activities in HFs, including some level of infrastructural upgrade at HFs, and regular supportive supervision and monitoring to identify and correct IPC gaps with interventions that strengthen and improve IPC practices in

HFs in Liberia(39). According to the HFs survey report 2021, only 55% of health facilities in Liberia presently have IPC guidelines available while 61% have materials for IPC standard precautions(2).

## Chapter Two – problem statement, Justification, and research objective

### **2.1. Statement of the Problem**

HWs are faced with a range of occupational hazards including infections, and injuries. The transmission of infections in health care settings may adversely affect HWs since they are in direct contact with ill patients and potentially infectious materials and agents. HWs do not only serve as source of infection but are also at risk of acquiring the infections(40). Although most studies focus on the burden of HAIs among patients, available data suggests that the prevalence of HAIs among HWs is significant ranging from 2.7-27.1% in low and middle income countries(41). The rate of HAIs increases during infectious disease outbreaks, especially among HWs since they are at the frontline and are 30 times more likely to get infected than the general population(42). The global prevalence of HWs infections with SARS-COV-2 during the COVID-19 pandemic was reported at 10.4% with higher rates observed especially among those working in COVID-19 designated wards and units(43). In sub-Sahara Africa, HWs infections accounted for 3.5-4.4% of all COVID-19 cases in the region according to the WHO report(24).

In Liberia, as in other LICs in Sub-Sahara Africa(SSA) , the exact burden of HAIs is unknown, however reports from various infectious disease outbreak in country have shown a high incidence of infections spread especially among HWs in healthcare settings(23,44). During the 2014-2016 EVD outbreak, the rate of infection among HWs was 4% as compared to 1% among the general population. A total of 378 HWs got infected with EVD in Liberia resulting in 192 fatalities. Majority of HWs infections were from within hospitals and other healthcare settings around Liberia (45–47). In 2019-2020, there was an outbreak of Lassa fever in Liberia that affected five counties with 7.7% of all confirmed cases being HWs from within HF (48). In addition, there had been a reported 404 HWs infections with COVID-19 in Liberia (44). According to WHO report on HWs infections with EVD, over 50% of HWs infections in Liberia were nurses and nurse aides followed by doctors and medical students-12%. Laboratory technicians and other non-clinical staff (janitors maintenance staffs etc.) were the least affected (23). Although available data on HAIs among HWs in Liberia is mainly during disease outbreak, a study conducted in 2017 reported a 18.5% prevalence of Hepatitis B virus infection among HWs in a tertiary hospital in Liberia (49).

The adherence of HWs to basic IPC practices in Liberia is inadequate as is shown in 2018 WHO IPC assessment report where the overall adherence rate of HWs to hand hygiene was 67% (50). Comparing reports from baseline IPC assessment of hospitals that was done in 2018 and the reassessment done in 2021, a decline was observed in IPC overall compliance across all components in Liberia (see figure 6)(51). In addition, a national

level IPC assessment done in 2022 shows a gap in compliance to all core components of IPC in all types of HF across Liberia (Figure 7)(51).

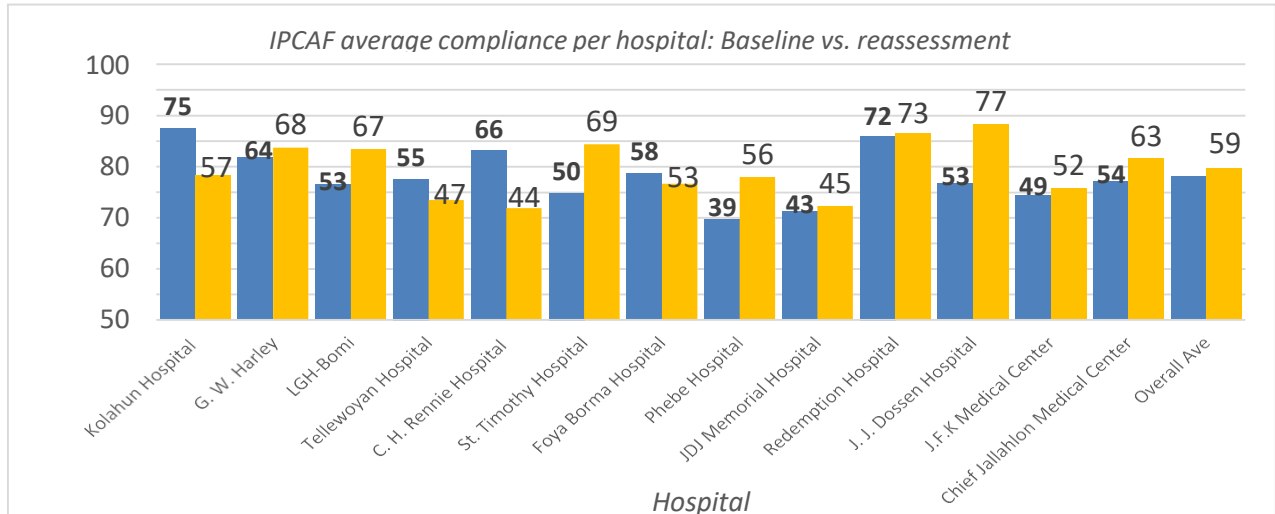


Figure 6: Scoring on IPCAF across 13 hospitals assessed in 9 counties (baseline vs reassessment) in Liberia, IPC report 2021

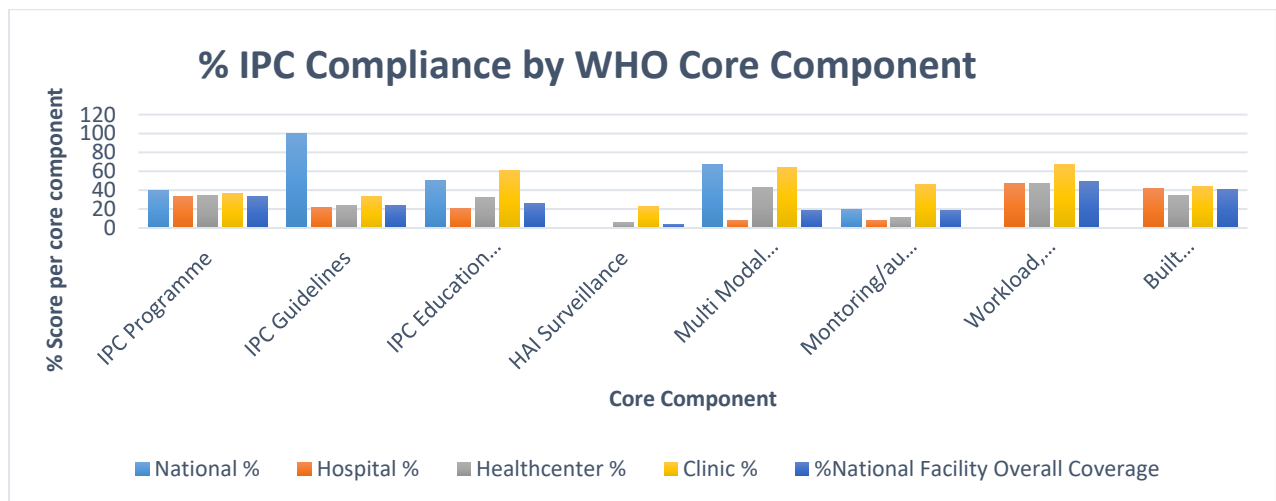


Figure 7 : Status of the IPC Program per type of Facility according to WHO Core Components of the IPC Program in Liberia, IPC report 2021

The lack of adherence to IPC standard practices has been identified as a significant risk factor to high HAIs among HWs especially during infectious disease outbreaks (52,53). This adversely affects the provision of routine health services in HF since HWs are key in-service delivery. Therefore, there is a need for HWs to



improve their adherence to IPC practices when providing care to patients to protect themselves and their patients from acquiring infections from within the health care setting.

## **Justification**

HAIs increase mortality and disability and incur financial burden on the health systems and on individual and families, while the growing use of antibiotics to treat HAIs propagate AMR. The elimination of preventable HAIs and the provision of safe, efficient, and high-quality health services both depend on effective IPC practices (54). As in other resource limited settings, efforts have been made to promote and enforce the adherence to IPC practices among HWs in Liberia, however, with limited resources and competing priorities, numerous challenges exist that can impact HWs adherence to IPC practices (42). This has been made evident by the rate at which HWs acquired infections while providing care to patients as the risk of exposure among HWs to infections in healthcare settings is still high (42,55).

Understanding the various factors that influence the behaviors of HWs in adhering to IPC practices when providing care to patients both during outbreak situations and routine care is important to design interventions that address adherence gaps. Available studies in Liberia have mainly focused on the impact of IPC in the control of outbreaks. Only few of these studies have briefly mentioned factors affecting HWs adherence to IPC and no study done in Liberia has clearly outlined and discussed specific factors impacting the adherence of HWs to IPC practices. To develop strategies and policies geared at enhancing the safety of HWs and patients and support the government of Liberia's efforts to build a resilient health system and attain Universal Health Coverage by 2030, one must understand factors that enable or impede HWs from practicing effective IPC.

This study is an analysis of available relevant literature from Liberia and other resource limited countries in SSA to identify and understand specific factors that are currently influencing the behaviors of HWs in adhering to basic IPC practices. In addition, this study will explore interventions and initiatives from Liberia other SSA countries to recommend contextualized interventions that could improve adherence to IPC and reduce HAIs among HWs.

## **2.2. Research Objective**

### **Overall objective**

The main objective of this study is to explore the factors that influence the adherence of HWs to IPC practices in HFIs in Liberia, and to provide evidence to inform policies and strategies formulated by the MOH and partners to improve adherence to IPC and reduce the spread of infections in health care settings.

### **Specific Objectives**

1. To **describe** how HWs individual factors impact their adherence to IPC practices, using examples from Liberia and other LMICs in SSA.
2. To **understand** environmental factors that influence HWs adherence to IPC practices when providing care to patients in Liberia and other LMICs in SSA.
3. To **explore** organizational factors such as policies and programs that affect adherence to IPC practices among HWs in Liberia and other LMICs in SSA.
4. To **identify** interventions from Liberia and other resource limited settings in SSA that have been successful in addressing HWs adherence to IPC practices and why.
5. To **use study findings** in providing to MOH and healthcare quality partners specific recommendations and focus for interventions, strategies and policies that improve IPC adherence in Liberia.

## Chapter Three – Methodology

This chapter consists of the chosen study design with a full description of the strategy employed to gather data including the criteria set for inclusion and exclusion of available evidence. It also includes the conceptual framework used to analyze study results and the possible study limitations.

### **3.1. Study design**

This work is based on a comprehensive review of literature using a systematic approach to gathering existing evidence found in published articles and grey literature.

#### **Search strategy**

Online search engines were used in this study to gather information including general google, google scholar, sci-hub, PubMed, VU online library, and their databases. The Liberia MOH website was searched for policy documents, National reports, and guidelines. Organizational websites such as WHO, CDC, and USAID was also searched for relevant materials as these organizations are involve in supporting IPC activities in Liberia. Initial search term employed are “influence” “infection prevention control” “adherence” “health workers” “Liberia” “sub-Saharan Africa” “low-middle income countries”. Search terms were also narrowed using other combinations linked to the specific objectives of the study and factors/ determinants in the chosen framework (see full table in annex 1). The initial delimitation of the study was 2010, however, with the use of a snowballing technique, references of papers was checked to include papers with relevant information but published outside of the timeframe

#### **Inclusion and exclusion criteria**

Peer-reviewed articles with full texts and grey literature, including reports on Liberia and policy documents, were used in this study. All papers included were those published from 2010 onward focusing on HWs' IPC practices written on LMICs in SSA that were published in the English language. Papers included from Liberia are those published since 2014, because it was at this point IPC became a growing interest because of EVD outbreak and attracted the attention of researchers.

Articles whose full text are not available or articles published in other language than English were excluded from the study. Also, papers published on countries that are not LMICs in sub-Saharan Africa were excluded.

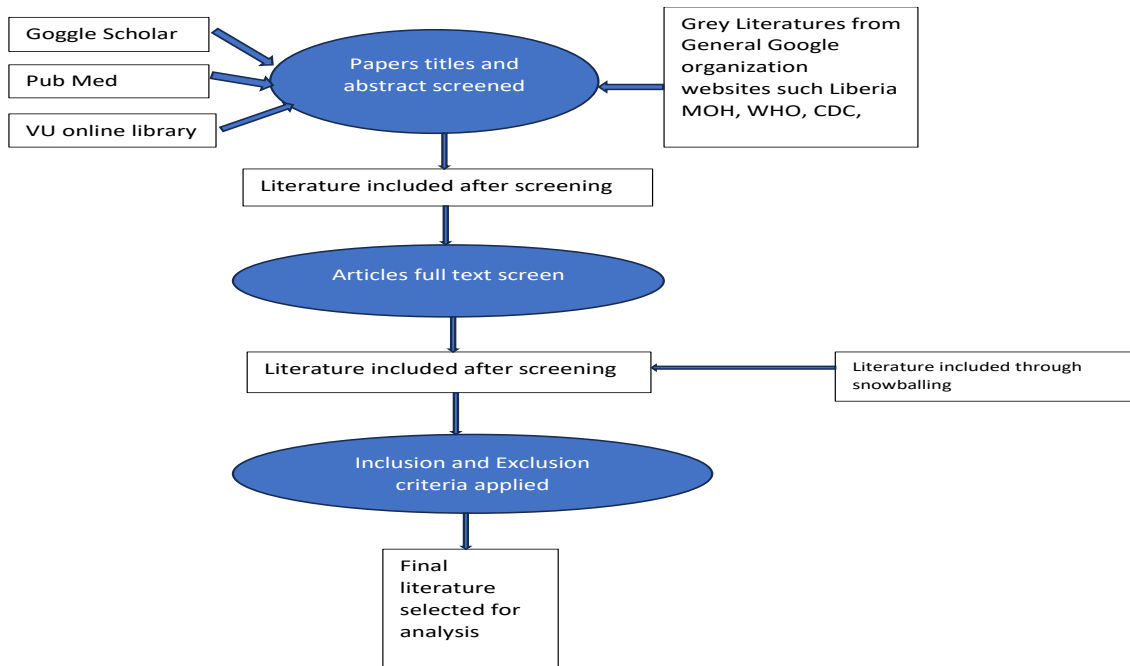


Figure 8: Literature search and Inclusion flowchart

### 3.2. Conceptual Framework

The framework applied in this study to analyze the research findings is the behavioral diagnostic model of Dejoy(56,57), which explains “self -protective behavior at work”. The model shows that “self-protective behavior at work” can be influenced by a combination of personal and situational factors, and that the individual’s behavior is a result of an interaction between these factors. For this study, the behavior of HWs to adhere to IPC can be considered as self-protective behavior, and the framework allows therefore to create an understanding of which factors can influence HWs adherence to IPC. Adherence to IPC has been considered a behavioral intent because it refers to an individual intent to engage in a particular behavior (practicing IPC). Adherence to IPC involves a conscious decision to follow safe procedures and practices and according to the framework can be influenced by a range of factors, which fall under three main categories: 1. Individual factors, 2. Environmental factors and 3. Organizational Factors (see framework).

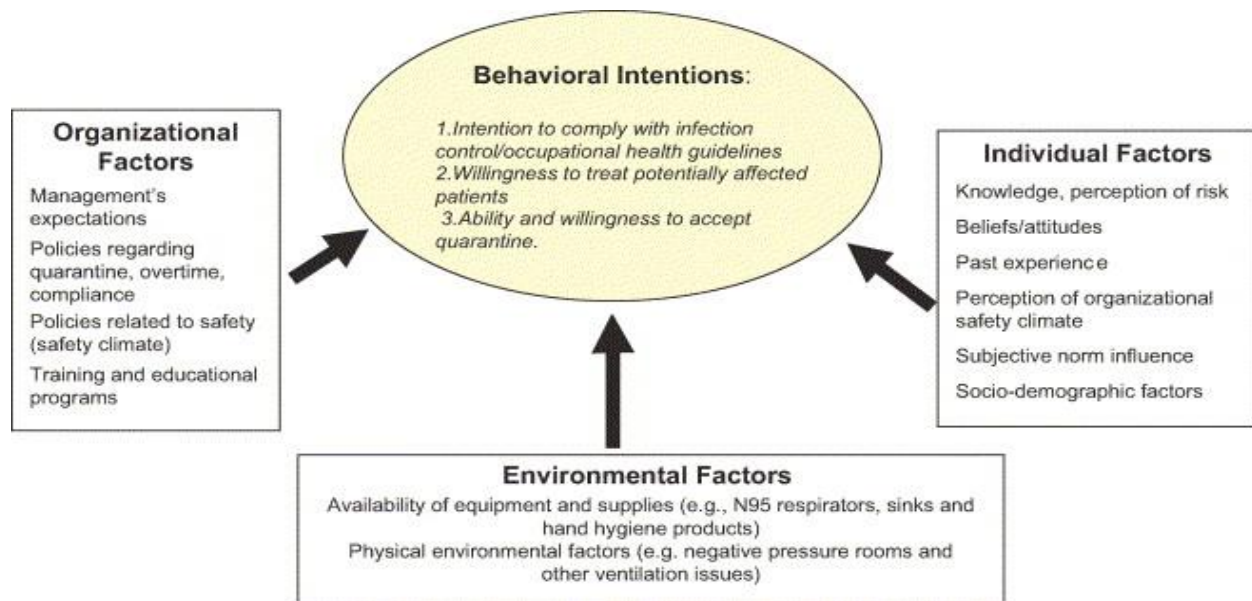


Figure 9: conceptual framework – “Theoretical model to explain self-protective behavior at work. Adapted from DE Joy D. A behavioral-diagnostic model for fostering self-protective behavior in the workplace. In: Karwowski W, editor. Trends in ergonomics/human factors III. North-Holland: Elsevier Science Publishers B.V.; 1986. p. 907-17”(57).

Individual factors include knowledge, attitude, beliefs about IPC practices, perception of risk exposure and the safety of the work environment, the influence of subjective norm on preventive behaviors. It also considers the effect of socio demographic factors such as age, sex, and area of work on preventive practices(57,58). Environment factors are the physical structure or design of the HFs and the available resources including materials and supplies that support the adherence to IPC practices(58). Organizational factors that influence the adherence to IPC guidelines and practices includes management expectations, Policies, and training programs(57,58).

This framework highlights the complex and multifaceted nature of the factors that influence HWs self-protective behavior, in this case adhering to IPC practices. By understanding these factors, strategies can be developed to address these factors in a comprehensive and coordinated manner thus promoting adherence, improving HWs safety and preventing HAIs.

### 3.3. Limitations of the study

It was difficult to locate the available evidence on Liberia, particularly in peer-reviewed literatures and new or updated data from reports. Because of this, the majority of the study's findings are based on LMICs in SSA that

are similarly resource-constrained like Liberia. By excluding material written in languages other than English when conducting an internet search, an information bias could be created. Unused unpublished studies may have the potential to enhance the research. Several search engines were used, and the procedures used in the papers were carefully examined, to narrow down the extent of this study's limitations. Another drawback of this study is that it used data from earlier studies as its foundation.

## Chapter Four – Results

This chapter presents the study results and has been set up in accordance with the conceptual framework that was used to analyze the findings. The specific research objectives 1-4 are represented by the four primary headings that make up this section. Throughout this chapter, first the Liberia specific findings will be presented, followed by findings from other SSA countries.

### 4.1. INDIVIDUAL FACTORS

Individual factors focus on how HWs' knowledge, attitudes, and beliefs affect their adherence to IPC standards. It also considers the impact of perceptions, approval, and an individual socio-demography on adherence to IPC practices.

#### 4.1.1. Knowledge, Beliefs, and attitudes

Several studies in Liberia identified HWs knowledge of IPC as an important facilitator of adherence to IPC practices in HFs during the EVD outbreak in Liberia(37,39,59). Studies from other SSA countries also identified knowledge as a factor to IPC practices(60–63). In Liberia, inadequate IPC knowledge among HWs was recognized as a contributor to poor IPC practices leading to the widespread transmission and cluster of EVD infections in HFs early in the Outbreak. Inadequate IPC capacity among HWs was one of the primary drivers of the high transmission between HWs and patients (37). Subsequently, evidence shows that improving HWs knowledge through training subsequently contributed to the improvement of IPC practices in HF and a downward trend of EVD infections among HWs from 9% in October 2014 to 1% by January 2015 (39,59).

A systematic review done on SSA countries reported inadequate knowledge of IPC as a barrier to adhering to good IPC practices(63). In addition, a facility based cross sectional study conducted in Ethiopia found that HWs with good knowledge of IPC were 1.5 times more likely to adhered to IPC practices compare to those with inadequate knowledge (AOR1.68, CI 95% 1.11-2.56)(61). Similarly, a cross sectional study done in a municipal hospital in Ghana reported high levels of IPC knowledge among nurses and also found that over half (65%) of these nurses adhered to IPC practices(62).

Contrary to these studies, findings from two cross sectional studies done in Nigeria suggest there is no relationship between knowledge of IPC and adherence to IPC practices(64,65). Though HWs that participated

in these studies were found to have good knowledge and awareness of IPC, they conversely had poor adherence to IPC practice. In one of the study, no significant correlation was found between IPC knowledge and adherence to IPC practices ( $P < 0.05$ )(64). In the other study, the adherence to hand hygiene practices among HWs that participated was observed to be inadequate despite the presence of adequate hand hygiene knowledge(65).

Concerning HWs attitudes toward IPC practices, a cross-sectional study conducted on HWs in Liberia during the COVID-19 pandemic reported a generally poor attitudes of HCWs toward IPC practices although a better attitude toward IPC was expected of HWs during COVID-19 due to lesson learnt from EVD outbreak. HWs in this study however did not seem to consider the importance of adherence to IPC as key in preventing the transmission of COVID -19 and as a result, poor adherence to IPC practices was observed in HF in Liberia(66). Another cross-sectional study done among HWs in southwest and northwest Nigeria during COVID-19 reported similar findings. 95% of HWs that participated had a poor attitude toward the use of PPEs and less than 5% adhered to PPE usage(67). Similarly, a descriptive cross sectional study done among Nurses and laboratory staff in a district hospital in Kenya reported that participants with a positive attitude toward Tuberculosis IPC guidelines were almost two times more likely to adhere with IPC practices (AOR 1.68, CI 1.15-2.55)(68).

No study done was found in Liberia on HWs beliefs in IPC practices, however, one study was found from Nigeria reported on HWs beliefs in the use of PPEs. 60% of HWs that participated in this study believe that PPEs was of fair quality and did not offer full protection and this affected their use of PPE(67).

#### **4.1.2. Perception of risk and safety climate**

Studies done in Liberia and other countries in SSA have identified perceived risk of infections among HWs as a motivator to HWs adherence to IPC practices (69–71). For Example, participants of a mixed method study done in rural Liberia were observed adhering to regular hand hygiene practices. Most of the participants had good knowledge of IPC but their motivation to adhere to hand hygiene practices was due to a perceived risk of getting infections from the hospital. The perception that they were at high risk of getting infections from patient motivated these HWs to adhere to IPC practices by all means even to the point of purchasing their own hand hygiene product when it was unavailable in the hospital(69). Similarly, the result of a hospital based cross-sectional study that was done in Ethiopia shows that HWs perception of infection risk was significantly associated with their adherence to the use of PPEs (AOR 1.98, 95%CI 1.18-3.33)(70). Likewise, another cross-



sectional descriptive survey done in two southern Nigerian hospital reported that 68% of the nurses that participated perceived a high risk of contracting COVID-19 from the hospital and it led to them adopting and adhering to IPC practices such as hand hygiene and correct PPE usage(71).

In this literature review, no study was found from Liberia on HWs perception of the safety climate of their work environment and adherence to IPC practices, however, a survey done on COVID-19 among HWs in Liberia reported that generally IPC practices were inadequate in health facilities and 79% of HWs that participated in this survey perceived that their work environment were unsafe for IPC (72). In Nigeria, a descriptive cross-sectional study done among HWs did not find an association between perceived workplace safety climate and adherence to IPC practices. Although over 85% of the participants reported good perception of workplace safety, there was generally poor adherence to IPC practices observed(73).

#### **4.1.3. Past experiences**

Past experiences refer to HWs experiences caring for infectious patients or being exposed to infectious diseases and using IPC measures to prevent disease transmission. The past experiences of HWs as a determinant of adherence to IPC practice have not been studied in Liberia and similarly no study was found in SSA considering how the past experiences of HWs influence their adherence to IPC practices. However, studies show that working experience has an impact on HWs IPC practice. For example, according to a study done in Ethiopia, HWs with more than 10 years working experience were more than three times likely to adhere to IPC practices than those with fewer years(AOR = 3.17, 95% CI 1.98–5.674)(74). Another study from Tanzania produces similar results when considering years of work experience as a factor in the adherence to IPC standard precautions practices. HWs participating in this study with 11-15 years' work experience were two times more likely to adhere compare to those who had been working less than 6 years(75). Another study from Ethiopia explain that HWs with more than 10 years working were three times more knowledgeable about IPC and therefore had higher odds of adhering to IPC practices (76).

#### **4.1.4. Subjective norm influence**

Subjective norms can refer to a HWs belief that certain preventive behavior is approved by their colleagues or superiors, their perception that others expect them to perform a certain behavior. Although no study was found from Liberia to clearly show the relationship between subjective norm influence on HWs adherence to

IPC practices, findings from studies done in other SSA demonstrate that subjective norms can have a positive impact on an individual adherence to IPC practices(77–79). For example, a mixed method study done in neighboring Sierra Leone with similar socio economic, political, and cultural climate as Liberia demonstrates that the participation of peers and managers in practicing IPC was as a positive driver for HWs adherence to IPC practices during the EVD outbreak and thus leading to an improvement in IPC practice in HFs (77). Similarly, in a cross sectional study conducted among HWs in Uganda, low positive correlation was found between subjective norm and the behaviors of to adhere to waste management practices ( $r=0.377$ )(80). In another study done in Tanzania, it was noted that staff from HFs that perform better in IPC were given specific task by the superiors and expected to complete those tasks. Managers also took the lead by examples in hand hygiene practices and keeping the facility clean whereas in the poorly performing facilities, the non-compliance of some staff negatively influence others to not adhered to hand hygiene practices(79).

#### **4.1.5. Socio-demographic factors**

Several studies focusing on Liberia and other SSA countries indicate that compliance rate to IPC practices is lower in HWs of older age group >30 years and among males HWs(23,81–84). For example, according to WHO report, HCWs above the age of 30 years constituted 78% of Ebola infection rate due to poor IPC practices within HFs during EVD outbreak in Liberia, Sierra Leone and Guinea (23). The result of a cross sectional study done among HWs in private facilities in Tanzania also show that older HWs above the age of 30 years were less likely to adhered to the use of Gloves (AOR 0.64, CI 95% 0.50-0.82). Also females HWs were found to be more adherent to hand hygiene practices compare to males HWs in this study(OR 1.90) (81). Another study done in Ethiopia also reported higher rate of adherence to IPC practices among younger HWs compare to older HWs (AOR 2.5, 95% CI 1.1-5.3)(82). Additional clarity on why these socio demographic factors impact adherence was not considered in these studies.

#### **4.2. ENVIRONMENTAL FACTORS**

A built environment, materials, and equipment for IPC at HFs is one of the eight core components to have a functional IPC program that supports effective practices. Under this category, we will consider the availability of IPC supplies and materials (hand hygiene, PPE, environmental cleaning and disinfection, Health Care Waste Management), and the physical environment/infrastructure (Water, sanitation and hygiene-WASH, isolation space, and waste disposal facilities).

#### **4.2.1. Availability of equipment and supplies**

Findings from studies done in Liberia and other SSA countries have demonstrated that the lack of and insufficiency of materials and equipment that supports IPC in HFs have resulted in poor adherence to IPC practices among HWs(37,85–89).

The findings from a qualitative study conducted among nurses in Liberia demonstrated the constraints HWs faced in adhering to IPC practices most especially the use of PPE to protect themselves and their patients in the presence of inadequate availability of PPE. HWs from 83% of the facilities that participated in this study, reported limited availability of PPE that led to nurses being constrained to ration available PPE either through reuse or substitution. Some nurses had to purchase PPE with the little salaries they received or ask the patients to purchase PPE which limited their adherence to the correct use of PPE (85). Similarly, another study done in Liberia during EVD outbreak identified the limited availability of IPC supplies and materials such as PPE, hand hygiene products and cleaning materials as one of the reasons for absence of IPC practices. This contributed to making HFs in Liberia a fertile setting for the EVD spread because HWs were being trained in the absence of these material resources thereby challenging their will to adhere to IPC practices(37).

A facility based cross sectional study conducted among 100 HCWs in two hospitals in Ghana also reported that 74% of the participating HWs attributed the poor adherence to IPC practices observed in the hospitals to the unavailability of adequate PPE within these hospitals. The insufficiency of PPE such as mask, gloves was seen as barriers to HWs adherence to IPC standard precautions(86). Likewise in Nigeria, another study identified the unavailability of soap, alcohol-based-handrub, sink and water as a barrier to HWs adhering to hand hygiene practices in HFs(87). Qualitative studies that have been done in Zimbabwe have also shown similar results. The limited materials resources such as gloves, water, soap, and PPE have negatively impacted the motivation of HWs to adhere to IPC practices and this has contributed to poor IPC practices within HFs(88,89).

#### **4.2.2. Physical environment (infrastructure)**

The critical role of the physical infrastructure of HFs in promoting HWs adherence to IPC practices has been recognized in studies done in Liberia and other SSA countries. The infrastructure highlighted in these studies include proper water sanitation hygiene (WASH), isolation, and waste management structures(63,90–92).

### *WASH infrastructures*

WASH services have been identified as a critical factor for IPC adherence in HF, but many LMICs such as Liberia face challenges when it comes to WASH in HFs and this compromise the ability of HWs to prevent and control infections(93). The national minimum standard for IPC in Liberia includes WASH services in HF, and according to a pre and post intervention study that was done in two hospitals in western Liberia, hand hygiene practices among HWs were poor during baseline assessment due to inadequate water system and poor sanitation facilities. However, upon upgrading these infrastructures such as improve water distribution and storage system, repair of nonfunctional sinks and increase number of hand washing stations, hand hygiene compliance rate increase from 36% and 86% to 88% and 89% respectively (94). A review of studies done on SSA countries identified the lack of hand hygiene infrastructures such as running or tap water and sink within HFs as barriers to hand hygiene practices in many resource limited countries in SSA(63,90). Similarly, according to two cross-sectional studies done in Ethiopia on factors associated with IPC practices in HFs, HWs in HFs that had continuous supply of water were 1.6 times more likely to adhere to good hand hygiene practices which was also lower in HFs without continuous water supply(61,95). The availability of water in these HFs provided easy and convenient access for hand washing. In Liberia, the unavailability of hand washing stations to promote hand hygiene compliance during patient care was observed to be a challenge as only 58% of HFs assessed had hand washing stations in patient care area according to the WASH assessment report, and some of the available ones were even nonfunctional (96).

### *Isolation infrastructure*

Available studies done in Liberia on EVD outbreak demonstrates that improved isolation infrastructures at HFs are essential for promoting isolation practices to prevent the transmission and spread of infectious diseases and protecting HWs(23,97). Inadequate isolation spaces at HFs was recognized as one of the determinants for the lack of adherence to basic IPC practices that led to HWs infections during EVD in Liberia(23,98). It is crucial to isolate infectious patients to stop the spread of infections to other patients and HWs. The investigation of 97 HWs infections in 2014 reveal the HFs with HWs infections had limitation in their physical spaces for isolation. Even HFs that had isolation spaces lack running water, separate toilets and barriers between patients and this limited the abilities of HWs to adhere to proper isolation of suspected infectious cases(97). According to findings from a qualitative study done in three public hospitals in South Africa, inadequate hospital infrastructure impeded the effective implementation of IPC measures. Due to lack of

isolation spaces, HWs were constrained in adhering to effective isolation practices in properly separating infectious from non-infectious patients. This increased the transmission of infections and exposed patients and HWs(99). Similarly, a cross-sectional studies done in two districts in Uganda with a high tuberculosis prevalence reported that inadequate building ventilation and lack of isolation spaces to separate suspected tuberculosis cases from other patients was a barrier to IPC implementation; thereby increasing the risk of tuberculosis transmission to patients and HWs(100).

The result of an intervention study done in one of Liberia's remote counties shows that improvement in providing isolation spaces at HFs contributed to an overall improvement in the adherence of HWs to IPC practices such as screening, triaging and isolation of suspected of confirm patients(101). A recent 2021 assessment of twenty-five HFs in Liberia has shown that isolation spaces is still a challenge to many HFs as only 47% was recorded to have holding areas or isolation spaces for infectious patients(51).

#### *Healthcare waste management infrastructures*

According to WHO, proper and safe healthcare waste management practices are part of a broader IPC practice as it help to reduce HAIs protecting HWs, patients and the environment (102). No studies have been found from Liberia on the impact of poor waste management structures on HWs adherence to IPC waste management practices in HFs. However, studies done in resource -limited countries suggest that inadequate or lack of proper waste management structures at HFs hinder HWs adherence to appropriate healthcare waste management practices needed to prevent the spread of infectious agents in healthcare settings (92,103,104). According to the National Waste Management Plan of Liberia, most of the HFs in Liberia have improper waste management structures such as damage incinerators and pits leading to poor management of waste generated (105).

In Ethiopia for example, across-sectional study conducted in public hospitals in the southern region reported over 50% HWs handling healthcare waste had accurate knowledge on waste management, however, there were poor waste segregation, collection, and disposal practices. This was due to the lack of color bins to appropriately separate and collect and damage incinerators that led to the over accumulation of waste spill on floor and open burning of healthcare waste (103). A similar scenario was observed in a study done in Tanzania on healthcare waste management linkage to IPC. During the assessment, it was observed that HFs did not have appropriate waste management structures such as waste storage, incinerators, and ash pits which resulted in poor waste management practices such as open dumping, open burning and disposal of ash

in placenta pits (92). Also, a study done in Kenya on IPC practices during COVID-19 identified inadequate waste management structures at HFs as a challenge to HWs adherence to proper IPC waste management practices(104). This shows that in the absence of proper healthcare waste management structures in HFs, there is poor compliance with proper waste management practices. This was also true in the case of Maryland county in Liberia, when the constructions and renovation of waste management structures at HFs contributed to improvement of these HFs overall IPC compliance scores from 66% to 96%(55).

### **4.3. ORGANIZATIONAL FACTORS**

This section describes how an institution or organization can facilitate or hinders HWs adherence to IPC practices by considering 3 sub domains: 1-management expectation through support of a safe work climate and provision of IPC guidelines, 2- policies, and 3- the availability of training and educational programs.

#### **4.3.1. Management's expectations**

Management expectation as an organizational factor refers to the support, communications and provision of standards and guidelines to promote safety in the workplace and protect HWs and patients from harm caused by injury and infections. Several studies done in SSA have recognized the important role of national and institutional level in the form of support, leadership, communications, and provision of guidelines in promoting adherence to IPC practices among staff (99,106,107). For example, the results of a qualitative study done among nurses in three district hospitals in south Africa reveal that ineffective management practices such as poor communication and support, lack of IPC orientation for staff negatively affected nurses implementation of IPC practices in these hospitals(99). Another cross-sectional study done in twenty tuberculosis care facilities in Nigeria reported weak management support such as lack of dedicated budget for IPC and lack of an IPC committee to oversee IPC activities as a barrier to the implementation and adherence of HWs to tuberculosis IPC practices(106). Similarly, a qualitative study that was done among HWs in Nigeria pointed to poor support from Hospital management by excluding IPC from Quality managements plan and bureaucratically controlling IPC materials contributed to the poor compliance among Staff(107). The result of a cross-sectional study done in Ethiopia also demonstrated that the support of hospital management was a significant driver of HWs adherence to IPC standard precautions(108).

### *The availability and communication of IPC guidelines*

Several studies, in Liberia and other SSA countries, identified the presence or absence of IPC guidelines as a factor influencing HWs adherence to IPC practices. A study in Liberia showed that the lack of IPC guidelines prior to and during the early stages of the EVD outbreak resulted in inconsistent IPC messages and practices(37). Findings from another interventional study that was done in Liberia shows that the provision of copies of IPC guidelines, standard operating procedures and job aids to HFs contributed to the improvement in IPC implementation and IPC practices among staffs (55). Furthermore, two studies from Ethiopia reported that among HWs participating, those who had IPC guidelines and SOPs available in their departments were more than 2-3 times likely to comply with safe IPC practices compared to HWs who lack access to guidelines (76). Study findings from Nigeria assessing IPC practices among laboratory HWs reported that the unavailability of TB IPC guidelines was one of the barriers experienced by HWs to implement IPC practices in the laboratory (109). Finally, results from a cross-sectional study among nurses in a municipal hospital in Ghana found the presence of IPC guidelines in the departments where nurses worked was associated with good IPC knowledge and a higher likelihood of compliance to IPC practices(62).

### *Safety climate*

Safety climate refers to the various ways in which safety such as the protection of HWs from injuries and infections is valued and IPC measures are prioritized in an institution. In Liberia, the outcome of a mixed method study conducted at the Tellewoyon Hospital, Lofa county shows that the hospital score in compliance to hand hygiene practices was basic due to the limited commitment from hospital leadership and management toward supporting activities for hand hygiene improvement. There was also low level of evaluation and feedback on hand hygiene practices from management to staff(110).

According to findings from an institutional based cross-sectional study conducted in Ethiopia, HWs who received frequent management support toward safety climate of their work environment were more than twice likely to be compliant to IPC standard precaution practices (AOR 2.23, 95% CI 1.11-4.53). It was likewise shown that the provision of feedback on safety practices increases to odds of adherence to standard precautions more than four times (OR 4.37, 95% CI 2.23-8.49)(108). This has also been due to the fact that institutional leadership and management have important roles in providing the necessary supplies and equipment to promote safety practices and in holding non-compliant staff accountable for their actions(108). Similarly, a cross sectional survey done among HWs in Ghana shows that the general safety climate including

a high management commitment to safety in the work environment positively correlates to HWs adherence to safety precaution behaviors(111).

#### **4.3.2. Policies (regarding quarantine, overtime, and safety climate)**

In Liberia, no study was found on the impact of health policies such as quarantine, overtime, and safety climate on the adherence of HWs to IPC practices. Beyond Liberia and in other SSA countries, a limited number of studies identified policy as a factor influencing IPC practices among HWs. In Kenya, for example, the result of a cross sectional descriptive study that was conducted in a district hospital showed that over 95% of participating nurses were aware of IPC policy, as it was written and available on hospital wards. This had a positive influence on their compliance to hand hygiene, use of gloves and decontamination practices (112).

#### **4.3.3. Training and Educational Programs**

According to available evidence from Liberia and countries in SSA, IPC training and education program for HWs is an essential contributor to the HWs adherence to IPC practices (66,75). In Liberia, the result of a cross-sectional study done among HWs during COVID-19 pandemic shows that HWs who had received training in IPC had higher odds of adhering to COVID -9 IPC practices (AOR 4.4, 95%CI 3.09 – 6.33) as compared to HWs who had not received any IPC training on COVID -19(66). The study also shows that IPC training was associated with good IPC knowledge and positive attitude that influence adherence to IPC practices(66). Similar findings were also found in another cross-sectional study done among 400 HWs in a Tanzanian district. The Study results show a higher level of adherence to IPC practices among HWs receiving at least one training session in the previous year (AOR 1.88, p=0.002) and HWs who had attended more than two trainings were three times more adherent to IPC practices as compared to those who did not attend any training(75). In addition, a descriptive cross-sectional study done among healthcare professionals in Ghana established that HWs who had attended IPC seminars and training had higher odds of adhering to IPC guidelines as compared to those who had not received trainings. The study also stated that increase in knowledge of IPC as a result of training increases odds of protective behaviors(113). Study result from Ethiopia also demonstrates the effect of IPC training on Improving IPC Knowledge and Influencing HWs behavior in adhering to IPC practices(114). The existence of a culture of periodic and regular training on new or updated IPC guidelines for HWs has been established by evidence to increase adherence to IPC practices (115,116).



#### **4.4. INTERVENTIONS TO IMPROVE ADHERENCE TO INFECTION PREVENTION AND CONTROL**

In Liberia and SSA, various interventions and strategies have been implemented to improve HWs adherence to IPC practices. These interventions include the provision of IPC training, supportive supervision and mentoring, supply chain management, workplace visual cues and reminders, and local production of Alcohol based handrub. Most of these Interventions have been implemented as a bundle of more than one intervention to improve IPC practice adherence. In Liberia for example, USAID maternal child survival program implemented several interventions as a bundle to improve HWs IPC practices within HFs and these interventions included IPC trainings, supportive supervision, provision of IPC supplies and establishment of IPC committees(39). Likewise in Zambia , interventions to Improve adherence to IPC practices in rural facilities was implemented as a bundle that included training sessions, provision of alcohol-based-handrub, text messages and poster reminders and monthly supervision(117). During EVD outbreak in the democratic republic of Congo, IPC interventions were also implemented in a bundle that included IPC trainings, provision of IPC kit containing supplies and onsite mentoring to Improve HWs adherence to IPC practices (118). The implementation of IPC interventions as a bundle that included more than one intervention was shown to improve HWs adherence to IPC practices as the implementations of single intervention is not always enough to facilitate adherence.

##### **4.4.1. Provision of IPC training**

IPC training and educational program in Liberia during and after Ebola proved to be effective in increasing HWs IPC knowledge and contributed to HWs adhering to IPC practices (37). Studies done in Liberia since the EVD outbreak has similarly shown that training programs such as the “keep safe , keep serving” (KSKS) and “safe and quality health services” (SQS) that was implemented nationwide in Liberia using standardize guidelines and materials translated in practice through the use of role play and simulation exercises were very effective in contributing to increase IPC compliance among HWs(37–39,101).

In Ghana, the result of a pre and post intervention study done in fifteen HFs demonstrate the impact of IPC trainings program and an additional WASH infrastructural improvements on Hand hygiene compliance among HWs(119). The intervention was implemented over a period of thirty-six weeks and included IPC capacity building through a practical training session on hand hygiene steps, decontamination processes and waste management. At the end of the intervention, findings reveal a considerable improvement in HWs

compliance to hand hygiene practices from 28.8% at baseline to 67.9% post interventions(119). However, WASH infrastructure and equipment were also provided in addition to trainings as it has also been noted that the provision of IPC training programs alone in the absence supplies and equipment cannot guarantee total adherence (37). According to a systemic review from SSA countries, IPC education has been considered one of the cores interventive strategies to promote IPC practices with the use of Tutorial lectures, simulations, on-site mentoring, visual cues. The study also recommend that a formal collaboration between a national government and a training institution may be established to give graduating healthcare professionals instruction or mentorship on IPC standards(120).

#### **4.4.2. IPC Supportive supervision and mentoring**

The WHO advised providing supportive supervision and mentoring of IPC to HWs in order to enhance their abilities, increase job motivation and satisfaction, and enhance performance through on-the-spot technical assistance(121).

In Liberia, numerous studies done during and after the EVD outbreak have demonstrated the impact of supportive supervision from management and supervisors on HWs adherence to IPC practices(38,55,101). For example, prior to the introduction IPC supportive supervision of HWs in Maryland county-Liberia, IPC practices in HFs were inadequate; however, after 4 rounds of supportive supervision and onsite mentoring in IPC standard precaution practices from national and county level supervisors, there was a mark improvement observed in IPC compliance among HWs in all components as these supervisory visits to HFs offered an opportunity to promote HWs IPC skills and Practice(55). Similarly, in Tanzania, supportive supervision and mentoring of HWs was implemented in a bundle of interventions that also included infrastructure improvement, trainings, and workload improvement. During the period of intervention, quarterly supervisions were conducted by health management Teams and HWs were mentored on how to improve IPC practices. Study results shows that HWs adherence to IPC practices improved by 25.6% over a period of one year in all HFs across Tanzania (122). Another cross sectional study conducted in Tanzania among HWs shows the rate of adherence to IPC practices were twice higher in HWs who received yearly supportive supervisions as compare to those who were not supervised at all (75).

#### **4.4.3. Improved Supply chain management of IPC materials and equipment**

Improved supply chain management for IPC supplies was one of the interventions that MOH and partners put in place to improve the adherence to IPC practices in hard-to-reach health facilities in Liberia. Within two months of distributing IPC supplies to facilities western Liberia, the IPC adherence score improved from 75% to 90% in these facilities(101). Between 2015-2018, similar results were observed in Northern-central Liberia when in conjunction with other interventions, the distribution and availability of IPC supplies to health facilities lead to improved IPC adherence scores in those facilities(39). The availability of IPC materials in these facilities increased the capacity of HWs to adhere to IPC practices.

#### **4.4.4. Provision of visual cues and reminders in the workplace**

Another strategy identified in literature to improve compliance with IPC practices is the use of visual cues and reminders within the HF. The use of visual reminders on PPEs doffing and donning, hand hygiene, waste segregation has been used in HFs in Liberia to reinforce IPC practices.(123). This strategy was also employed in a tertiary hospital in Ghana to improve hand hygiene practices in the hospital Neonatal intensive care unit. (124). WHO standards posters on HH were customized with pictures of local staff and placed in strategic locations. With in three months of implementation, a mark improvement was observe in hand hygiene compliance from a baseline of 67% to 92%.(124). Similarly, to improve IPC practices in its reproductive health clinics, Zambia employed the use of infection control reminders via posters and short messages. Posters visualizing hand hygiene, labor and delivery IPC practices were placed on prominent display around reproductive Health Clinics to reinforce concepts among HWs. Reminders on IPC standard precautions through text were sent daily to HWs(117).

#### **4.4.5. Local production of alcohol-based-handrub**

Another intervention to improve hand hygiene compliance was piloted in a hospital in rural Liberia consisting of two phases. In phase one, a baseline assessment was done on hand hygiene compliance status and the availability of materials to practice and it was recognized that the lack of hand hygiene supplies were contributing to low adherence among staff (69). As a result the first intervention included a low cost hospital production of alcohol-base-handrub using pharmacists, laboratory technician who had been train using WHO guidelines(125). This was followed by the provision of holster to be worn by staff to carry bottles of alcohol-

base-handrub while on duty to make hand hygiene more convenient and serve as a physical reminders for HWs to perform hand hygiene(125).

Rwanda also introduce the local production of alcohol-base-handrub in one of its rural hospitals and made available reminder posters in the workplace resulting in the availability of hand-hygiene materials and thus increasing hand-hygiene compliance significantly from 34.8% to 68.9%.(126). Similar intervention was also carried on in Uganda and Zambia to improve hand-hygiene compliance by locally producing alcohol-base-handrub from low-cost locally available materials resulting in availability of materials, increasing Hospital hand-hygiene compliance rate and reducing the burden of HAIs(117,127).

## Chapter Five – Discussion

This section discusses key findings from the result section and its implication for Liberia, how various factors are linked together and to implemented interventions. It also includes reflections on the used framework and the study strengths and weaknesses.

### 5.1. Individual Factors

Evidence from this study shows that individual factors such as Knowledge of IPC, a positive attitude toward IPC, perception of infection risk, and more than 10 years of work experience are factors that facilitate HWs adherence to IPC practices with limited evidence on beliefs. There was also two studies that did not find an association between IPC knowledge and IPC practices and it was similar to a study done in Bangladesh where HWs IPC practices were not reflective of their level of IPC knowledge(128). This clearly demonstrates that knowledge in the absence of material resources and infrastructure cannot guarantee adherence to IPC practices. Findings also show that HWs are also incline to adhere to IPC practices when there is a perceived risk that they could get infected if they neglect IPC practices (129).

Although no evidence from Liberia was found to support subjective norm influence, available evidence from other SSA countries show that the approval and acceptance of IPC practices from colleagues and superiors influences HWs to also adhere to IPC practices. This is also in-line with a study done among Jamaican HWs; a high percentage of respondents adhere to IPC guidelines because it was accepted and approved by senior nurses and medical colleagues(130)This also shows that supervisors and management can influence HWs behaviors by requiring adherence to IPC guidelines and practices.

Two socio demographic factors – age less than 30 years and being a female was found to be associated with adhering to IPC practices. Regardless of age and gender, IPC practices are critical for all HWs. However, the differences observed could be due to cultural and social norms that influence females HWs to be more attentive, careful and have a higher risk perception and thus adhere more to preventive practices. In this study, younger age was found to be more adherent than older age and this in my opinion could be because younger HWs are more physically resilient than the older ones.

### 5.2. Environmental Factors

The environmental factors considered in this study are the availability of IPC equipment and supplies and IPC infrastructures at HFs.

According to available evidence presented in this study, the lack of or limited supplies and equipment for IPC such as PPE and hand hygiene products constrain HWs to adhere to IPC and contribute to poor IPC practices within HFs. This is in line with the result of two systemic review that included studies done in both HICs and LICs which shows that the non-availability of IPC supplies and equipment is a barrier to HWs adhering to IPC standard precaution practices(131,132). Report from Liberia shows that many HFs both in urban and rural areas are still constrain with limited availability of IPC materials such as PPE, materials for hand-hygiene, environmental-cleaning, and waste-management. The most recent HFs assessment conducted in Liberia shows that of all the HFs assess across Liberia, only 61% had materials available to practice IPC standard precautions (2). The limitation or lack of these IPC materials has been found to influence the poor adherence to IPC practices observed in the HFs and thus contributing to the spread of infections among HWs and patients.

The findings from this study also demonstrate that HWs within HFs that have good IPC infrastructure such as WASH, isolation and waste management have higher chances of adhering to IPC practices compare to HWs working in HFs with poor or damage infrastructure that support IPC practices. The lack of these IPC infrastructures was also found to be a barrier to IPC adherence for HWs. Although there were Limited evidence from Liberia, national reports show that Liberia is still struggling with HFs infrastructures that support IPC practices. For example, data from WASH reports shows that a little over half of HFs in Liberia has improve water source while 13% lack access to on-site water source. This is also in line with WHO report that WASH services in HFs is either absent or limited in many LMICs and has a negative implication for IPC practices(93). A recent 2021 assessment of 25 HFs in Liberia has also shown that only 47% of HFs in Liberia have areas to isolate patients with suspected or confirm infectious diseases (51). An evaluation of 723 HFs in 2016 reported a less than 50% score for Isolations spaces which was one of the least score for the assessment showing how challenging it has been to improve isolation capacity at HFs in Liberia(38). In addition, the 2018 SARA report on Liberia indicates that only 49% of health facilities in Liberia have safe and proper structures for the final disposal of infectious waste in Liberia(22). This indicates a need for improving waste management structures at HFs in Liberia.

### **5.3. Organizational Factors**

This category discusses how organizational level factors such as management expectations and support, policies and programs influence IPC among HWs.

The result of this study shows that organizational level factors such as management expectation and support through the availability and communication of IPC guidelines and safe climate in the worked environment are needed to improve HWs adherence to IPC practices. It has been shown in this study that the lack of IPC guidelines for HWs is a barrier to Implementing IPC practices and the availability of Guidelines in wards and workstations improve the odds of adherence to IPC practices two-three times. Study results also show that the odds of adherence increase 2-4 times in the presence of a safe work climate. In Liberia however management level commitment to support IPC is limited and even though the national IPC guidelines were developed in 2018, many HWs still lack access to IPC guidelines(5).The 2021 HHFA that covers 600 of the 866 HFs in Liberia including all hospitals reported that the availability of IPC guidelines in only 55% of the assessed HFs(2). There is still need for national level and county level management to roll out these guidelines to all HFs in Liberia.

Regarding policy as an organizational factor in the adherence of HWs to IPC practices, there was very limited evidence providing support, however, A study from Saudi Arabia shows how that the presence of a quarantine policy was effective in allowing HWs infected with MERS-COV to stay away from colleagues thus controlling the spread in a referral hospital(133). Singapore also included quarantine policy in its IPC guidelines as a protection for HWs(134). The limited evidence on the impact of policy on HWs IPC practices in Liberia and SSA shows that the attention of policy makers and researchers should be drawn in this area.

#### **5.4. Interlinkage between factors**

The study's evidence-based findings emphasize the significance of every component in affecting HWs' behavior to follow IPC guidelines. The tangible variables that have the greatest impact on IPC practices and are connected to both individual and organizational characteristics were found to be environmental factors. In Liberia, environmental factors are the biggest obstacle preventing HWs from adhering to IPC practices, despite gaps being found with organizational level factors like a lack of policy and limited management support. For instance, it may be obvious that the absence of either one or both categories of factors create a barrier to practicing IPC. Because the elements are interconnected, interventions that have been put into place have thought about tackling numerous issues rather than just one.

### **5.5. Link between adherence factors and interventions to improve adherence**

This study discusses various factors that impact HWs behaviors to adhere to IPC practices, and the individual interventions consider in this study are gear towards improving some of these factors however, interventions should be considered holistic as a single intervention cannot improve all the factors that are barriers to IPC practices. The implementation of IPC training and education intervention and the provision of visual aids in the workplace have been to improve HWs knowledge on IPC serve as a reminder to increase adherence to IPC practices. The issue with management support for IPC can be partly addressed through the provision of supportive supervision to provide feedback and guidance and encourage HWs to continue to engage in IPC practices. Mentoring during supervision also tends to improve HWs knowledge and skills by providing hands on the job experiences. The availability of supplies for IPC are hindered by poor supply chain system that leave facility stockout of IPC materials. Improving supply chain management leads to the continuous availability of IPC supplies in HFs. Locally producing alcohol-based handrub also improved the supply and availability of hand hygiene products in HFs and reduced the spending for importing these products. Also, because the interventions are geared toward improving the factors that influence IPC practices, they are implemented in a bundle of more than one.

### **5.6. The complexity of IPC practice**

IPC is a broad and complex field that involves a variety of strategies and measures to stop the spread of diseases in HFs and communities. IPC is complicated due to several issues, such as the complicated nature of infectious illnesses and the variety of healthcare settings. This work limit IPC practices to the basics of standard precautions but IPC is in every continuum of care and is embedded in every health delivery program and therefore requires interdisciplinary teamwork.

### **5.7. Reflections on chosen framework**

The conceptual framework used in this study greatly aided the research's direction in achieving its goals, in guiding the search for pertinent literature, and in assisting in the systematic analysis of data. However, this framework was created in 1996 and has not been updated, even though IPC has made significant advancements because of the advent of new diseases. For instance, a national level program is crucial and should be considered in the framework due to the significance of IPC in controlling emerging infectious



diseases. The availability of a workforce to handle the current burden in patient care is a crucial aspect of IPC that is not considered in this framework. It is necessary to pay attention to policy as a factor in IPC adherence because the lack of research on various aspects of this framework tends to diminish the importance of factors, such as policy. This framework has been developed primarily for outbreaks but is applicable for non-outbreak as the factors covered influences HWs behavioral intention to comply with IPC guideline, willingly treat a potentially infected patients and accept quarantine when necessary.

### **5.8. Thesis strengths and weaknesses**

The results of this study identified and discussed the facilitators and challenges to HWs adhering to IPC practices in Liberia based on personal, environmental, and organizational factors. This study also demonstrates the interrelationship of the variables affecting HWs' IPC practices. This study goes beyond just talking about the factors by also looking at some of the strategies that may be employed to increase HW adherence. The lack of Liberian peer-reviewed literature was this study's principal weakness. There is very few research on individual characteristics such as HWs attitudes, perceptions, beliefs, and sociodemographic. Obtaining current information on HWs in Liberia, including reports, surveys, evaluations, and policies, was another issue.

Since there is very little information available from Liberia on HWs, IPC practices, and HAIs during routine patient care, much of the data examined was contextualized against the background of EVD in Liberia and a few studies conducted during COVID-19. Since this research analysis was created using analysis from other studies, there is also a possibility of bias. Due to the paucity of studies on Liberia, results from those conducted in other LMIC SSA were contextualized to Liberia, which may be another issue given the degree of similarities between the countries.

## Chapter six – Conclusions and Recommendations

### 6.1. Conclusions

HAIs remains a major problem in health care globally while sub-Saharan Africa is faced with a high burden although with limited existing evidence. Liberia is no exception to infections spread both in and out of health care settings with high burden of HWs Infections recorded especially during infectious disease outbreaks. Adhering to IPC practices of Standard precautions remains the primary means by which HWs can protect themselves and patients from getting infected by avoidable infections. However, evidence points to several factors that promote and impede HWs adherence. Existing evidence from Liberia and other countries in SSA shows that these factors range from a HWs individual level to a higher institutional or organizational level.

From an individual level, Knowledge of, positive attitude towards IPC can positively influence adherence to IPC practices. Evidence also shows that this association is somewhat limited as these individual factors influencing adherence depend on other levels of factors. Evidence also suggests that HWs with the right risk perception of infections are more adherent. There were also several limitations in evidence from Liberia on individuals' factors such as socio-demography and subjective norm influence.

From this study, it is evident how environmental factors greatly impact the adherence to IPC practices among HWs. These environmental factors such as availability of resources and HF infrastructures are a major limitation in many resources limited SSA countries such as Liberia. Evidence shows that the availability of Supplies and equipment supports HWs in adhering to IPC practices and that Individual factors without these environmental factors cannot promote adherence. In our study, the lack of materials and supplies was found to inhibit HWs IPC practices and poor Infrastructure at HFs such as WASH, Isolation and waste management was found to also limit HWs adherence to good IPC practices. Our evidence also shows that available policies on quarantine during routine healthcare and policies preventing HWs from working overtime is lacking in Liberia although the current human Resource policies has provision for a safe work environment for HWs. The unavailability of these policies and the absence of guidelines in HFs has limited the support for IPC adherence among HWs.

Most of the research gap observed in this study from Liberia was evidence on Individual level factors and organizational factors. There have been interventions done in Liberia and in other SSA countries that has improve HWs IPC practices in HFs although these interventions have been carry on a smaller scale. Over the years, most of government and health partners interventions have focus on IPC trainings provided to HWs

and there are still gaps observed in IPC practice adherence. However, from our study, it is evident that interventions to improve adherence must cover more than one level of factors to have a positive result.

## 6.2. Recommendations

Based on the different levels of factors examined in this paper that influence HWs adherence to IPC practices and lesson learnt from Liberia and other SSA countries and from organizations such as WHO, the recommendations to improve IPC adherences in Liberia are as follow:

Recommendations to MOH and health partners:

- ***The development of a HWs and patient safety policy***- The Quality management unit at MOH can work with key stakeholders and partners in Liberia to develop a HWs and patient safety policy to be included in the national health policy of Liberia and roll out the existing IPC guidelines to every HF in Liberia.
- ***Integrate training on IPC into the training curricula of health care professionals*** - The MOH can work with existing healthcare training institution in Liberia to include IPC as a course component in training curriculum enabling graduating healthcare professionals to have basic knowledge on IPC prior to assignment within any HFs. The MOH should also work with professionals' boards to ensure that IPC training and certification programs are mandatory for all healthcare employees. Standardized training that includes practical hands-on sessions ought to be required to get or renew a healthcare license. To guarantee that healthcare professionals stay up to date with best practices, continuing education requirements should also be put in place.
- ***Strengthen Procurement and distribution of essential IPC supplies*** – MOH and partners can work with county and hospitals procurements officers, supply chain officers and county IPC focal persons to ensure that only essential and needed IPC supplies are purchase and distributed to counties and HFs.
- ***Scale up the local production of Alcohol-base-handrub*** – The MOH and health partners in Liberia can work with all counties hospital administration to scale up the production alcohol-base-handrub to improve HWs access to hand hygiene products by providing

Recommendation for County Health Teams:

- **Conducting regular monthly supervision and Audits to improve IPC practices** – County Health Teams can support county and hospital IPC focal persons to conduct weekly and monthly supervision and audits of HWs IPC practices within HFs by observations, feedbacks, and mentoring staffs on improving IPC practices.
- **Improve management and supply of IPC materials** – county and Hospital administration can support supply chain officers and IPC focal persons to conduct weekly and monthly inventory of IPC stock balances at HFs and ensure the availability of buffer stocks for essential IPC materials in HFs.

Recommendations for future research

- The Liberian government can fund research on HWs IPC adherence utilizing primary data collecting through the National Public Health Institute of Liberia and other research organizations. IPC practices in all HFs in Liberia should be thoroughly evaluated to identify their strengths and weaknesses, including the availability of resources. The effectiveness of interventions both singly and holistically in addressing adherence gaps, the difficulties encountered in putting IPC guidelines into practice in Liberia, and novel tactics for advancements can all be the subject of more research.
- Surveillance and epidemiological studies can be carried out to determine the prevalence and distribution of HAIs across various healthcare environments in Liberia and by using this data, priority focus areas and resource allocation can be determined.

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**Appendix 1: Search strategy ..... Keywords words combination**

	<b>Problem/issue term</b>		<b>Factors related Terms</b>		<b>Geographical Terms</b>
<b>OR</b>	adherence	<b>AND</b>	knowledge	<b>AND</b>	Liberia
	Infection Prevention Control		Attitude		West Africa
	Infection Prevention		Beliefs		Sierra Leone
	Preventive Measures		Perception of risk		Guinea
	compliance		Risk perception		Sub Saharan Africa
	Preventive Practices		Safety climate		Low-income Countries
	Standard precautions		Safe workplace		Low- and Middle-Income Countries
	Hand hygiene		Age		Nigeria
	Personal Protective Equipment		sex		Ghana
	Waste management		gender		
	isolation		sociodemographic		
	WASH		Subjective Norms		
			Availability of supplies		
			Availability of equipment		
			infrastructure		
			Guidelines		
			SOPs		
			Policies		
			Management expectations, support		
			Overtime, quarantine,		
	Interventions, strategies, improvements				



